DRAFT ENVIRONMENTAL IMPACT REPORT/
EXPANDED PROJECT NOTIFICATION FORM

Caesars Resort at Suffolk Downs

Boston and Revere, Massachusetts

EEA # 15006



Submitted to:

Boston Redevelopment Authority
1 City Hall Square
Boston, Massachusetts 02201

Submitted by:

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SUFFOLK DOWNS

CAESARS ENTERTAINMENT

October 9, 2013

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October 9, 2013

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List of Acronyms

AASHTO	American Association of State Highway and Transportation Officials
ABC	Asphalt, Brick, and Concrete
ACEC	Area of Critical Environmental Concern
ACM	Asbestos-Containing Material
ADA	Americans with Disabilities Act
ADT	Average Daily Trips
AEC	Alternative Energy Credit
AHU	Air Handling Unit

List of Acronyms (Continued)

ANSI	American National Standards Institute
ATR	Automatic Traffic Recorder
AUL	Activity and Use Limitation
BBRS	Board of Building Regulations and Standards
BCB	Boston City Base
BCEC	Boston Convention and Exhibition Center
BLC	Boston Landmarks Commission
BLSF	Bordering Land Subject to Flooding
BMP	Best Management Practice
BRA	Boston Redevelopment Authority
BTD	City of Boston Transportation Department
BUD	Beneficial Use Determination
BVW	Bordering Vegetated Wetland
BWSC	Boston Water and Sewer Commission
CAFO	Concentrated Animal Feeding Operation
CA/T	Central Artery/Tunnel
CFC	Chlorofluorocarbon
CFR	Code of Federal Regulations
CGP	Construction General Permit
CHP	Combined Heat and Power
CMP	Construction Management Plan
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COP	Coefficient of Performance
CTP	Central Transportation Planning
CUP	Central Utility Plant
CWA	U.S. Clean Water Act
CxA	Commissioning Agent
CZM	Massachusetts Coastal Zone Management
CZMA	Federal Coastal Zone Management Act
DCR	Massachusetts Department of Conservation and Recreation
DDA	Densely Developed Area
DEIR	Draft Environmental Impact Report
DHW	Domestic Hot Water
DOC	Diesel Oxidation Catalysts
DOER	Massachusetts Department of Energy Resources
DPA	Designated Port Area
DPF	Diesel Particulate Filters
EBLLS	East Boston Low Level Sewer
ECD	Emission Controlled Diesel

List of Acronyms (Continued)

EDA	Economic Development Area
EEA	Massachusetts Executive Office of Energy and Environmental Affairs
EJ	Environmental Justice
EMS	Emergency Management System
ENF	Environmental Notification Form
EPA	U.S. Environmental Protection Agency
EPNF	Expanded Project Notification Form
ERP	Environmental Results Program
ERU	Energy Recovery Unit
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
GCOD	Groundwater Conservation Overlay District
GEP	Good Engineering Practice
GHG	Greenhouse Gas
GPD	Gallons per day
GSHP	Ground Source Heat Pump
HCA	Host Community Agreement
HCM	Highway Capacity Manual
HFC	Hydrofluorocarbon
HOV	High Occupancy Vehicle
HSG	Hydrologic Soil Group
HVAC	Heating, Ventilation, and Air Conditioning
IEB	Investigations and Enforcement Bureau
IECC	International Energy Conservation Code
I/I	Infiltration and Inflow
IPCC	Intergovernmental Panel on Climate Change
ITE	Institute of Transportation Engineers
JTW	Journey to Work
LEED	Leadership in Energy and Environmental Design
LID	Low Impact Development
LNG	Liquefied Natural Gas
LOS	Level of Service
LSCSF	Land Subject to Coastal Storm Flowage
LSP	Licensed Site Professional
LUHPPL	Land Use with Higher Potential Pollutant Loads
LUW	Land Under Water
MAAQS	Massachusetts Ambient Air Quality Standards
MAHWL	Mean Annual High Water Line
MassDEP	Massachusetts Department of Environmental Protection

List of Acronyms (Continued)

MassDOT	Massachusetts Department of Transportation
MassDPH	Massachusetts Department of Health
MBTA	Massachusetts Bay Transportation Authority
MCP	Massachusetts Contingency Plan
MEP	Mechanical, Electrical, and Plumbing
MEPA	Massachusetts Environmental Policy Act
MHHW	Mean Higher High Water
MPO	Metropolitan Planning Organization
MUTCD	Manual on Uniform Traffic Control Devices
MWRA	Massachusetts Water Resources Authority
NAAQS	National Ambient Air Quality Standards
NAC	Noise Abatement Criteria
NESHAP	National Emission Standards for Hazardous Pollutants
NFIP	National Flood Insurance Program
NHESP	Massachusetts Natural Heritage and Endangered Species Program
NMCPA	Massachusetts Minor Source Preconstruction Approvals
NOI	Notice of Intent
NOx	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Services
NSR	New Source Review
OHWM	Ordinary High Water Mark
OSHA	Occupational Safety and Health Administration
OSW	Off-Site Wetland
PAH	Polyaromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PDD	Planned Development District
PIC	Public Improvement Commission
PIF	Pressure-Injected Footing
PM	Particulate Matter
PPA	Power Purchase Agreement
PPM	Parts per million
PSD	Prevention of Significant Deterioration
PV	Photovoltaic
RAM	Release Abatement Measure
RAO	Response Action Outcome
RFA	Request for Application
RFA	Riverfront Area
ROW	Right of Way
RPA	Regional Priority Credits
RPP	Resident Parking Permit

List of Acronyms (Continued)

RTN	Release Tracking Number
SHW	Solar Hot Water
SIP	State Implementation Plan
SOV	Single-Occupant Vehicle
SREC	Solar Renewable Energy Credits
SRI	Solar Reflectivity Index
SSO	Source-Separated Organics
SWPPP	Stormwater Pollution Prevention Plan
TAPA	Transportation Access Plan Agreement
TBHA	The Boston Harbor Association
TDM	Transportation Demand Management
TMA	Transportation Management Association
TMC	Turning Movement Count
TMDL	Total Maximum Daily Load
TMP	Traffic Maintenance Plan
TSS	Total Suspended Solids
TWT	Ted Williams Tunnel
UPS	Uninterruptible Power Supply
USCS	Unified Soil Classification System
USGBC	U.S. Green Building Council
UST	Underground Storage Tank
VFD	Variable Frequency Drive
VHB	Vanasse Hangen Brustlin, Inc.
VMT	Vehicle Miles Travelled
VOC	Volatile Organic Compound
VPD	Vehicles per day
VPH	Vehicles per hour
WPA	Massachusetts Wetlands Protection Act
WSHP	Water Source Heat Pump

Executive Summary

EXECUTIVE SUMMARY

ES.1 Caesars Resort at Suffolk Downs

The Proponent is committed to setting the standard of excellence for gaming resorts in the Commonwealth of Massachusetts across a range of key areas. Central to achieving this new standard, the Project will be the most sustainably designed and built gaming development project in the world. The Proponent has developed a comprehensive program to ensure it is the leader in this area, beginning with the commitments it has made to its host communities of Boston and Revere.

The Resort will be energy-efficient, environmentally conscious, and healthy for employees and visitors. Achieving LEED Gold certification will make the Project only the second casino in the world to reach that designation, and the only one with an integrated hotel and other amenities. The operator of the proposed Resort operates more than 50 properties around the world and has a well-documented and recognized leadership role in sustainability across its footprint. Since 2008, Caesars Entertainment has been recognized with more than 60 awards and distinctions for its sustainability efforts from organizations including the U.S. Environmental Protection Agency, Audubon International, and the American Gaming Association.

In addition to the sustainable design, the Project will generate extraordinary public benefits, the foremost being the creation of 4,000 permanent jobs and 2,500 construction jobs with local hiring preferences. The Project will also preserve jobs at the property's racing facility in its current use. In addition, the Proponent has committed to significant local road and infrastructure improvements ($42 million to $50 million), $35 million in local capital projects in Boston and Revere as well as improvements to the Suffolk Downs MBTA Station, and the preservation and improvement of open space accessible to the public.

ES.2 Sustainability Elements

The Proponent is committed to creating the greenest, most sustainable casino development in the world. To achieve this, many innovative, creative, and sustainable features are included in the Project design and configuration. These features, which are discussed in detail within this filing, include the Project's energy demand, water use, and overall site design. This Project's environmental standards would be high for any development of its size, but are particularly so for the development of a casino resort, a 24-hour use that is typically a large consumer of energy and other resources.

Energy, Innovative Design Measures, and Greenhouse Gas Emissions Reduction

The Proponent is incorporating leading-edge technology and innovative design and materials to conserve energy and reduce potential greenhouse gas emissions. These measures are illustrated in Figure ES-1.

- Anaerobic Digestion: The Resort has signed on as an "anchor tenant" for Massachusetts-based Harvest Power enabling the recovery of approximately 3,100 tons of food waste from the Resort annually that will produce nearly 850,000 kWh of net energy. The Resort's central processing facility is being designed to separate all organic waste for the digester.

- A Central Utility Plant will include two combined heat and power units. These units will provide utility services for the entire Resort, including approximately 5% of the Resort's electricity, 100% of its domestic hot water, and 30% of its heating needs.

- Solar: The Project design includes a large approximately 2.7 MW photovoltaic system, of which approximately 1.45 MW will be building-mounted, one of the largest private building-mounted arrays in the northeast United States. The PV system will produce at least 10% of the Resort's electricity (see Figure ES-2). In addition, Renewable Energy Credits will be purchased so at least 35% of the buildings' electricity consumption will come from renewable sources.

- LED lighting: The Project will install these fixtures in both indoor and outdoor applications throughout the Resort to reduce overall energy consumption and thermal load.

- Heat Recovery Ventilation: Heat recovery will be used to pre-treat incoming make-up air by capturing latent heat in outgoing exhaust air. This "recycling" of heat energy that would otherwise be wasted allows for much greater system efficiency by reducing the amount of energy needed to heat or cool incoming air.

- Occupancy-based controls: These controls will allow the Resort to optimize system performance to reduce energy consumption, and will be included throughout the property, including in hotel guest-room, support offices, and large function rooms.

- Advanced lighting controls in conjunction with architectural daylighting strategies will take advantage of natural light to reduce the need for artificial lighting. These controls will have the ability to automatically decrease artificial lighting when natural light is detected in the space.

Water Conservation

The Proponent is incorporating several key tactics to reduce, recycle, and manage water consumption on the Project site. Water management tactics are illustrated in Figure ES-3.

- Rainwater harvesting: Every drop of water falling onto casino rooftops and about 50% of water falling onto the garage rooftop will be directed towards one of three rainwater harvesting tanks with a combined capacity of 270,000 gallons, reducing potable water demand by up to 4.5 million gallons annually (see Figure ES-4).

- Low-flow or waterless plumbing fixtures and other water conservation measures will reduce water use by approximately 30%, resulting in an annual water use reduction of approximately 4.0 million gallons.

- A high-efficiency irrigation system, together with plantings of native, drought-tolerant vegetation, will target a 50% reduction in potable water use when compared to a mid-summer baseline.

Open Space, Activation, and Site Design

The creation of public open space and the reduction of impervious surface were key design considerations for the Project. As a result of these efforts:

- Open space will increase by approximately 16 acres with a diversity of spaces ranging from active pedestrian plazas to passive ecological parks, offering a variety of amenities for public use.

- Impervious area will be reduced by approximately 14 acres.

- Improved Water Quality: Low-impact design and primary treatment Best Management Practices encompass a new stormwater management system that will improve the quality of discharges, thus benefitting Sales Creek, Belle Isle Marsh, and the Rumney Marshes Area of Critical Environmental Concern (see Figure ES-5).

- A network of pedestrian walkways will connect neighborhoods and visitors to the Resort, promoting circulation and access.

- The Project includes on-street bicycle accommodations to connect Constitution Beach, Belle Isle Marsh, and Revere Beach along the Bennington Street corridor, as well as connections to and through the Project site from the Suffolk Downs MBTA station and from Winthrop Avenue.

- Bicycle Amenities: The Project includes valet bicycle parking, two Hubway stations (when the City expands the Hubway network into East Boston), showers for employees, covered bicycle storage, and short-term bicycle parking.

- Innovative green infrastructure and sustainable systems will use the landscape to purify stormwater, improve soils, and provide educational opportunities.

- The roof of Casino Area II will feature a 5,600-square-foot greenhouse with a hydroponic planting system that will produce, year-round, most of the fresh produce for restaurants in the Resort, thereby reducing demand for delivery trucks.

Climate Change Adaptability and Resiliency

The Project is designed with the capability to function as a safe haven for the community should an extreme event occur. To achieve this, landscape design responds to the threat of sea level rise by elevating buildings, roadways, and access points in a manner that will maintain access and building operations during future coastal storms assuming sea level rise.

- A balanced cut-and-fill soil strategy across the site will increase the capacity of floodplain storage by approximately 60,000 cubic feet.
- A significant portion of Tomasello Drive will be raised above the potential future 100-year coastal storm flood elevation of 18.7 feet that may occur at high tide accounting for sea level rise.
- The Project will reduce stormwater runoff from the site by increasing pervious surfaces and harvesting rainwater from roof areas for reuse.
- First-floor elevations of proposed buildings will be significantly higher than anticipated flood elevations accounting for sea level rise and storm surge.
- Critical mechanical and electrical equipment will be located significantly higher than anticipated flood elevations accounting for sea level rise and storm surge.
- Upper-level windows in the hotel will be operable to provide ventilation in case of power outage.
- Small pumps will be located in lower levels of the parking garage and casino buildings to evacuate stormwater from these areas.
- Space will be reserved for future expansion of the major mechanical and electrical systems if needed to adapt to climate change, for example by adding emergency generators to increase the facility's capability of sheltering the public.

In addition to these sustainability measures, the Proponent is committed to a rigorous Transportation Demand Management (TDM) program, described in detail in Section 5.9.

ES.3 Summary of Environmental Impacts and Mitigation

ES.3.1 Transportation

The Project includes major off-site roadway, traffic, and safety improvements, many of which are expected to address pre-existing regional traffic problems independent of the proposed Project. The proposed Route 1A infrastructure improvements will go far beyond mitigating the potential impacts of Project trips, significantly improving safety and traffic

capacity in the vicinity of the Project site with reduced queuing and delays for both local and regional traffic. New ramp connections at the Route 1/Route 16 interchange and improvements at other strategic locations along the Revere Beach Parkway corridor are expected to address existing regional traffic and safety problems and relieve the Route 60 corridor through Revere. Traffic, roadway, and safety infrastructure improvements to address existing conditions will be provided at numerous other local intersections in Boston and Revere, some of which are expected to experience limited or minimal Project impacts.

The Proponent is also committed to implementing a robust Transportation Demand Management program to reduce single-occupancy vehicle travel, thereby reducing Project parking demand, traffic congestion, and associated environmental impacts. Supported by parking demand management and on- and off-site infrastructure improvements, the program will also promote walking, bicycling, ridesharing, and public transit use. Well-designed pedestrian and bicycle connections to and through the Project site will enhance accommodations for those modes and address pre-existing connectivity and safety issues.

Traffic operations analysis shows limited degradation in overall LOS grades at study area intersections during critical peak periods due to Project impacts. Capacity and operational improvements accrue as the result of proposed roadway improvements, generally providing positive impacts compared to No-Build conditions and, at many locations, Existing conditions.

The Project will generate significant new ridership on the MBTA system, largely on the Blue Line. Use of Suffolk Downs Station will increase substantially but will remain within the capacity of this extremely under-utilized station. Project-related ridership can be accommodated within the MBTA's service delivery policy, with the exception of limited times in the late evening on Thursdays and Fridays. Adverse impacts to MBTA bus capacity and operations are not expected.

With 5,100 proposed spaces, on-site parking will be less than under existing conditions, and will adequately accommodate the Project's peak parking demand. Employee parking will be accommodated as part of the Resort's extensive ground shuttle operation.

ES.3.2 Wind

The pedestrian wind analysis (see Section 6.1) demonstrates that shelter provided by the proposed Project is expected to significantly improve wind conditions over the Project site. As a result, many previously uncomfortable wind conditions are predicted to be comfortable for walking or better once the development is complete. Furthermore, the Project is not expected to have a significant negative effect in any of the surrounding areas. On the contrary, construction of the proposed Project is expected to reduce wind speeds in most surrounding areas, most significantly along Tomasello Drive southeast of the existing shopping plaza.

ES.3.3 Shadow

The shadow analysis (see Section 6.2) demonstrates that new shadow impacts from the Resort will be minimal, and will not affect any sensitive areas off-site. Likewise, the network of pathways throughout the entry landscape will be unaffected by new shadow, as will most of the open spaces on the Project site.

ES.3.4 Air Quality

Results of the microscale analysis show that all predicted carbon monoxide concentrations are well below one-hour and eight-hour National Ambient Air Quality Standards (NAAQS). Therefore, it can be concluded that there are no adverse air quality impacts resulting from increased traffic in the area. Results of the stationary source air quality dispersion modeling analysis show that all predicted concentrations are well below the NAAQS. Therefore, it can be concluded that the stationary sources associated with the Project will not cause or contribute to a violation of the NAAQS. Although results of the mesoscale analyses (see Section 6.5) show increases in nitrogen oxide and volatile organic compound emissions, the quantitative values (in tons per year) are relatively small (~3 tons per year) between No-Build and Build cases. With the Host Community Agreement improvements, reductions of NOx and VOC are expected from the Build case.

ES.3.5 Noise

Based on a detailed noise analysis (see Section 6.6), with appropriate mitigation, the Resort is expected to meet the City of Boston and Massachusetts Department of Environmental Protection noise limits as well as the recommended Environmental Protection Agency and Housing and Urban Development guidelines. In addition, a mobile source analysis of future traffic impacts indicates that sound levels due to increases in traffic volumes associated with the Resort will meet the applicable Federal Highway Administration noise criteria at each of the nearest residences and community receptors. Furthermore, an analysis of construction noise resulting from the operation of diesel-powered equipment indicates that the Resort is expected to meet the applicable City of Boston construction noise limits during daytime construction hours. In conclusion, results of these analyses indicate that predicted sound levels due to stationary mechanical equipment, increased traffic volumes, and temporary construction activities are not anticipated to cause a significant noise impact on the surrounding community, and, with appropriate mitigation, are expected to meet relevant noise limits at all noise-sensitive locations.

ES.3.6 Wetlands

The Project site does not contain any areas of Priority Habitat or Estimated Habitat for state-listed species. There are also no mapped certified or potentially certifiable vernal pools located on or near the Project site. A portion of on-site activities will occur within Bordering Land Subject to Flooding (BLSF) and the 25-foot Riverfront Area (RFA) associated with Sales Creek. No work is proposed in Bordering Vegetated Wetland (BVW), Inland

Bank, or Land Under Water (LUW). Although the Project will fill some areas of BLSF, the site design calls for more cutting than filling, and these activities will result in a net *increase* in approximately 60,000 cubic feet of floodplain storage. The additional flood storage areas will be designed to comply with Wetlands Protection Act (WPA) performance standards for BLSF. With regard to the Sales Creek RFA, activities in this location are limited to proposed stormwater management system improvements and upgrades and construction of a small floodplain compensatory storage area adjacent to Sales Creek at the north end of the site.

Off-site infrastructure improvements will occur in proximity to LUW, Inland Bank, BVW, RFA, Salt Marsh, and/or Coastal Bank (see Section 6.9.2). Impacts, if required, can be allowed under the limited project provision cited at 310 CMR 10.24(7)(c)(1) of the WPA Regulations, which allows for maintenance and improvement of existing public roadways (including widening less than a single lane and adding shoulders). As required by the limited project provision, the proposed work will not adversely impact habitat of rare vertebrate or invertebrate species.

ES.3.7 Hazardous Materials

Completion of a subsurface investigation, sampling, and testing program of soil and groundwater media and a Method 3 Risk Characterization found that a condition of No Significant Risk to human health or the environment exists at the release areas of the site, and No Significant Risk was identified both for current and future hypothetical residential uses. No Activity and Use Limitation has been placed on the property. Additional subsurface investigations with soil and groundwater sampling and testing were completed in 2007. Based on the findings, it was concluded that no new MCP reportable conditions exist with respect to soil or groundwater. Haley & Aldrich has been engaged by the property owner to provide environmental consulting services during Project design and construction. If contamination is identified in pre-construction sampling or during construction, a Licensed Site Professional (LSP) will provide services consistent with the MCP as required for regulatory compliance and close-out.

ES.4 Conclusion

The Proponent's commitment to developing a world-class, environmentally-conscious Resort is manifested in the myriad of sustainable elements incorporated into its design. Together with the numerous extraordinary public benefits promised by the Project, the Resort will be a good neighbor locally and an important asset regionally. A detailed Project description, various environmental analyses, and proposed mitigation measures are all described in detail in the Draft Environmental Impact Report/Expanded Project Notification Form.

WHAT IT IS

- SHADING
- CO2 REDUCTION
- MEADOW PLANTING
- MARSH RESTORATION PLANTING
- DECIDUOUS TREES
- WILDLIFE HABITAT

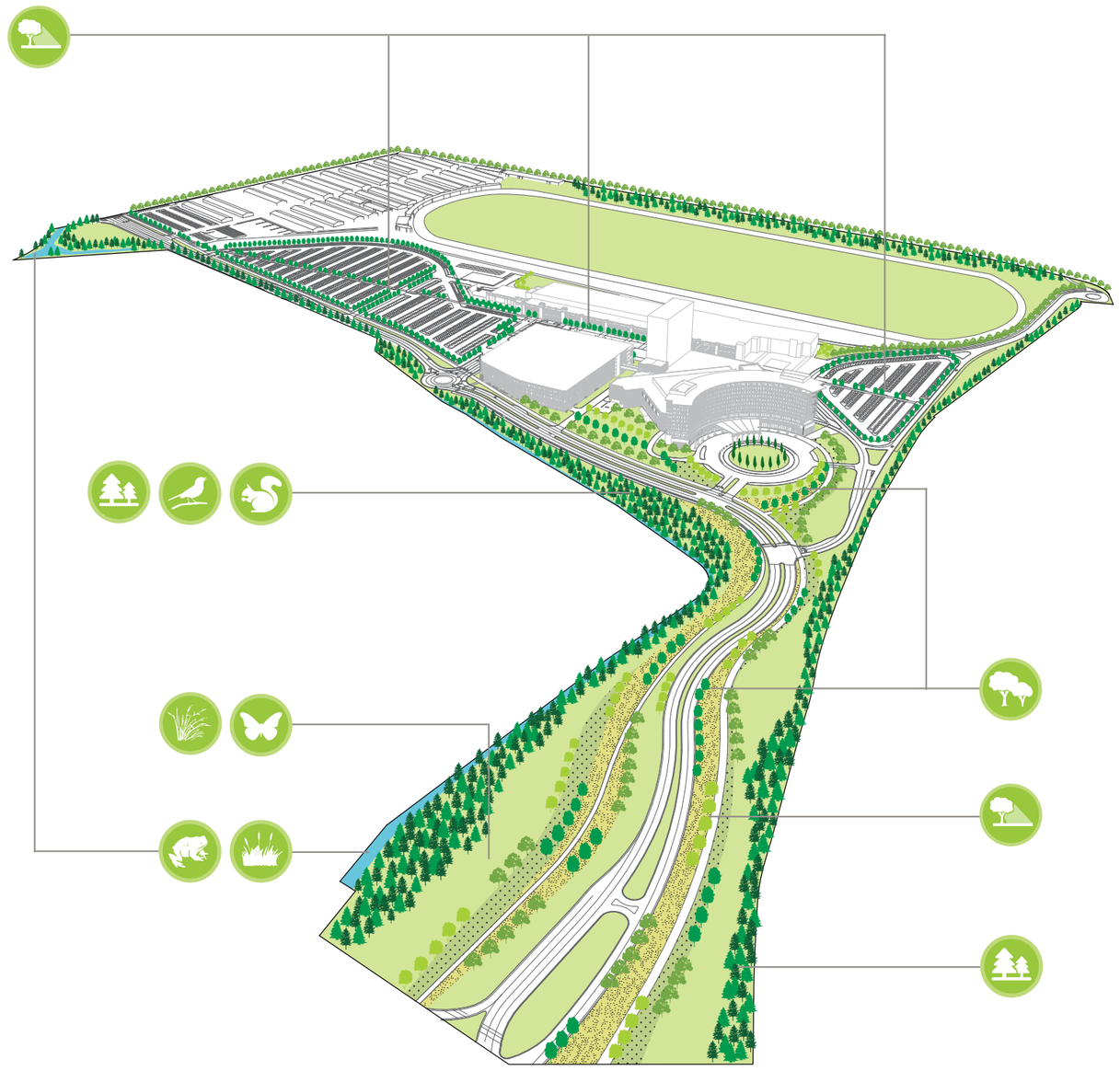








WHERE IT IS



WHAT IT MEANS

INCREASED TREE CANOPY

C02 REDUCTION

3 MILLION POUNDS
over 10 years

1 CAR ICON = 100 CARS



TOTAL = 279 CARS

STORMWATER INTERCEPTION

C02 REDUCTION

9.5 MILLION POUNDS
over 10 years

1 CAR ICON = 100 CARS



TOTAL = 853 CARS

INCREASED WILDLIFE HABITAT



INCREASED SHADE

THERMAL COMFORT

REDUCE URBAN HEAT ISLAND EFFECT

ELKUS | MANFREDI ARCHITECTS

SASAKI

CAESARS ENTERTAINMENT

SUFFOLK DOWNS

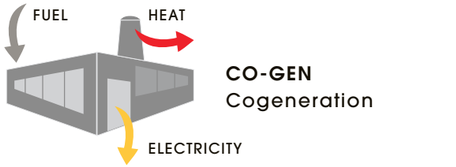
CAESARS RESORT AT SUFFOLK DOWNS
Boston/Revere, Massachusetts

Ecological Systems
FIGURE ES-1

WHAT IT IS

SOLAR PANELS

COGENERATION

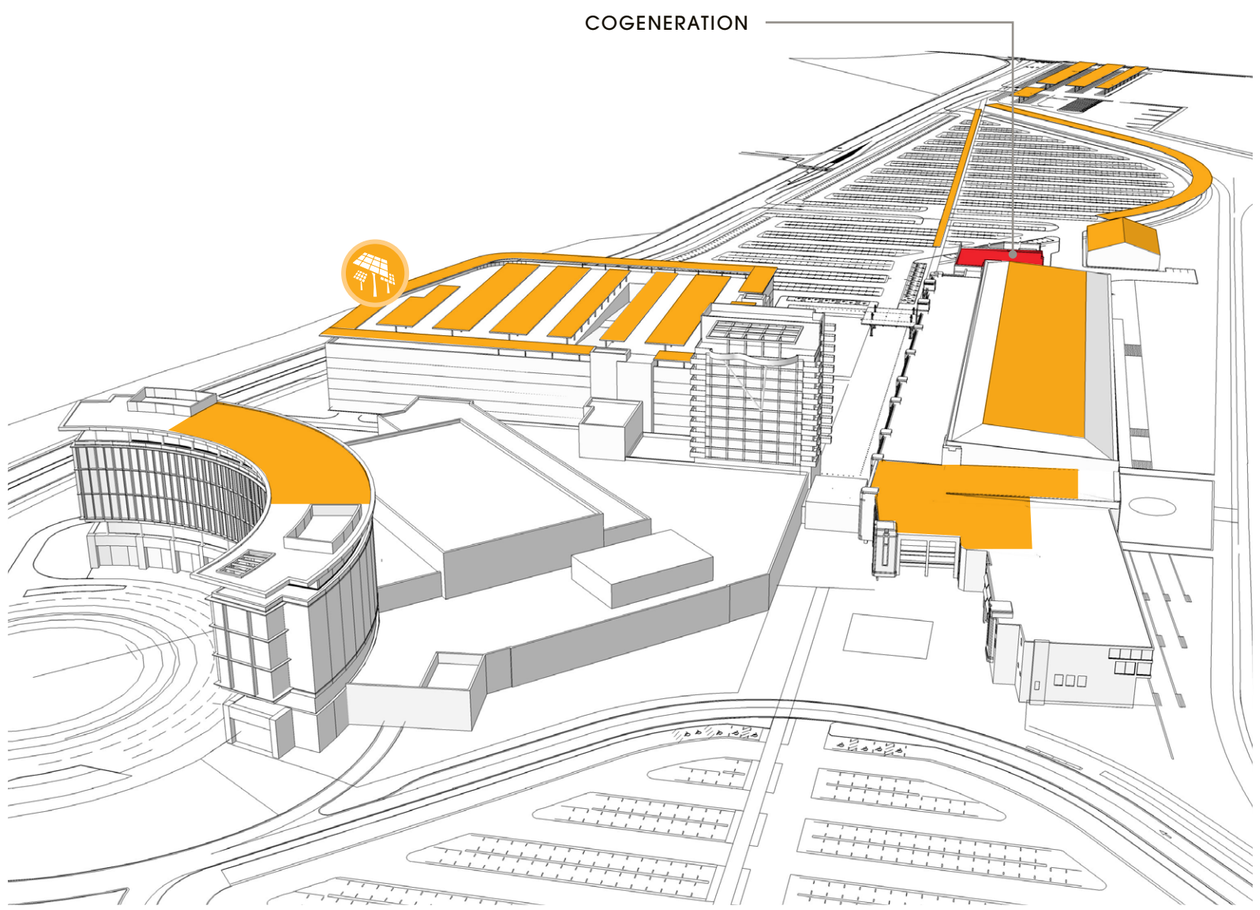


CO-GEN
Cogeneration





WHERE IT IS



WHAT IT MEANS

SOLAR PANELS

TOTAL GENERATION

3.1 MWH

1 HOUSE ICON = 50 HOMES



TOTAL = 327 HOMES

COGENERATION

NET SAVINGS

1.35 MWH

1 HOUSE ICON = 50 HOMES



TOTAL = 143 HOMES

ELKUS | MANFREDI ARCHITECTS

CAESARS ENTERTAINMENT

SUFFOLK DOWNS

CAESARS RESORT AT SUFFOLK DOWNS
Boston/Revere, Massachusetts

On-Site Energy Generation
FIGURE ES-2

WHAT IT IS

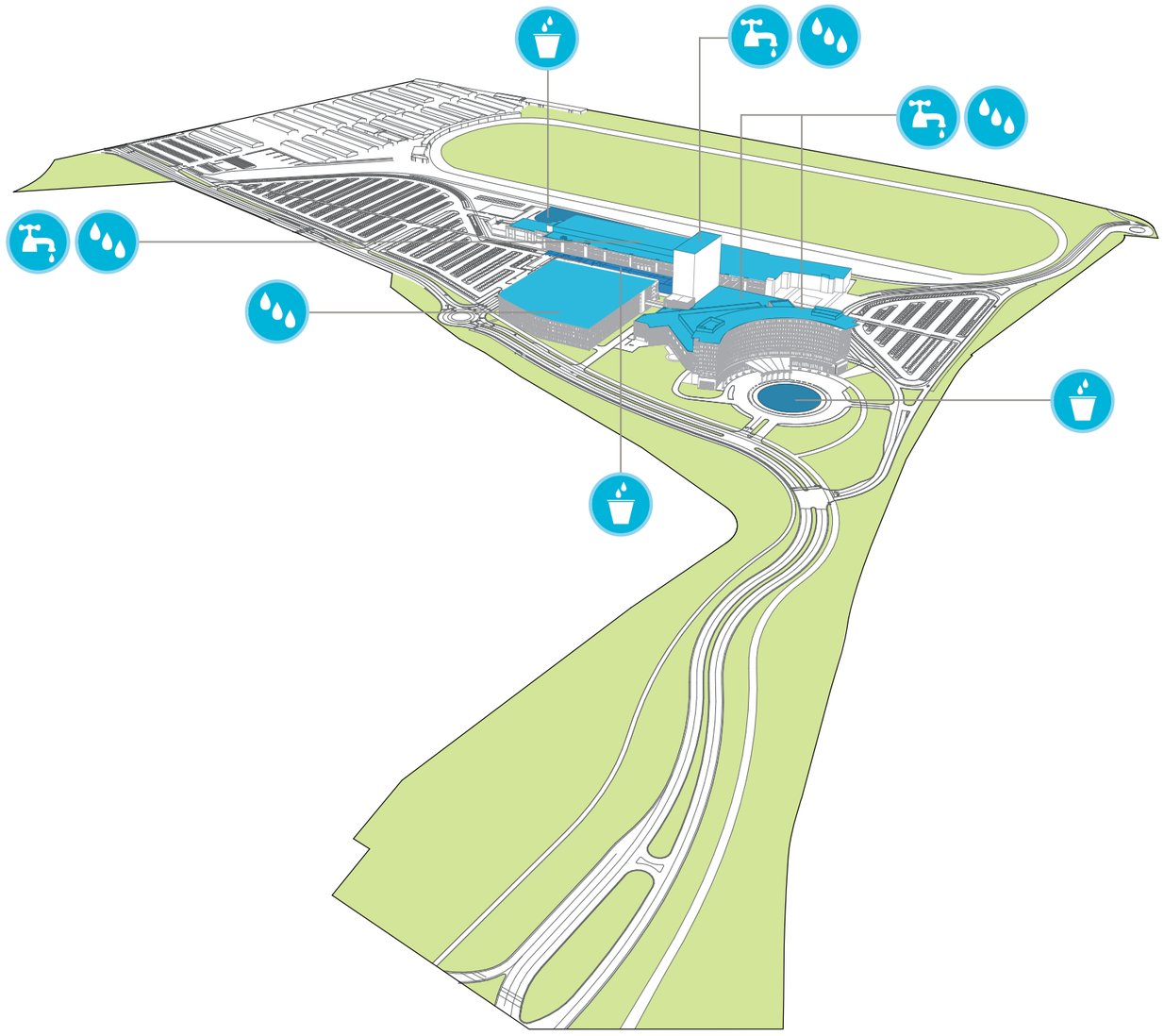
- RAINWATER REUSE
- RAINWATER STORAGE
- WATER CONSERVATION







WHERE IT IS

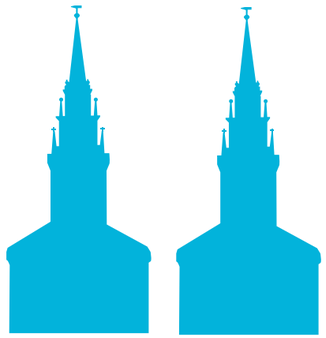


WHAT IT MEANS

RAINWATER REUSE

SAVINGS

4.5 MILLION GALLONS/YR



FILLS THE OLD NORTH CHURCH – TWICE

RAINWATER STORAGE

SAVINGS

270,000 GALLONS

WATER CONSERVATION

SAVINGS

4 MILLION GALLONS/YR

- Low Flow Fixtures
- Waterless Urinals

ELKUS | MANFREDI ARCHITECTS

SASAKI

Nitsch Engineering

CAESARS ENTERTAINMENT

SUFFOLK DOWNS

CAESARS RESORT AT SUFFOLK DOWNS

Boston/Revere, Massachusetts

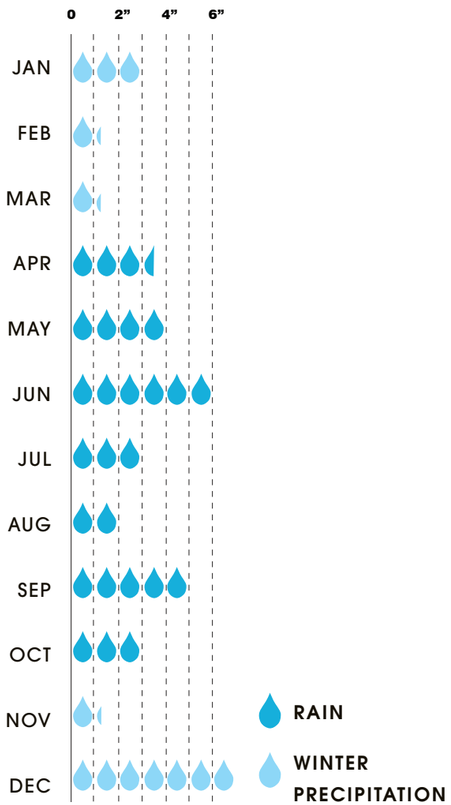
Water Conservation & Reuse

FIGURE ES-3

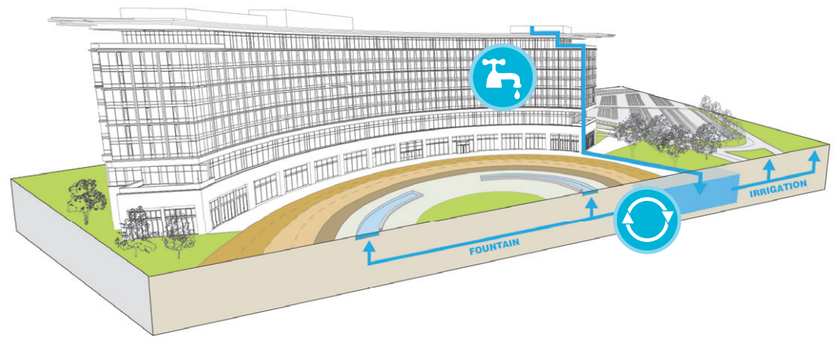
WHAT IT IS

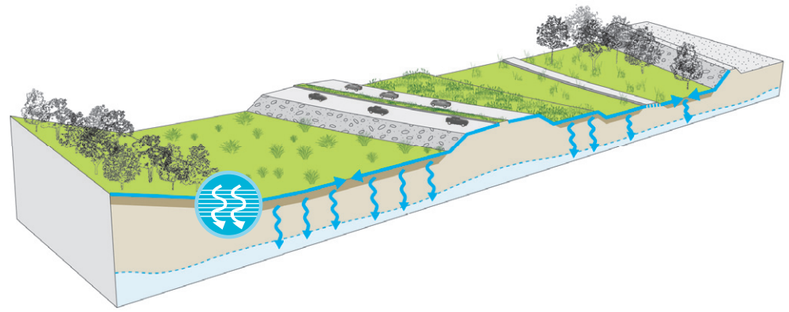
- REUSE
- CONSERVE
- RECHARGE/ STORMWATER TREATMENT
- TREATMENT & RELEASE

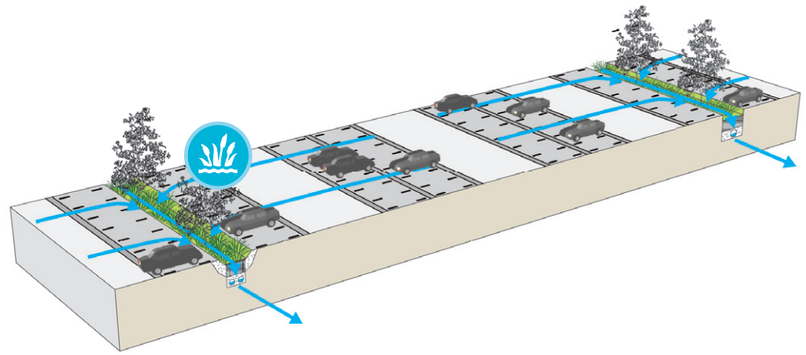
RAINFALL/PRECIPITATION
2012 TOTAL: 39.63”



HOW IT WORKS





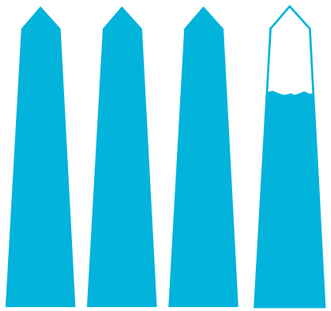


WHAT IT MEANS

REUSE & REDUCE
storage cisterns

TOTAL SAVINGS

8.5 MILLION GALLONS/YR



FILLS THE BUNKER HILL MONUMENT – 3.75 TIMES

RECHARGE & INFILTRATE
ecological park

REMOVE ≥

80% TOTAL SUSPENDED SOLIDS

TREAT & RELEASE
parking bioswales

REMOVE ≥

80% TOTAL SUSPENDED SOLIDS

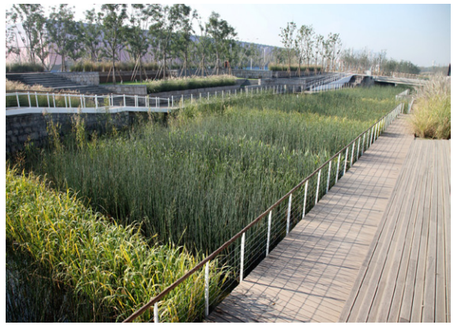
ELKUS | MANFREDI ARCHITECTS
SASAKI
Nitsch Engineering
CAESARS ENTERTAINMENT
SUFFOLK DOWNS

CAESARS RESORT AT SUFFOLK DOWNS
Boston/Revere, Massachusetts

Interpreting the Water
FIGURE ES-4

WHAT IT IS

- REUSE
- RECHARGE/ STORMWATER TREATMENT
- TREATMENT & RELEASE
- EXISTING WETLAND
- SURFACE FLOW

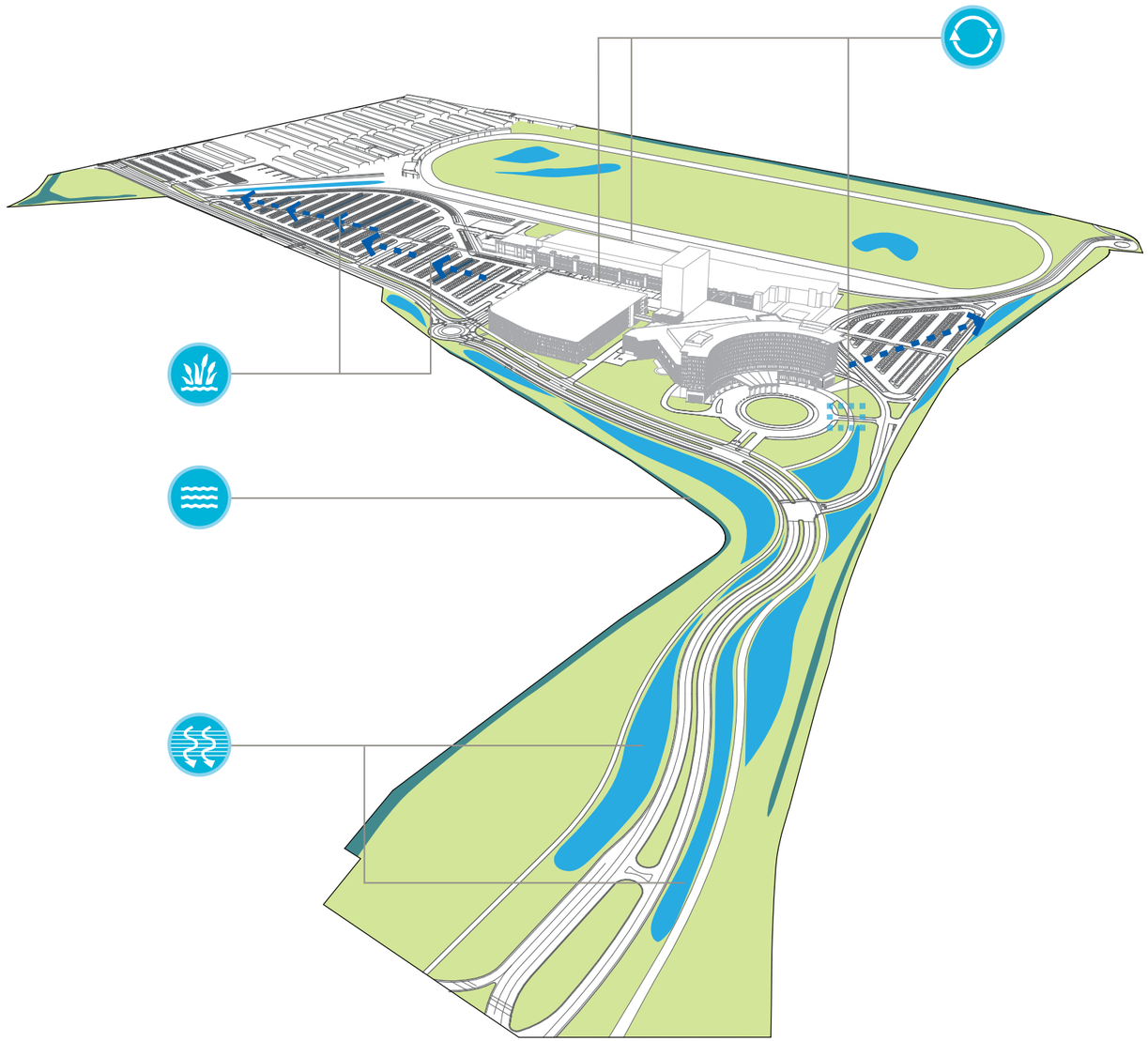






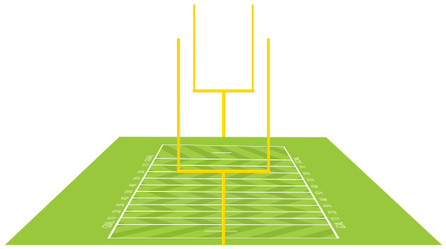


WHERE IT IS



WHAT IT MEANS

- Create 12 acres of pervious landscape for stormwater treatment and recharge
- Reconnect natural surface hydrology
- Design grading to maximize natural stormwater flows and treatment



1 ACRE = 1 FOOTBALL FIELD

12 ACRES = 12 FOOTBALL FIELDS

ELKUS | MANFREDI ARCHITECTS

SASAKI

Nitsch Engineering

CAESARS ENTERTAINMENT

SUFFOLK DOWNS

CAESARS RESORT AT SUFFOLK DOWNS

Boston/Revere, Massachusetts

Stormwater Treatment

FIGURE ES-5

Section 1.0

Caesars Resort at Suffolk Downs

1.0 CAESARS RESORT AT SUFFOLK DOWNS

Caesars Resort at Suffolk Downs is a redevelopment proposed on approximately 161 acres of land in East Boston and Revere (see Figures 1-1 and 1-2 [note that all figures are included in Volume II, Project Figures]). Of the 161 acres comprising the site, approximately 116 are located in Boston and approximately 45 are located in Revere. To the west, the property is bordered by a retail shopping plaza, properties containing fuel storage tanks owned by Irving Oil Terminals Inc. and Global Petroleum, and McClellan Highway (Route 1A). Winthrop Avenue is located to the north of the Project site. The neighborhood north of Winthrop Avenue is Crescent Beach, which in turn borders Revere Beach and the Atlantic Ocean; the Project site is located less than one mile from the beach. The MBTA Blue Line and Bennington Street lie east of the Project site, and Waldemar Avenue is at the southern boundary. Orient Heights is the residential neighborhood located immediately south of the Project site.

The portion of the Project site located within Boston is within the East Boston Neighborhood District and is zoned as the Suffolk Downs Economic Development Area (EDA), the purpose of which is to "encourage sound development and growth that will expand the City's economic base and afford broad employment opportunities." The site is also included in a Special Study Overlay Area that overlays the EDA.

The main access points to the site are from Route 1A to the west and Tomasello Drive as well as from Winthrop Avenue at the north end of the property. Two mass transit stops on the MBTA Blue Line (Suffolk Downs and Beachmont stations) currently serve the Project site. Parallel to the train tracks is Bennington Street, which connects East Boston to the City of Revere and is a key route for access to the Town of Winthrop (via Saratoga Street, Route 145). Beyond Bennington Street lies the Belle Isle Reservation where the Massachusetts Department of Conservation and Recreation (DCR) manages a 28-acre park with pathways, benches, and an observation tower; the reservation is part of the 241-acre Belle Isle Marsh, the last remaining salt marsh in Boston.

Sales Creek is associated with the Belle Isle Inlet and Rumney Marshes Area of Critical Environmental Concern (ACEC) and extends through the Project site, primarily as a manmade drainage channel, from approximately the northwest corner of the site, passing between the proposed construction and the existing horse barns, through the northern portion of the racing track infield, and continuing east of the Project site (see Figure 1-3). Areas north of Sales Creek house stables for the ongoing racing program.

The property is currently home to Suffolk Downs, which opened in 1935 and remains New England's only operating thoroughbred racetrack. Historically, the Project site has hosted as many as 40,000 patrons and contained as many as 12,000 parking spaces (see Figure 1-4). Racetrack operations require approximately 63 acres for a one-mile oval racing surface and related open space, all of which exist in an urban environment. The maintenance of this open space and related view corridor is an important community amenity. Existing conditions are shown in Figure 1-5.

This Draft Environmental Impact Report (DEIR)/Expanded Project Notification Form (EPNF) has been prepared in response to comment letters received on the Environmental Notification Form (ENF) submitted to the Massachusetts Environmental Policy Act (MEPA) Office on January 31, 2013 as well as discussions with MEPA, the cities of Boston (including the Boston Redevelopment Authority [BRA]) and Revere, and other state and local agencies. The Secretary of the Executive Office of Energy and Environmental Affairs' (EEA) Certificate on the ENF is provided in Section 11.0 along with each of the comment letters received on the Project.

Caesars Resort at Suffolk Downs provides a unique opportunity for the cities of Boston and Revere to create a world class entertainment complex located minutes from the heart of downtown Boston and Logan International Airport. Caesars Entertainment's commitment to sustainably developing the expansive 161-acre site in partnership with the cities of Boston and Revere and surrounding communities is the foundation for many of the unique elements of this Project. While some of the Project's concepts are well known, its sheer size and scope set it apart from many other world class urban casino developments.

In terms of distinguishing this Project from others, first and foremost is its restorative approach to the landscape. By embracing the history and natural ecology of the existing site, the proposed 1.8 million square feet of development will be achieved while also creating 16 additional acres of open space for public use and enjoyment as well as converting 14 acres of impervious area into pervious surfaces. Pedestrian and bike paths will be infused through the landscape, transforming the existing site and better connecting it with other open space areas. The Project will also preserve the long-term viability of the horse racing industry in Massachusetts, an industry that provides a substantial number of jobs in the Commonwealth, farms and open space. Preserving this industry is a stated goal of the Massachusetts Gaming Commission, as it fulfills its mandate to expand gaming opportunities in Massachusetts.

The Proponent believes the most compelling destination resort casinos (i.e., those that provide the maximum value to host and surrounding communities as well as their own patrons) are integrated into a destination's existing infrastructure and its restaurant, entertainment, hospitality, and recreational offerings. As such, the Project is being designed to emphasize linkages with existing local and regional attractions and services, and these community assets will benefit from the Resort's ability to attract tourists and local visitors. Another component unique to this development is the inclusion of engaging ground-floor program spaces along the perimeter street edges of the two casino areas. Program elements such as restaurants, retail, and hotel lobbies have been consciously designed and placed along the new street grid. Three plazas with universal access to the major entry points will provide opportunities for terraces and outdoor seating to engage at a pedestrian scale. The apron along the racetrack will also be redesigned to create a pedestrian connection from the grandstand to the clubhouse. An elegant terraced green space will provide amphitheater-style seating for viewing races and other special events held at the track.

Conservation is the cornerstone of responsible sustainable development, and the Proponent is committed to an integrated design approach that incorporates state-of-the-art technologies to preserve natural resources. The proposed design is estimated to consume up to a third less energy

than a standard development of similar size. In addition to conservation and efficiency measures, an approximately 2.7 MW solar array system will be deployed to generate on-site electricity. Approximately 1.45 MW of this system will be building-mounted, one of the largest private building-mounted systems in the northeast United States. Solar panels and supporting structures will be integrated into the building and landscape design to provide both shade and covered pedestrian walkways. These prominent elements will serve as visual reminders of the Proponent's commitment to responsible stewardship and sustainable design.

This section contains a detailed description of the proposed Project in terms of the development program, public open spaces, public benefits, and sustainable design. Also included are descriptions of the development context for the Project, Project alternatives, and the development schedule.

1.1 Detailed Project Description

Caesars Resort at Suffolk Downs presents a unique opportunity to re-energize the Project area with a mixed-use urban resort casino development. The Resort (see Figure 1-6) will bring extraordinary new investment to the cities of Boston and Revere, will increase government revenue, and will provide new permanent employment opportunities for residents of the host cities and other local communities. Furthermore, pursuant to M.G.L. chapter 23K, a portion of the taxes on the Resort's gross gaming revenue will be allocated to a community mitigation fund, from which the Massachusetts Gaming Commission will allocate funds to the cities of Boston and Revere and others to address potential Project impacts. In addition to new jobs, public funding, and direct investment at Suffolk Downs, the proposed Resort will promote small business and the tourism industry and have positive economic effects on the host cities and the Commonwealth of Massachusetts. Locating a Category I gaming establishment at the Project site will enable patrons to enjoy both the gaming establishment and the unique cultural, historical, environmental, and social resources of Boston and Revere, and will result in additional enjoyment of and support for those resources.

As more particularly described below, the Project program includes two distinct casino gaming areas (referred to herein as Casino Area I and Casino Area II), approximately 450 guestrooms in two hotels, multi-purpose meeting/entertainment space, dedicated structured parking as well as some surface parking, fine dining, retail space, and sports bars (see Figure 1-7, Proposed Site Plan). The Proponent proposes to construct substantial infrastructure improvements on Route 1A in the vicinity of the Project site as an integral part of the Project, and the Project also includes a number of other transportation-related improvements at key locations in the general area. These improvements are described in detail in the transportation section, Section 5.0. Project elements are described in more detail below.

1.1.1 Project Elements

Proposed Project elements consist of the following:

- Two hotels: an approximately 300-room hotel (Hotel I) and an approximately 150-room hotel (Hotel II);
- Multi-purpose meeting/entertainment space;
- Dining: approximately 15 restaurants, including six fine dining concepts, casual outlets, a Streets of Boston restaurant pavilion, and sports bars;
- Gaming Space: approximately 220,000 square feet of gaming space containing 4,000-5,000 slot machines, 200 table games, and a World Series of Poker™ room;
- Retail: approximately 30,000 square feet;
- Central Utility Plant (CUP);
- Parking: an approximately 2,550-space, six-story parking garage, approximately 2,090 surface parking spaces, and approximately 460 below-grade spaces for valet parking (total parking 5,100); and
- Maintenance building.

The Project also involves continued operations at the Suffolk Downs racetrack as well as ongoing maintenance in the existing horse barn area, which will include replacing or improving horse barns as necessary due to deteriorated conditions. As shown in Table 1-1, the Project involves both renovation and new construction. Figure 1-8 shows a view of the proposed development from the Orient Heights neighborhood, while Figures 1-9 through 1-12 illustrate the Entry Drive, North Plaza, Route 1A, and Winthrop Avenue arrivals, respectively. Floor plans are provided as Figures 1-13 through 1-17; a roof plan is shown as Figure 1-18.

The Proponent is committed to developing a Resort that is sustainably designed, energy efficient, environmentally conscious, and healthy for its employees and visitors. Pursuant to Article 37 of the Boston Zoning Code and the Expanded Gaming Act, the Proponent is committed to achieving Gold certification in the U.S. Green Building Council's (USGBC'S) Leadership in Energy and Environmental Design (LEED) program for this Project (see Section 2.2).

Table 1-1 Proposed Project Program

Proposed	*Gross Square Footage (approx.)*
Renovation	
Casino Area I (Existing Grandstand)	114,177
Restaurants (3) and Bars (3)	39,840
Support and Back-of-House	54,688
Racing & Racing Support (Clubhouse and Link)	119,313
Loading	3,200
Unrenovated Space	6,730
subtotal	*337,948*
New Construction	
Casino Area II	104,840
Hotel I (300 keys)	223,140
Restaurants (5) and Bars (4)	34,600
Entertainment Space	38,110
Greenhouse	5,656
Retail (within parking structure)	30,000
Spa and Gym	10,000
Support and Back-of-House	55,957
Loading	2,920
Parking Structure	840,880
subtotal Casino Area II (also called the principle casino area)	*1,346,103*
Hotel II (150 keys)	130,000
Maintenance Building	12,000
subtotal new construction	*1,620,603*
GRAND TOTAL	**1,826,051**

*Square footages do not include mechanical spaces per City of Boston zoning.

Proposed parking is identified in Table 1-2 and shown in Figure 1-19.

Table 1-2 Project parking

Area	*Spaces*
Parking garage	2,550
North Lot	1,468
South Lot	413
Valet	460
Barn Area/Horsemen's Lot	209
total	*5,100*

1.1.1.1 Casino Area I

Casino Area I will be housed on the first floor of the existing, re-purposed grandstand, link, and clubhouse buildings on the Project site. In its current design, the first floor will be a gaming floor (i.e., slot machines and table games) that will include a restaurant, sports bar, dedicated poker room, and high-limit gaming area. Figures 1-20 and 1-21 show west elevations of Casino Area I.

The second floor of the grandstand building will be re-purposed to house a Streets of Boston restaurant pavilion and back-of-house support spaces with connections to the grandstand area for racing patrons. The second floor of the adjacent link building will be re-purposed to house gaming offices and additional back-of-house support spaces. A double-bay loading dock and employee service entrance will be located on the north side of the building. Just to the north, a CUP will provide utility services for the entire Resort.

The existing clubhouse, attached to the grandstand building via the link building, will undergo renovations and will continue to house the horse racing program on the second and third levels (see Figure 1-22). Gaming and racing components will be operated jointly and will be fully accessible to patrons. Section 8.0 provides a more detailed description of renovations to the grandstand and clubhouse buildings.

1.1.1.2 Casino Area II

The main entrance of Casino Area II will be centered on the crescent-shaped luxury hotel (i.e., Hotel I), with a lower-story façade that will provide a clear visual connection to the interior of the building; terrace dining will support an urban, pedestrian-friendly environment along the access drive (see Figure 1-23, View of Casino Area II and Hotel I). A glass canopy and porte-cochere (i.e., covered entrance) will accommodate drop-off and valet services for up to 460 guest vehicles and 100 bicycles below-grade.

The main entrance leading directly to the gaming floor of Casino Area II will be flanked by two fine dining restaurants and the Hotel I lobby (see Figure 1-24, Lobby View of Winter Garden). A two-level feature bar and table gaming area will command the center of Casino Area II and will be the main focal point. The feature bar will have a direct visual connection from the main entrance lobby to the south, and from the north escalators leading to the parking garage.

Access to a 25,000-square-foot multi-purpose conference and entertainment space will be provided off the main entry lobby with a grand open stair and escalators. The two-story pre-function lobby will spatially connect function areas with the retail and gaming floor below. In addition, outdoor terraces at the second level will lead to a 5,500-square-foot greenhouse which will provide fresh produce for year-round use in the restaurants. Equipped with a chef's table, the greenhouse will also provide opportunities for culinary and educational demonstrations to showcase for the public what will be one of the many

sustainable features integrated into daily Resort operations. Service access to Casino Area II will be provided through a double-bay loading dock and mechanical area northwest of the gaming floor.

A northern entrance to Casino Area II will provide pedestrian access from a detached seven-story, approximately 2,550-space parking garage. In addition to the on-grade access, an enclosed pedestrian bridge from the garage will lead to a mezzanine level connecting to the gaming level of Casino Area II with open stair and escalators (see Figures 1-25 through 1-28 for Building Elevations and Views). At ground level adjacent to the north entrance of Casino Area II, a glass pavilion ("winter garden") will connect with Casino Area I, creating a primary gathering area; this will be the drop-off point for dedicated charter buses and shuttles from Logan Airport, nearby business districts, and other major tourist, cultural, and travel venues in Boston, Revere, and the surrounding region as well as from the Massachusetts Bay Transportation Authority (MBTA) Suffolk Downs Station. The shuttle program and primary gathering area is a key strategy to Caesars' philosophy of the importance of integrating the surrounding communities into the fabric and essence of the Resort.

The Proponent expects at least 11 percent of visitors and 30 percent of Resort employees to access the site via public transportation, and has endeavored to treat the nearby Suffolk Downs MBTA Station as another "front entrance" to the site. Accordingly, a tree-lined walkway will greet pedestrians arriving from the station on the MBTA Blue Line, and an enhanced shuttle service will provide a direct connection from the station via Blue Line Road to the winter garden and employee entrances. Pedestrian and bicycle access will also be enhanced as important modes of transportation for both patrons and employees.

Consistent with the objectives of the Transportation Demand Management (TDM) plan described in Section 5.9, to discourage employees from commuting by private cars and encourage use of alternative modes such as transit, no employee parking will be provided on the Project site, with the exception of a limited number of spaces for senior management, handicapped employees, and essential staff. The parking plan for staff is based on the use of multiple geographically-dispersed locations remote from the Project site, with employee shuttle service to and from the Resort. This strategy is designed to discourage private auto travel and will result in maximum dispersion of employee auto trips, and will minimize employee vehicle miles travelled (VMT), as employees will choose to park at locations that are most convenient for their commute. Further, it will minimize employee vehicle trips in the vicinity of the Project site, as the majority of employee trips will be intercepted on the roadway network before they reach the Project site area, and therefore will not use the roadway network local to the Project site.

The Proponent proposes to engage a contractor to manage and operate the employee shuttle system, which will run continuously 24 hours per day, seven days a week to serve the continuous turnover of multiple shift changes throughout the day. As discussed in Section 5.4, this will also provide a way for employees whose shifts start or end during the period when the MBTA is not operating (roughly 12:30 to 5:30 a.m.) to commute to work.

A shuttle contractor will be responsible for identifying available parking locations and developing the shuttle plan, and it is anticipated that locations could include strategic regional parking facilities such as the Logan Express park-and-ride lots or other existing public commuter parking facilities, key transit and commuter rail hubs, or available private parking facilities.

1.1.1.3 Hotels I and II

The approximately 300-room, nine-story (seven stories of hotel rooms and a two-story podium) luxury hotel (Hotel I) will feature breathtaking views of Boston and the Massachusetts Bay seacoast. On the second floor, guestrooms are being designed to complement the spa interior and provide a unique experience for hotel guests. On the all-suite penthouse level, two large villas will anchor each end of the plan (see Figure 1-17). Each villa will have generous outdoor terraces with panoramic views of the Boston skyline. The current design for Hotel I consists of approximately 253 guestrooms, 45 suites, and 2 villas, although the final room configuration is still in development.

The 12-story Hotel II, which may be developed by a third-party hotel operator, will have approximately 150 guestrooms and a prominent porte-cochere entrance located south of the North Plaza. South-facing guestrooms will have views towards Boston, while and north-facing rooms will overlook the plaza and the Atlantic Ocean. A second-level concourse will connect to the covered bridge providing access to the parking garage.

1.1.1.4 Parking Structure

The proposed parking structure is a six-story standalone structure, approximately 60 feet tall, with one level of below-grade parking and six levels of above-grade parking. The open-air parking structure is sited away from the adjacent neighborhood and will provide approximately 2,550 self-park parking spaces with elevated solar panels above the top parking level (see Figures 1-29 and 1-30 for parking garage elevation views). The top of the garage will be highlighted with a PV canopy that will be part of the approximately 2.7-MW solar array system deployed on-site. The PV canopy will be supported by a thin steel structure integrated into the design of the building. Figure 1-31 shows the site plan including solar panel arrays.

1.1.1.5 Site Circulation

Vehicular access to the Resort will primarily be from two locations: from Winthrop Avenue in Revere, and from Route 1A in Boston. Tomasello Drive will be enhanced and is envisioned as the primary drive providing access to the Resort from entrances in Revere and Boston.

The new Tomasello Drive is envisioned to transform the arrival experience of visitors from the existing deteriorating asphalt pavement to a unique experience along a meandering drive through a restorative marsh-like ecological landscape. From Tomasello Drive, the secondary streets leading visitors to entry plazas of Casino Areas I and II will be lined with street trees and pedestrian sidewalks, creating a ceremonial entry sequence. The network of streets is intended to establish connectivity between the Resort and adjacent neighborhoods and the site's surroundings, and to create a unique arrival sequence and visitor experience that embraces the site's natural setting and outwardly-focused landscape.

Within the site, secondary streets from Tomasello Drive will connect to the hotel and casino drop-off areas as well as the parking garage, creating a framework of streets that will cater to the overall vehicular circulation and seamlessly integrate shuttle buses, potential MBTA bus routes, and service-related traffic (see Figure 1-32, Vehicular Circulation).

The site plan proposes to reduce a considerable amount of existing impervious pavement used for parking. The proposed exterior parking court will be defined with trees to reduce the heat island effect along with shaded walkways to the public spaces and buildings (see Figure 1-19, Site Parking). See Section 4.4.9 for additional information pertaining to surface parking.

The Project site is well served by MBTA Blue Line rapid transit service, as Suffolk Downs Station abuts the site, providing direct access for transit riders and pedestrians alike. A new Blue Line Road is proposed to extend shuttle bus service between the station and racetrack and provide direct connections for patrons and employees. A shared pedestrian and bicycle path is proposed from Suffolk Downs Station to the racetrack and grandstand (see Section 1.4 for a detailed description).

A potential MBTA bus stop may be located along Tomasello Drive to cater to visitors and employees for direct access to the Resort (see Figure 1-33, Potential Bus Circulation).

On-site shuttle bus circulation is proposed for visitors and employees, with pick-up and drop-off locations at key locations. The shuttle bus will pick-up and drop-off from the Suffolk Downs Station to Casino Areas I and II and the racetrack grandstand (see Figure 1-34, Shuttle Bus Routes).

Pedestrian access to the site will be provided through a hierarchy of walkways that are shown on Figure 1-35 (Pedestrian Circulation) and are described in greater detail in Sections 1.4 and 4.4.7.

In conjunction with the future deployment of the East Boston Hubway network, the Proponent is committed to installing two Hubway stations, one at the Suffolk Downs MBTA station and the second near the entrance to Casino Area II, to promote bike access to the site and its surroundings. Proposed bike circulation is shown on Figure 1-36.

The Project will also enhance the landscape and pedestrian experience along Winthrop Avenue, another front door to the Project site. Pedestrian accommodations at the Tomasello Drive intersection will be significantly improved by the introduction of concurrent pedestrian phasing and the provision of a new "missing" crosswalk on Winthrop Avenue east of Tomasello Drive. Also, as described in Section 5.6.2, traffic and pedestrian safety improvements will be implemented in Donnelly Square, which will incorporate streetscape improvements east of Beachmont Station. In addition, the Project will provide plantings for shade and visual interest at the edge of the neighborhood as well as an attractive new fence along the Resort edge. Figure 1-37 depicts a street section along Winthrop Avenue. Section 4.0 contains more detail about the landscape and pedestrian experience on the Project site.

1.1.1.6 Route 1A Infrastructure Improvements

A flyover at the entrance of Route 1A and Boardman Street has been proposed and presented to the community and was included in the ENF as the Proponent's preferred alternative. This proposed option and the other alternatives, which have been developed at the specific request of MassDOT for the purpose of completing an alternatives analysis of the options, are discussed in detail in Section 5.0 and will be referred to throughout this document as Route 1A infrastructure improvements. Section 6.9.2 provides detail on potential wetlands impacts.

1.1.1.7 Host Community Agreements and Surrounding Community Agreements - Off-Site Improvements

Unlike for any other project, the Proponent is required by chapter 23K to have agreements with Host Communities. These Host Community Agreements (HCAs) require the Proponent to undertake certain public improvements that may or may not be required to directly mitigate Project impacts. Because the Proponent has agreed within the East Boston and Revere HCAs to permit, design, and construct some of these improvements, in addition to describing the Route 1A infrastructure improvements and other proposal detailed in Section 5.0, this filing describes potential environmental impacts for the three off-site transportation projects bulleted below.

The analysis of off-site wetlands (see Section 6.9.2) and historic resources (see Section 8.0) includes potential impacts from these off-site projects. The transportation section (see Section 5.0) includes additional detail on transportation and an alternatives analysis. Concept plans for the off-site transportation improvements are provided in Attachment A. Necessary permits for the three off-site transportation projects are included in the permit analysis in Section 3.2. For a complete list of HCA improvements related to transportation, see Section 5.6 and Attachment B.

The Project includes conceptual improvements at various locations along Revere Beach Parkway to address traffic issues and improve traffic flow. The locations include:

- Route 1/Revere Beach Parkway (Route 16);
- Revere Beach Parkway (Route 16)/Winthrop Avenue (Route 145)/Harris Street; and
- Revere Beach Parkway (Route 145)/Tomasello Drive/North Shore Road.

Revere Beach Parkway is under DCR jurisdiction. Route 1, Route 16 northeast of Revere Beach Parkway (Route 145), and North Shore Road are under jurisdiction of the Massachusetts Department of Transportation – Highway Division (MassDOT). Harris Street is within City of Revere jurisdiction, as are other local roads, and Tomasello Drive is a private way.

1.2 Public Open Spaces

The Project design contains a number of public open spaces to activate exterior portions of the site and to offer unique programming opportunities and outdoor leisure. These spaces are described in greater detail in Section 4.4, and are briefly described below:

- A 20-acre Entry Landscape will set the tone for visitors entering the site from Route 1A, and will be comprised of meandering pathways, wetlands, and beautiful landscaping;
- An elegant Entry Court will create a memorable arrival experience and focal point for the Resort;
- At the entry to Casino Areas I and II, the South Plaza will contain native plantings and outdoor café seating to create an active and vibrant space;
- The tree-lined North Plaza will contain some hardscape and permeable pavers as well as a large green area at its center to create a cool oasis for informal gatherings and planned events; and

- An approximately four-acre apron and racetrack viewing landscape will lead from Casino Area I and the grandstand to the edge of the racetrack, and a continuous pedestrian path will allow controlled access along the track and paddock (see Figure 1-38, Program and Land Use Diagram).

1.3 MBTA Shuttle and Blue Line Connections and Shuttle Bus Routes

The Project site is well served by MBTA Blue Line rapid transit service as well as several MBTA bus routes with stops proximate to the site. Suffolk Downs Station abuts the site, providing direct access for transit riders and pedestrians alike. The existing shuttle bus service currently provided between the station and racetrack will be enhanced to provide direct connections for both patrons and employees. Figures 1-39 and 1-40 show planned improvements along Blue Line Road from Suffolk Downs Station.

Although located further from the racetrack, Blue Line service is also accessible at the MBTA's Beachmont Station, and bus stops for MBTA bus routes are located close to the site entrances. The site layout allows for the routing of MBTA bus service through the site and provision of an on-site MBTA bus stop, should the MBTA wish to do so (see Figure 1-33, Potential MBTA Bus Circulation). Public transit services are described in detail in Section 5.2.1. The Proponent will substantially expand the use of alternative modes of transportation through the implementation of an off-site HOV Shuttle Plan operated by a suitably qualified contractor with extensive experience in the Boston region. These shuttle operations will be in addition to the on-site shuttle service connecting the Suffolk Downs MBTA station with the Resort building entrances.

The off-site shuttle plan will be tailored to the distinct needs of employees and patrons. The off-site shuttle plan to accommodate employee commuting needs is described in Section 5.10.3. The shuttle plan for patrons will comprise a diverse range of services to provide alternative transportation for patrons to and from multiple locations. The purpose of the shuttle service goes beyond catering to the needs of patrons and minimizing vehicle trips; it is also intended to stimulate business and tourism in the region by enabling convenient transportation connections to the Resort for tourists, visitors, and business entities, and is a key component of the Proponent's strategy to connect the Resort to its host communities.

A major advantage of an off-site shuttle service is the flexibility with which it can be planned and operated. In essence, it is in the Proponent's interest to provide shuttle service wherever there is demand, and the routing and scheduling of shuttles can be tailored to satisfy such demand. Further, the shuttle plan can be implemented dynamically, responding to changes in need as and when they occur.

Plans for the Resort include the establishment of a ground shuttle service to bring patrons and employees to and from the MBTA, nearby business districts, cultural and tourist attractions, area hotels, and parking locations. The plan advances the goal of minimizing the impact of resort traffic on local roads. In furtherance of the City's long-standing

commitment to improving air quality through the promotion of public transit and the utilization of clean fuel technologies, the Proponent plans to use a fleet of compressed natural gas (CNG), liquefied natural gas (LNG), or other alternative fuel buses in the provision of this service. Use of fuel-efficient and alternative fuel vehicles in this shuttle service can lead to significant greenhouse gas (GHG) emissions savings as well as reductions in other pollutant emissions. The precise types and number of buses to be used is dependent on negotiations with the ground shuttle operator, which are ongoing. Routes and schedules will be developed over time to meet actual demand for these services.

1.4 Pedestrian and Bicycle Connections

Pedestrian access to the Resort will be provided through a hierarchy of walkways that are shown on Figure 1-35 (Pedestrian Circulation). The Project site design includes a network of public pedestrian walkways and bikeways to establish connectivity between the Resort and adjacent neighborhoods and the site's surroundings. These pathways will create a unique arrival sequence and visitor experience that embraces the site's natural setting and outwardly-focused landscape. The site's proximity to the East Boston Greenway and trails of the Belle Isle Marsh offers the opportunity to connect into the greater East Boston network of public open spaces; see Section 4.0 for a more detailed discussion of the Project site context.

All pedestrian areas and pathways are designed to support universal access and to comply with Americans with Disabilities Act (ADA) requirements, and are sized to appropriately accommodate the anticipated volume of users. Site furnishings along pathways will support pedestrian comfort, and pedestrian areas will be well-lit with high-quality lighting fixtures chosen to ensure safety, be energy-efficient, and reduce light pollution (i.e., full-cutoff). Streetscapes on the site are designed in compliance with Boston and MassDOT Complete Streets standards, while sidewalks and bikeways along roadways are designed in smooth materials to comply with ADA regulations.

Attractive, shaded multi-use pathways for bikes and pedestrians will extend along Tomasello Drive and Blue Line Road, providing connections between the Resort, surrounding neighborhoods, and the MBTA Suffolk Downs Station. At the southern edge of the site, a pedestrian path will provide direct access from the Orient Heights neighborhood to the Resort and Tomasello Drive, maintaining a key pedestrian link that has long been important to the community.

Streetscapes on the site are designed in compliance with the Boston and MassDOT Complete Streets standards, which puts pedestrians, bicyclists, and transit users on equal footing with motor-vehicle drivers. The initiative aims to improve the quality of life in Boston by creating streets that are both great public spaces and sustainable transportation networks.

A shared 16-foot-wide pedestrian and bicycle path will be constructed from the MBTA Suffolk Downs Station to the South Plaza at the casino entrance. The remaining approximately 5,800-foot-long 14-foot-wide shared path will be constructed from the entrance of Hotel I and extending eastward along Tomasello Drive to Winthrop Street (see Figure 1-41); a separate 14-foot-wide shared path will extend from Tomasello Drive to the Resort's employee entrance, where there will be secure, covered storage for approximately 60 bicycles. At the entrance to Casino Area II, valet bicycle service will be available in addition to a bicycle rack (see Figure 1-36, Bicycle Circulation).

In conjunction with the future deployment of the East Boston Hubway network, the Proponent is committed to installing two Hubway stations, one at Suffolk Downs Station and the second near the entrance to Casino Area II.

In addition to on-site bicycle amenities, the Proponent will provide on-street bicycle accommodations along the Bennington Street corridor from Saratoga Street in East Boston to Winthrop Street in Revere (see Section 5.8 for additional details).

1.5 Project Changes since Filing ENF

As a result of design advancements and ongoing coordination with agencies, host communities, surrounding communities, and interested parties, there have been several Project changes since the filing of the ENF. These changes are identified below, and are described in further detail in various sections of this document:

- The proposed site plan design now includes approximately 16 more acres of open space relative to existing conditions;
- The proposed site plan design will decrease impervious area by approximately 14 acres relative to existing conditions, compared with a decrease of only 9 acres in the ENF;
- The Project now includes an approximately 2.7 MW photovoltaic (PV) system, the building-mounted portion of which (approximately 1.45 MW) will represent one of the largest private building-mounted solar arrays in the northeast United States;
- The Project now includes several bicycle-related amenities:
    - The Proponent is committed to installing two Hubway bike stations in conjunction with the future deployment of the East Boston Hubway network: one will be at the Suffolk Downs MBTA Station, and one will be near the entrance to Casino Area II;
    - Covered bike storage with valet parking will be provided with a capacity for 160 bicycles (100 visitor bikes and 60 employee bikes) in accordance with Boston Transportation Department (BTD) guidelines;

- Short-term bicycle parking will be located at the entrance to Casino Area II;
- Employees will have access to six showers (3 women's, 3 men's) near the casino area as well as two showers in the jockey area;
- Covered bicycle parking will be provided at the employee entrance;

- The proposed pedestrian way leading from the intersection of Tomasello Drive and Route 1A into the main entrance of Project has been reconfigured to keep it separate from the roadway, moving it through the entry landscape to provide a more enjoyable pedestrian experience;
- A maintenance building is now included in the Project program;
- The size of Hotel II has increased to approximately 130,000 square feet;
- Valet parking has been added under Casino Area II;
- The overall square footage for the Project program has increased slightly, from approximately 1.8 million square feet to approximately 1.83 million square feet, resulting mainly from the addition of the maintenance building and an increase in the size of Hotel II;
- The "roof garden" that was first presented in the ENF has grown into an approximately 5,600-square-foot greenhouse that will provide fresh produce to restaurants at the Resort;
- Various sustainability elements such as rainwater harvesting and construction of a cogeneration facility are now part of the Project design as well as incorporating food composting in response to the Commonwealth's recent announcement (see Section 2.0); and
- Public bus shelters have been added to the proposed site plan.

1.6 Public Benefits

In addition to the design changes identified above, various public benefits have been added or enhanced since the ENF. Many of the various public benefits proposed as part of the Project are memorialized within the HCAs established with the cities of Boston and Revere (see Attachment B for copies of the Revere and Boston HCAs). The Proponent will also enter into agreements with its Surrounding Communities, as required by the Expanded Gaming Act, which will specify additional benefits to be provided. The Project will provide numerous significant public benefits, included but not limited to the following:

Capital Investments

- Subject to further discussions with the MBTA, approximately **$3.0 million in improvements are proposed for the Suffolk Downs MBTA Station**, including significant maintenance improvements, installation of new ADA-compliant elevators, new turnstiles, and site improvements such as new sidewalks, ramps, railings, lighting, wayfinding, landscaping, and a pedestrian shelter at the entrance to the Project site.

- **$33.4 million in Capital Improvements** to be used for East Boston Capital Commitments including park improvements at Lopresti Park (33 Summer Street in East Boston) and Noyes Playground (Boardman Street, East Boston), school improvements at the Mario Umana Middle School Academy (312 Border Street, East Boston), construction of a new combined youth and senior citizens center in the East Boston community, and creation of an East Boston Business Improvement District.

- **Water Transportation Contribution:** The Proponent supports Mayor Menino's vision to enhance water transportation options to East Boston by instituting regular water shuttle service between the South Boston and East Boston waterfronts. As such, the Boston HCA includes a contribution that will assist the City in establishing this service.

- **$42-50 million in Roadway Improvements:** Significant transportation improvements to the surrounding roadway network in East Boston and Revere that would improve existing conditions and accommodate the additional Project-generated trips, including: (1) Route 1A at Boardman Street, Waldemar Avenue, and Tomasello Drive – infrastructure improvements, widening, and signalization; (2) Bennington Street at Saratoga – intersection improvement, improve pedestrian condition; (3) Boardman Street at Saratoga Street – upgrade traffic circle; (4) Neptune Road – various improvements at multiple intersections; (5) Route 1A southbound at Curtis Street – create exit from 1A southbound; (6) Route 1 at Route 16 (Revere Beach Parkway) – intersection improvements; (7) Route 1 at Route 16 – commitment to fund planning and design for additional work; (8) Route 16, Route 145, Harris Street – widening and lane enhancements; (9) Site Bicycle Improvements – 14-foot bicycle and pedestrian pathway; and (10) Hubway Stations – two dedicated Hubway stations in conjunction with the future deployment of the East Boston Hubway network.

- **Strengthened MBTA Connection:** Improved access to the MBTA Suffolk Downs Station, including upgraded pedestrian, bicycle and shuttle connections to the Resort. The Proponent has also agreed to Suffolk Downs Station improvements:

- Maintenance improvements including concrete restoration and repair of the existing structure, ramps, stairs, overpass, and platform as well as repainting;
- Installation of two new ADA-compliant elevators, along with associated foundations, structure, and improvements;
- Three new turnstiles; and
- Various site improvements including new sidewalks, ramps, railings, lighting, way-finding, and landscaping, along with a pedestrian shelter located at the entrance to the Project site.

- **Boston Housing Authority:** Funding of up to $20 million over the term of the Boston HCA for the revitalization of Boston Housing Authority's Orient Heights housing development that abuts the Project site.

Economic Benefits

- **New Real Property and Personal Property Tax Revenue:** Enhanced annual property tax revenues.
- **Tax Revenues:** The Resort will generate significant new tax revenue at the state and local levels in the form of income tax, sales taxes, hotel taxes, food and beverage taxes, as well as taxes on gross gaming revenues.
- **Support for Local Businesses:** The Proponent expects to spend approximately $150 million annually for goods and services at local and regional businesses in connection with the ongoing operation of the Resort and also intends to partner with Boston, Revere, Chelsea, and Winthrop area hotels, restaurants, entertainment venues and tourism organizations to attract visitors and boost the local economy.
- **Support for Local Restaurants:** A "Streets of Boston" restaurant pavilion will bring six locally-owned restaurants to the resort.
- **Boston and Revere HCAs:** Payment to the cities of Boston and Revere of Community Impact Fees pursuant to the respective HCA for each city.
- **Publicity for Tourism Attractions:** The Resort will include interactive digital visitor display kiosks inside the resort casino that will promote attractions throughout Greater Boston.
- **Expansion of Caesars Total Rewards Program:** Caesars will seek to enlist several area hotels and restaurants in this program which allows its 45 million members in the United States and around the world to use rewards credits for meals and lodging, both inside and outside of the casino.

- **Partnership with Citi-Center:** The Performing Arts Center (including the Wang, Shubert, and Emerson Colonial theaters), a 77 year old non-profit, has partnered with the Proponent to collaborate on the entertainment and cultural activities at a future resort casino.

- **Additional Community Benefits:** In collaboration with the cities of Boston and Revere, the establishment of Community Advisory Boards to provide additional community benefits (e.g., inclusion of local vendors) relevant to Project impacts and to generally benefit the communities and their residents.

- **Mayor's Office of Arts, Tourism, and Special Events:** Funding to foster growth of cultural community, promote public participation in the arts and public celebrations, especially in East Boston, and advance cultural tourism in the City due to increased tourism and special events expected as a result of the Project.

- **Securing the future of Massachusetts' Racing Industry:** Construction of the Resort will secure the future of the Commonwealth's horse racing industry which directly and indirectly supports a significant number of jobs in the state.

- **Ground Shuttle Connection Program**. In an effort to tie the Project to the communities in which it is located, the Proponent will operate a 24 hour shuttle service connecting the Resort to East Boston and Revere business districts, other nearby tourist and cultural attractions, area hotels, and regional transportation hubs. It will operate as a connector with the planned water shuttle to the Maverick Square area once that service is running.

Extensive Employment Benefits

- **New Jobs:** Approximately 2,500 construction jobs and approximately 4,000 permanent resort jobs, the latter of which will encompass more than 39 job categories such as hotel/resort personnel, facility employees, food and beverage, gaming, racing, and management and operation and will include full job training, benefits and opportunities for career advancement.

- The Proponent will host and maintain a **central job bank website** (in English and Spanish) as a micro-site within the larger Project website.

- The Proponent will utilize best efforts to use the **existing labor force** in the Commonwealth, and in particular the existing labor force in the host communities, when hiring for new construction jobs, as required by Section 18(17) of the Expanded Gaming Act.

- The Proponent will hold **job fairs** at the Project site to make host community residents aware of job opportunities.

- The Proponent will establish, fund and maintain **human resource hiring and training practices** that promote the development of a skilled and diverse workforce and access to promotion opportunities through a workforce training program that: (i) establishes transparent career paths with measurable criteria within the gaming establishment that lead to increased responsibility and higher pay grades that are designed to allow employees to pursue career advancement and promotion; (ii) provides employee access to additional resources, such as tuition reimbursement or stipend policies, to enable employees to acquire the education or job training needed to advance career paths based on increased responsibility and pay grades; and (iii) establishes a program or partnership to provide off-site child day-care, all as required by Section 18(9) of the Expanded Gaming Act.

- The Proponent will provide host community residents with **advance notice of hiring activities** by publishing announcements in local newspapers approximately four to eight consecutive weeks prior to initial hirings.

- Host and surrounding community residents will be given **first priority to apply for jobs** during a specified "advance period," and written flyers in English and Spanish will be distributed to publicize this period.

- The Proponent will donate at least 25 **computers** to be placed in strategic areas in East Boston (e.g., libraries or community centers) as well as install and maintain at least two computers on-site to ensure that residents without computers can research and apply for jobs at the Project site online.

- The Proponent will use best efforts to work with the Public Schools Department to establish **school-to-work programs** for hospitality jobs at vocational or public high schools in the host communities.

- The Proponent will support the efforts of and actively engage with the Massachusetts Gaming Commission and community colleges to develop the **Massachusetts Community College Workforce Training Institute and Massachusetts Casino Careers Training Institute** at community colleges in the Commonwealth, particularly those within the City of Boston.

- The Proponent will provide opportunities for team members to pursue **personal and professional growth**, to enjoy satisfying **careers**, to participate in **training** and development programs and to celebrate success including rewards and recognition for superior performance against measurable goals.

- The Proponent will provide new employees with **learning programs** such as the "Empire Series," Caesars' best-in-class and award-winning learning program for all new employees. This program offers a lively and engaging environment that uses cutting-edge technology. In addition to such a learning program, the Proponent will provide **specialized training courses** customized to meet employee learning needs.

- The Proponent will provide an **educational assistance program** that reimburses employees 90% of tuition costs up to a maximum of $3,000 per year for pre-approved undergraduate classes or up to a maximum of $4,000 per year for pre-approved graduate study at an accredited college or university.

- The Proponent will provide **regulatory and compliance training** such as Skillsoft, which is Caesars' online learning platform, used to deliver all regulatory and compliance training in addition to numerous **professional development courses**.

Green Design and Environmental Benefits

- **Sustainable Design/Green Building:** The Proponent will set a new standard of excellence in sustainable design for gaming development projects. With a commitment to achieve LEED NC v2009 Gold Certification, the Resort will be sustainably designed, energy efficient, environmentally conscious, and healthy for its employees and visitors. Innovative technologies are currently being explored to determine what works best with the Project as well as what might set a visible example for those visiting the site.

- **Open Space:** The Project will increase open space by approximately 16 acres over existing conditions, and will increase pervious surfaces by at least 14 acres.

- **Water Quality Improvements:** Improved stormwater management on the Project site, which will lead to enhanced water quality reaching Sales Creek, the Belle Isle Inlet, and Rumney Marshes ACEC.

- **New Bicycle and Pedestrian Connections:** To enhance local and regional connectivity, the Project will improve bike and pedestrian circulation and access. The Project includes provision of on-street bicycle accommodations to connect Constitution Beach, Belle Isle Marsh, and Revere Beach along the Bennington Street corridor, along with connections to and through the Project site from the Suffolk Downs MBTA station and from Winthrop Avenue. On-site pedestrian paths and aesthetically-pleasing open spaces will encourage pedestrian activity and access, including at the site entries. The pedestrian connection from Orient Heights will be maintained.

- **Bicycle Amenities:** The Project includes valet bicycle parking, two future Hubway stations, showers for employees, covered bicycle storage, and short-term bicycle parking.

- **Agricultural Support:** The Project, unlike conventional mixed-use development alternatives which would typically involve higher-density build-out, will maintain open space and support continued agricultural and open space practices in Massachusetts.

In addition to the specific Project benefits listed above, the Proponent has committed as part of a consent decree with the U.S. Environmental Protection Agency (EPA) to fund over the next four years three important regional supplemental environmental projects valued at approximately $742,000. This includes construction of a boardwalk that will improve public access through Belle Isle Marsh and protect natural resources within the Marsh from degradation through pedestrian contact.

1.7 Public Participation

The Proponent has engaged in extensive public outreach by holding a series of meetings with specific interest groups and the public at large. Community meetings have been held in East Boston, Revere, Chelsea, and Winthrop and the Proponent has met with staff and elected officials in these communities as well. Below is a partial list of community groups the Proponent has met with as well as community meetings that have been held thus far:

Community Groups

- Greater Boston Visitors and Convention Bureau;
- Greater Boston Labor Council;
- East Boston Chamber of Commerce;
- East Boston Latino business leaders;
- Revere Chamber of Commerce;
- Revere Patriot Club;
- Orient Heights Neighborhood Association;
- Orient Heights Yacht Club;
- Kiwanis;
- Chelsea Casino Forum – Chelsea Chamber of Commerce;
- Chelsea Chamber of Commerce;
- Chelsea Chamber of Commerce – Latino Division;
- International Brotherhood of Electrical Workers;

- Union members in East Boston and Revere;
- Eagle Hill Civic Association;
- Winthrop Chamber of Commerce;
- Greater Lynn Area Chamber of Commerce;
- North Shore Alliance for Economic Development;
- Beachmont Improvement Committee;
- Air Cargo Club of New England;
- The Boston Harbor Association;
- Spanish-speaking employees of Suffolk Downs;
- Salem Rotary Club;
- Charlestown Waterfront Coalition;
- Friends of the Belle Isle Marsh;
- Maverick Landing Association of Residents;
- Suffolk University Casino Forum;
- St. George Apartments; and
- Barnes School Apartments.

Community Meetings

- East Boston (June 12, 2012);
- Revere (June 13, 2012);
- Winthrop (June 26, 2012, November 15, 2012;
- Chelsea (July 12, 2012);
- Revere (transportation focused) (August 21, 2012);
- Beverly Rotary Club;
- Revere Economic Development Summit (October 26, 2012);
- East Boston (transportation focused) (August 23, 2012);
- Latino Community (East Boston) (March 5, 2013);
- Public Transportation Presentation for Spanish Speakers (March 27, 2013); and
- Waldemar Avenue Neighbors Meeting (April 2, 2013);
- East Boston Model Viewing (April 9, 2013);
- Revere Model Viewing (April 11, 2013);

- General Public Model Viewing (April 13, 2013);
- Beachmont Improvement Committee Model Viewing (May 13, 2013);
- East Boston and Revere Open House Model Viewing (May 13, 2013);
- Local Union Member Model Viewing (May 22, 2013);
- East Boston YMCA Model Viewing (May 28, 2013);
- Orient Heights Yacht Club Model Viewing (May 29, 2013);
- East Boston Social Center Model Viewing (May 30, 2013);
- Vendor Forum Open House (June 5, 2013);
- Victory Gardens Apartments Presentation (June 11, 2013); and
- Urban League of Eastern Massachusetts Casino Forum (June 17, 2013).

1.8 Development Context

The list below identifies each of the development projects in the study area of the proposed Caesars Resort at Suffolk Downs that have been included as background to help assess the cumulative impacts from the Project. As such, these various projects are included in the No Build transportation analysis in one of the following ways: (1) estimated traffic impacts from available studies or environmental documents; (2) performance of trip generation analyses, trip distribution and assignment; (3) already included in background regional traffic growth; (4) already included in existing traffic counts; or (5) too small or remote from the Project study area to have any meaningful effect.

Revere Projects:

- Market Basket, consisting of approximately 83,000 square feet of retail;
- Verizon, an approximately 4,000-square foot retail store;
- Tedeschi Food Mart, approximately 4,700 square feet;
- Wonderland Market Place, consisting of approximately 62,000 square feet of retail;
- Harley Davison, a 40,000-square-foot specialty retail store;
- A Mobil gas station with approximately 10 pumps and 4,500 square feet of retail;
- A Prime gas station with approximately 10 pumps and 2,200 square feet of retail;
- Ward Street Residential, consisting of approximately 261 units;
- 526-646 Revere Beach Boulevard, an approximately 145-unit residential development;

- 525 Beach Street, an approximately 35-unit residential development;
- Thayer Avenue, an approximately 45-unit residential development;
- 55 Revere Beach Boulevard, consisting of approximately 55 residential units;
- Waterfront Square (Parcel I), consisting of approximately 194 residential units;
- Waterfront Square (North Lot), consisting of approximately 500 residential units;
- Wonderland Greyhound Track, a mixed-use development;
- Waterfront Square (Parcel H), a project involving approximately 400 hotel rooms, 149 residential units, and 50,000 square feet of retail;
- 197 Broadway, consisting of approximately 40 residential units and 4,000 square feet of retail;
- Wonderland Ballroom site, consisting of approximately 200 hotel rooms;
- Shaw's site, which is in the planning stage for an approximately 300-room hotel;
- For Kids, an academic facility for approximately 120 students;
- An elementary school for approximately 690 students; and
- Della Russo stadium, which will seat approximately 2,000.

East Boston Projects:

- Clippership Wharf, consisting of approximately 400 residential units;
- Portside at Pier 1, consisting of approximately 178 residential units;
- Boston East, with approximately 191 residential units;
- Hodge Boiler Works, consisting of approximately 95 residential units;
- New Street Development, with approximately 224 residential units and a 235,000-square-foot hotel;
- 415 McClellan Highway, an approximately 117,060-square-foot hotel and retail project; and
- An approximately 42,800-square-foot Charter School.

1.9 Project Alternatives

As required by the Secretary's Certificate on the ENF, this section discusses the preferred alternative (i.e., the proposed Project), a No-Build alternative, and two other development alternatives. The first development alternative is an approximately 3.8 million-square-foot mixed-use development. The second development alternative is an approximately 2.8 million-square-foot primarily retail-based development containing residential as well as office uses. Table 1-3 defines the programs of the two development alternatives.

Table 1-3 Comparison of two development alternatives for the Project site.

	Alternative 1 ("Office")	*Alternative 2 ("Retail")*
Retail, square feet (sf)	1,286,500	1,642,000
Office, sf	1,496,000	147,000
Residential, sf	1,001,500 (1,030 units)	940,200 (900 units)
Total square footage	*3,784,000*	*2,737,200*
Parking (including garages)	11,978 spaces	8,077 spaces

Table 1-4 compares potential impacts associated with the No-Build alternative, preferred alternative, and two development alternatives. Each alternative is also discussed in greater detail below. After evaluating the environmental impacts, costs, and benefits of the various alternatives, the Proponent identified the proposed Project as the preferred alternative.

Table 1-4 Impact Comparison of Various Alternatives Considered

	No-Build	*Preferred*	*Office Alternative*	*Retail Alternative*
New Land Alteration (acres)	0	0	0	0
Impervious Area (acres)	70.34	53.74	98.56	85.24
Open Space (acres)	80.75	99.26	28*	34.7*
Water Use (gpd)	40,200	354,017	381,123	265,788
Wastewater Generation (gpd)	166,020	321,834	346,475	241,625
Wetlands (sf of alteration)	0	0	0	0
Traffic Generation (net new average daily vehicle trips)	0	21,434 (weekday) 33,038 (Sat.)	34,128 (weekday) 36,294 (Sat.)	33,360 (weekday) 40,740 (Sat.)
Parking Spaces	6,000	5,100	11,978	8,077

* Open space calculations for the two development alternatives assume that 50% of the areas not paved, buildings, or wetlands are open space.

1.9.1 Preferred Alternative

The preferred alternative is described in detail in Sections 1.1 and 1.2. The Expanded Gaming Act sets certain minimum criteria that the preferred alternative has been designed and planned to meet. For example, Sections 9 and 15 of chapter 23K set certain minimum requirements that applicants must meet in order to apply for a gaming license in the

Commonwealth. M.G.L. c.23K, §15(2) requires applicants to "invest not less than the required capital under this chapter into the gaming establishment," which minimum capital investment for a Category 1 facility is $500,000,000 pursuant to G.L. c.23K, §10(a). The Proponent will therefore be required to meet this level of capital investment through construction of the Project, infrastructure, off-site improvements, and other public benefits.

In addition to these minimum requirements, the Expanded Gaming Act includes a number of factors that the Massachusetts Gaming Commission is required to consider in evaluating each application for a gaming license. These include, for example, how the applicant proposes to maximize revenues to the Commonwealth, how the applicant realizes maximum capital investment exclusive of land acquisition and infrastructure improvements, the caliber of the gaming establishment and whether it has a variety of quality amenities, and whether the Project will utilize sustainable building development principles. The application and evaluation criteria set forth in the Expanded Gaming Act have guided the Proponent in its design of the Project. The list below identifies some of the ways in which the Project has been designed to meet and exceed these various criteria. For a complete list of the factors the Commission must consider in evaluating a license application, please consult G.L. c.23K, §§15 and 18 and 205 CMR 119.00.

- The Proponent will invest not less than $500,000,000 in the Project. See G.L. c.23K, §10(a) and §15(2).

- The Project has been designed to be the greenest casino in the country and to set the standard in sustainable design for gaming development projects around the world with an emphasis on energy efficiency, alternative modes of transportation, water conservation, and stormwater management. See G.L. c.23K, §18(8).

- The Proponent expects to achieve a LEED Gold certification for the Project. See G.L. c.23K, §18(8)(i).

- The Project has been designed not only to meet or exceed requirements of the existing stretch code, but to meet or exceed the anticipated requirements of the new stretch code that is anticipated to be proposed sometime in 2013. See G.L. c.23K, §18(8)(ii).

- The Proponent is committed to a rigorous TDM program designed to mitigate vehicle trips and encourage alternative modes of transportation among employees and guests. See G.L. c.23K, §18(8)(iii).

- At least 10% of the annual electricity consumption for the Resort will be generated on-site using a renewable energy source (solar power), and the Proponent will also purchase Renewable Energy Certificates to provide a minimum of 35% of the buildings' electricity from renewable sources as described in further detail in Section 2.0. See G.L. c.23K, §18(8)(vi).

- The transportation improvements proposed in connection with the Project are designed to both address existing long-term regional traffic and transportation issues and to mitigate the potential impacts on host and surrounding communities of the Project. See G.L. c.23K, §18(14).

1.9.2 Development Alternative 1 – Mixed Use/Office

Alternative 1 consists of developing the site into approximately 3.8 million square feet of retail, office, and residential space located in 15 new buildings (see Figure 1-42). The Alternative 1 buildings range in height from 1 to 17 stories, and the taller buildings (a 17-story and two 10-story buildings) are residential towers containing 1,030 residential units (approximately 50% one-bedroom and 50% two-bedroom units). The three residential towers, at just over one million square feet, encompass approximately one-third of the Alternative 1 development program. The remaining buildings consist of a mix of retail and office uses, with retail primarily on the first floors and office spaces on the floors above. Three parking garages would be required near the residential towers, and in total Alternative 1 would require approximately 12,000 parking spaces in both surface and garage parking. No wetlands would be altered, although site work would occur on the vast majority of the site.

Alternative 1 would have a potable water demand of approximately 381,000 gallons per day (gpd), and would generate approximately 346,000 gpd in wastewater flows.

Alternative 1 would contain drastically less open space than the preferred alternative (i.e., the proposed Project), and would significantly increase impervious surface area relative to existing conditions.

Alternative 1 would also generate significantly more traffic than the preferred alternative, with approximately 34,128 new average daily weekday trips and approximately 36,294 new average daily Saturday trips. Moreover, the nature of the trips would be such that, unlike the preferred alternative, many of them would conflict with peak traffic periods, thereby further exacerbating traffic conditions.

Alternative 1 would be subject to state and local permitting review and would be subject to the zoning of Boston and Revere, and would not typically be proposed to include the substantial economic benefits or comprehensive infrastructure improvements associated with the proposed Project which are memorialized in the HCAs with the cities of Boston and Revere.

1.9.3 Development Alternative 2 – Primarily Retail

Alternative 2 consists of a developing the site into approximately 2.8 million square feet of mixed uses but with a particular emphasis on retail space (see Figure 1-43). This alternative includes 16 buildings and contemplates the development of two "big box" retail stores along with four buildings containing residential uses. A total of 900 residential units (50%

one-bedroom and 50% two-bedroom units) occupying just under one million square feet are included in Alternative 2. A modest amount of office development (approximately 147,000 square feet) would be provided in four buildings. With retail uses occupying the remaining Alternative 2 buildings, the total retail area would exceed 1.6 million square feet. Alternative 2 would also include the construction of three parking garages, and total parking on-site would be approximately 8,077 spaces including surface parking and garage parking.

Alternative 2 would demand almost 266,000 gpd in potable water use and would generate approximately 242,000 gpd in wastewater flows, both less than the preferred alternative. However, Alternative 2 would generate approximately 33,360 new average daily weekday trips and approximately 40,740 new average daily Saturday trips, significantly more than the preferred alternative. Moreover, the nature of the trips would be such that, unlike the preferred alternative, many of them would conflict with peak traffic periods, thereby further exacerbating traffic conditions. Due to the fact Alternative 2 consists of one- and two-story retail buildings, the density would be lower than the density of Alternative 1; however, site disturbance would still cover much of the site, and impervious area would still increase over existing conditions. Open space, while more than for Alternative 1, would remain far below the preferred alternative.

Alternative 2 would be subject to state and local permitting review and would be subject to the zoning of Boston and Revere, and would not typically include the substantial economic benefits or comprehensive infrastructure improvements associated with the proposed Project which are memorialized in the HCAs with the cities of Boston and Revere.

1.9.4 No Build Alternative

The No Build alternative would not include the substantial economic benefits or comprehensive infrastructure improvements associated with the proposed Project which are memorialized in the HCAs with the cities of Boston and Revere.

The Project site would remain underutilized and, given the overall decline in the stand alone racing industry, would likely suffer the loss of the horse racing component, the retention of which has been a stated goal of the Massachusetts Gaming Commission. Since Suffolk Downs is New England's last remaining thoroughbred racing venue, the loss of horse racing would have a significant impact on the Massachusetts economy. Horse racing provides an array of jobs, both on and off the track, from minimum wage through more highly paid technical and management positions. During the racing season at Suffolk Downs there are approximately 900 workers on-site. The track and its major vendors (security, concessions, janitorial, video production, wagering service provider) employ 300 workers, while there are an additional 600 workers who make their living working with the horses (e.g., trainers, assistant trainers, jockeys, exercise riders).

The racing industry in turn fosters many other industries, all needed to support and sustain a healthy horse racing structure. Veterinarians and blacksmiths, local feed and supply enterprises, and tack shops that make and provide saddles, harnesses, and other related equine equipment are needed to ensure the health and longevity of these four-footed athletes. For example, the leading hay supplier for Suffolk Downs provides 458 tons of hay (approximately 18,000 bales) throughout the racing season. There are approximately 36 tack stores throughout Massachusetts offering equine feed products and supplies.

According to the Massachusetts Thoroughbred Breeders Association, there are more than 20 Thoroughbred breeding farms in the Commonwealth. A continued presence of racing in Massachusetts is expected to increase the number of mares brought to Massachusetts to foal. There would be little, if any, market for these farms if horse racing becomes defunct in Massachusetts.

In addition, the links between horse racing and Massachusetts open space and the agricultural industry must not be discounted. Many acres of agricultural land are currently needed to care for, train, and groom racehorses, which in turn lead to additional jobs. According to the most recent agricultural census conducted by the United States Department of Agriculture, there are nearly 7,700 farms in Massachusetts providing more than 16,000 acres of open land. While the majority of these are active in crop production, the 24 horse breeding farms comprise more than 5,000 acres of open space. These could potentially be lost to development without an active horse racing industry in Massachusetts.

1.10 Socioeconomics and Environmental Justice

Environmental Justice (EJ) is based on the principle that all people have a right to be protected from environmental pollution and to live in and enjoy a clean and healthful environment. This requires equal protection and meaningful involvement of the community with regard to the development and enforcement of environmental laws and regulations to ensure that lower income communities and communities of color do not share a disproportionate share of the environmental burdens associated with growth and development.

In 2002, the EEA adopted an Environmental Justice Policy to ensure that EJ Populations are engaged in environmental decision-making through expanded and inclusive outreach, with the goal of improving the environmental quality of life in those, and all, communities.

EEA's Policy defines EJ Populations as neighborhoods that meet one or more of the following criteria:

- Median annual household income is at or below 65% of the statewide median income;
- 25% or more of the residents are minorities;

- 25% or more of the residents are foreign born; or
- 25% or more of the residents lack English language proficiency.

Both host communities qualify as EJ Populations. According to 2010 U.S. Census Block data (in information provided by EEA), 109 of the communities in Massachusetts have an EJ Population.[1] According to that same data, the host community of Revere is an EJ Population community, meeting each of the EJ criteria defined in the EEA policy. Additional demographic information that looks at Boston neighborhoods confirms that East Boston also meets at least one of the criteria to be considered an EJ Population.[2] The nearby communities of Chelsea and Winthrop also meet one or more of the required criteria.

1.10.1 Requirements of the EEA Environmental Justice Policy

In adopting its EJ Policy, EEA directed state agencies to take EJ Populations into account in their policies, regulations, and financial decision-making. Agencies were also directed to work with EJ Populations to take direct action to restore degraded resources, increase access to open space and parks, and address environmental and health risks associated with existing and potential new sources of pollution by:

- Enhancing opportunities for residents to participate in environmental decision-making;
- Enhancing environmental review of new or expanding large sources of air emissions and regional waste facilities in those neighborhoods;
- Ensuring that all existing facilities in these neighborhoods comply with all environmental rules and regulations; and
- Encouraging investment in economic growth in these neighborhoods where there is existing infrastructure.

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1 MA Executive Office of Energy and Environmental Affairs, 2010 Environmental Justice Populations

2 According to 2010 Census Data, the total population of East Boston was 40,508. Of that population, 35.2% was identified as non-white and 52.9% was identified as Hispanic or Latino. The 2010 median household income in Massachusetts was $63,967 [US Census Bureau 2010 and 2011 American Community Surveys]. Sixty-five percent (65%) of that 2010 median is approximately $41,579. The median household income for East Boston is $42,747 (American Community Survey, BRA Research Division Analysis). Some sources have reported median household income for East Boston to be as low as $40,960.

Projects that require MEPA review and are in close proximity to EJ Populations are given very specific mandates in the EJ Policy with regard to residents of those neighborhoods who were historically unaware of or unable to participate in environmental decision-making. Such projects require enhanced public participation as well as enhanced analysis of impacts and mitigation.

Enhanced public participation may include using alternative media outlets such as community or ethnic newspapers, use of alternative information repositories, and translation of materials or interpretation services at public meetings. Enhanced analysis of impacts and mitigation may include analysis of multiple air impacts, data on baseline public health conditions within affected EJ Population(s), analysis of technological, site planning, and operational alternatives to reduce impacts, and proposed on-site and off-site mitigation measures to reduce multiple impacts and increase environmental benefits for the affected EJ Population(s).

1.10.2 Actions to Address EJ Populations

The Proponent has paid close attention to the potential Project impacts on EJ Populations that surround the Project site. The Proponent has acted in both the spirit and letter of the EEA EJ Policy to ensure that EJ Populations of Revere and East Boston have had and continue to have the opportunity for inclusive, robust participation. This is consistent with Caesars' corporate "Code of Commitment," which reflects a steadfast commitment to integrity and communication with the communities in which its facilities are located and environmental stewardship. This Code of Commitment can be found at http://www.caesars.com/corporate/about-us-code-of-commitment.html.

In connection with the operation of the Suffolk Downs racetrack, the Proponent has been an integral part of the community for many years. Unlike many developers who come to a site having no direct history or involvement with an area or its residents, Suffolk Downs knows and has been a part of the fabric of the area for over 75 years. As such, it has witnessed changes in surrounding populations and has adapted to those changes. The approach to educating and informing residents about the proposed Project is consistent with the intent behind EEA's EJ Policy. In keeping with this commitment, Suffolk Downs has maintained active memberships with the following local Chambers of Commerce: East Boston, Revere, Chelsea, Winthrop, North Shore, Greater Boston, Hispanic American Chamber of Commerce as well as the Greater Boston Convention and Visitors Bureau. Over the last year, Project update presentations have been given to each one of these groups in an open forum.

Suffolk Down's local employment record demonstrates its deep commitment to community, with many of the permanent, year-round employees residing in East Boston and Revere. The Proponent has employed traditional outreach and notification efforts to ensure that Revere, East Boston, Chelsea, Winthrop, and other nearby communities have been regularly and thoroughly informed about progress on the Project design. In keeping with its

commitment to ensure that information about the Project is meaningful to all those who may be impacted, the Proponent has also been aggressive in its use of alternative media to reach out to the Spanish-speaking populations of Revere and East Boston.

Since February 2013, the Proponent has convened public meetings with the Latino Division of the Chelsea Chamber of Commerce, East Boston Latino business leaders, and Spanish-speaking employees of Suffolk Downs, in addition to holding a Latino Community Public Meeting and hosting a public transportation presentation for Spanish-speakers. Public meetings have included interpreters. Public notices announcing these meetings appeared in traditional print media as well as in the following community and ethnic newspapers: East Boston Times, Revere Journal, Revere Advocate, El Mundo, El Planeta, La Semana, Siglo 21. All materials disseminated at public meetings are available in English and in Spanish at www.friendsofsuffolkdowns.com.

Recognizing that it is important for meetings to be held at convenient times for interested residents, the Proponent has scheduled meetings for various times during the day. Eleven meetings have been held between 9 am and 5 pm; 27 meetings have been held in the evenings after 5:30 pm and one meeting was held on a Saturday between 11:00 am-1:00 pm.

The Project website (www.suffolkdowns.com) and www.friendsofsuffolkdowns.com are available in both English and Spanish, providing information on Project progress and ongoing activities at the Suffolk Downs racetrack. The website includes facts about the proposed Project and information about potential jobs as well as vendor and supplier opportunities.

As with the ENF, copies of this DEIR/EPNF have been provided to the East Boston branch of the Boston Public Library, the Revere Public Library as well as the Boston Public Library to increase opportunities for public review and comment.

1.10.3 Enhanced Analysis of Impacts and Mitigation

EEA's EJ Policy requires enhanced EIR analysis of impacts and mitigation for a project undergoing MEPA review if that proposed project meets two criteria:

- the project exceeds a mandatory EIR threshold for air, solid and hazardous waste, or wastewater and sewage sludge treatment disposal; and
- the project is located within one mile of an EJ Population (or five miles if the project exceeds a mandatory EIR threshold for air).

The proposed Project meets the criteria for such enhanced analysis of impacts and mitigation under MEPA. First, the Project exceeds the following mandatory thresholds for an EIR:

- 301 CMR 11.03(1)(a)(1): direct alteration of 50 or more acres of land, unless the Project is consistent with an approved conservation farm plan or forest cutting plan or other similar generally accepted agricultural or forestry practices; and

- 301 CMR 11:03(6)(a)(6): Generation of 3,000 or more new adt on roadways providing access to a single location.

Second, the Project is located within one mile of two EJ Populations, East Boston and Revere, and is within five miles of two additional EJ Populations, Chelsea and Winthrop.

Section 1.6 describes the Project's numerous public benefits, and mitigation measures intended to avoid and minimize potential Project-related impacts are summarized in Section 10.0 and described in greater detail throughout this DEIR/EPNF.

1.10.4 Other Actions and Approaches to Enhance the Participation of EJ Populations

As described above, the Proponent has worked diligently not only to meet EEA EJ Policy but also to ensure that the quality of life for the Resort's neighbors is enhanced through the proposed development. Some examples of these efforts to support residents of Revere and East Boston and to ensure they enjoy a clean and healthful environment are identified below; many of these efforts are also described in other parts of the DEIR/EPNF:

1. Promoting Economic Partnerships: Commitment to hiring Revere and East Boston residents

The Resort will bring approximately 4,000 permanent jobs and approximately 2,500 construction jobs to the area, and the Proponent recognizes that hiring local residents will be a priority. The Proponent proposes a local hiring program that will include the following components:

- Host and maintain for a given period a central job bank website as a micro-site within the larger Project website;

- The Proponent will provide residents of Revere and East Boston with advance notice of hiring activities by publishing announcements prior to initial hirings;

- Residents of the host communities will be given priority to apply for jobs during a specified "advance" period;

- Written flyers in English and Spanish will be distributed to local community-based organizations to inform people about local advance hiring;

- The Proponent will partner with local community college and community centers to provide an open computer lab for applicants who may not have a computer or internet access to submit an online application; and

- The Proponent will develop a job training program in accordance with Section 3, questions 8 and 9 of the Massachusetts Gaming Commission's proposed Request for Application (RFA) 2 application.

2. Promoting Economic Partnerships: Providing economic opportunities for local vendors and suppliers

The Proponent expects to spend $150 million annually on local and regional goods and services, and is committed to procuring local and regional goods from a diversified pool of vendors, contractors, and profession service providers. The Proponent will operate a shuttle to run regular service between the Project site and nearby business areas, and will work closely to cultivate local vendors, including certified minority-owned, women-owned, disabled, and disadvantaged business enterprises.

3. Promotion of Green Space: Grounds around the Resort

As described in Section 4.0, the Proponent has taken great efforts in landscape design to ensure that the Resort grounds will be welcoming to neighbors and that pedestrian and bicycle pathways will promote accessibility to and through the site. Landscaping and open spaces are being designed to encourage use by the neighbors.

4. Promotion of Green Space: Improvements to and around Revere Beach

To enhance local and regional connectivity, the Project will improve bike and pedestrian circulation and access. The Project includes provision of on-street bicycle accommodations to connect Constitution Beach, Belle Isle March and Revere Beach along the Bennington Street corridor, along with connections to the Project site from the Suffolk Downs MBTA station and from Winthrop Avenue. On-site pedestrian paths and aesthetically-pleasing open spaces will encourage pedestrian activity and access, including at the site entry.

5. Transportation

The Project will provide substantial investment in local and regional transportation infrastructure, and will enhance multi-modal access to the Project site and within the neighborhoods.

6. Alternatives

Section 1.9 contains an alternatives analysis that includes two alternative development scenarios for the Project site. Both alternatives have been designed to be reasonable and feasible, with one being a mixed-use development and one being primarily retail-based. Given the proximity of the site to public transportation, it is expected that any alternative development scenario would involve significant density and the elimination of the view

corridor and open space that will be preserved by the continued operation of the racetrack. As demonstrated in the alternatives analysis, these alternative development scenarios would have more significant impacts and fewer public benefits than the proposed Project.

1.11 Project Schedule and Phasing

This section describes the Project's construction schedule, planned stages of construction, and schedule for delivery of public benefits.

1.11.1 Phasing Plan

The Project will be constructed in one continuous phase, although certain portions of the Resort will open to the public before others are completed. Staging is described in greater detail in the Draft Construction Management Plan (CMP) in Attachment L, and plans are provided illustrating the anticipated progress of construction throughout the Project site and showing how site access will be provided throughout construction. Casino Area I and the clubhouse will be completed and are planned to open to the public during months 14 to 17, as will patron parking areas and the major on-site roadway infrastructure. The parking garage will be complete and in operation during months 17 to 20, and reconstruction of Tomasello Drive, including landscaping, will also be complete during this period. Casino Area II and Hotel I will be completed by month 26 of construction, when the Resort will be fully turned over for public use. The proposed widening of Route 1A will be completed prior to the opening of any element of the Resort and the remaining proposed improvements to Route 1A will be completed prior to the opening of Casino Area II and Hotel I. As described in Section 1.1.1.7, other off-site infrastructure improvements proposed as part of the HCAs and surrounding community agreements will be completed in accordance with the terms of those agreements (see also Section 5.6 for a discussion of phasing off-site improvements).

1.11.2 Construction Schedule

Project construction is expected to take approximately 26 months, with construction beginning in spring 2014 (assuming issuance of a gaming license) and continuing through spring of 2016. Typical construction hours will be from 6:00 a.m. to 7:00 p.m., Monday through Saturday. Weekend and/or 2nd/3rd shift activities will be performed in a manner that will minimize impacts as may be necessary to meet permitting restrictions. The construction manager will also need to perform some activities, such as materials unloading, during off hours; deliveries of large construction equipment (e.g., cranes, excavation equipment) will be scheduled to avoid and/or minimize impacts to vehicular and pedestrian traffic.

No truck idling, construction activity, or staging outside of the construction site fencing on the Project site will be allowed between the hours of 7:00 p.m. and 6:00 a.m. It is expected that material staging and hoisting will be undertaken within the fenced enclosure during 2nd/3rd shifts. Off-site improvements will be constructed at a time and using

techniques designed to minimize nearby noise and impacts on traffic. Every two weeks, the contractor will publish an updated schedule of upcoming work and will disseminate the schedule to affected parties in local neighborhoods. In addition, the construction manager will publish monthly schedule updates describing progress as well as projected activity for the next month. This information will be available on a Project website which will allow neighbors real-time access to the most up-to-date construction information. Construction-period activities are discussed in greater detail in the Draft CMP in Attachment L.

Section 2.0

Commitment to Green

2.0 COMMITMENT TO GREEN

This section describes the Proponent's commitment to creating the greenest, most sustainable casino development in the United States. The Project's various sustainable design elements are described below along with discussions of LEED credits and climate change adaptation.

Caesars Entertainment is committed to developing projects that are sustainably designed, energy-efficient, environmentally conscious, and healthy for employees and visitors. At all of its casino resorts, Caesars Entertainment implements an Environmental-Social-Governance sustainability strategy. This strategy, CodeGreen, addresses critical issues of energy, waste, water, and carbon emissions and seeks to engage Caesars employees in efforts to reduce natural resource use, conserve energy, and promote reuse and recycling. In the past nine years, Caesars has invested nearly $70 million on energy conservation projects alone and has invested in more than 162 retrofits involving, among others items, energy-efficient lighting, improved air-handling systems, upgraded thermostats, advanced energy-saving sensors, and low-flow water controls and fixtures. Annual savings from these retrofits include in excess of 208 million kilowatt-hours in energy, over 3.3 million therms in natural gas, more than $24 million in annual resources, and 298 million pounds of carbon dioxide emissions.

Two of the challenges in sustainable design for this Project are the high-demand energy use inherent in the round-the-clock operations of casinos and the Project site context. The Project team carefully considered the site location, adjacency to wetlands, and native plant life when designing the Project. In an effort to build upon Caesars Entertainment's knowledge of and commitment to sustainability, the design team gathered energy use data from existing Caesars casino properties and identified several energy efficiency measures that were subsequently tested in various iterations of the building energy model. Measures that demonstrated the most significant energy savings were incorporated into the building systems design.

The Proponent engaged the Project design team early in the design phase by tasking a sub-group of the team, nicknamed the "Green Team", to focus on sustainable design and energy efficiency approaches. Using an integrative approach, the Green Team was able to incorporate several sustainable design measures into the Project. This group is comprised of architects, mechanical, electrical, and plumbing (MEP) engineers, civil engineers, landscape architects, sustainable design consultants, the Owner's project manager, and representative members of the Owner's project management team; this team meets bi-weekly and has held numerous meetings to date. The Green Team reviews research and discusses the viability of implementing potential sustainable design elements and energy efficiency building systems components into the Project design.

Throughout the design phases, the Green Team has researched and collectively reviewed a myriad of sustainable design approaches and related technologies, including but not limited to:

- extensive planting of native and adaptive plant species and natural landscaping design to improve the on-site absorption of rainwater and reduce runoff;

- rainwater harvesting for irrigation uses;
- installation of a geothermal system;
- construction of a cogeneration facility;
- use of sustainable technologies and strategies in the design and construction of off-site transportation improvements, in a manner consistent with MassDOT's GreenDOT policy initiative;
- sourcing an anaerobic digester plant to accept bio-waste generated on site; and
- installation of a PV array for on-site renewable power generation.

Several of the potential sustainable design solutions are now integrated into the Project's proposed design, and are discussed in further detail below, while others were considered but rejected as infeasible for this particular Project.

The Proponent also performed detailed research into the feasibility of using water transportation in its suite of strategies for bringing visitors to the Resort. A Water Transportation White Paper is provided as Attachment C. This analysis demonstrates some significant challenges to establishing efficient water transportation to this particular Project site. However, the Proponent acknowledges the importance of water transportation in the City of Boston and supports Mayor Menino's vision to enhance water transportation options to East Boston by instituting regular water shuttle service between the South Boston and East Boston waterfronts. As such, the Boston HCA includes a contribution that will assist the City in establishing this service.

Many of the sustainable design elements considered by the Green Team are innovative, creative, and atypical for projects of this type and scale. Such elements currently included in the Project design and configuration include:

- Cogeneration: the core system equipment, from Massachusetts company Tecogen, is based on relatively new and advanced technology and is being combined with thermal energy storage to greatly improve system operation and economics, and includes:
    - Emissions Reduction Technology (nitrogen oxides, carbon monoxide, volatile organic compounds) for small/medium-scale rich-burn cogeneration engines that significantly exceeds current standards (on track to become BACT Standard for California Air Resources Board);
    - Variable-speed, water-cooled, permanent-magnet generator and water-cooled inverter based cogeneration system that improves part-load performance, eliminates issues with uneven cooling of generator and power electronics, and enhances the cogeneration system's ability to follow the thermal loads for the building;

- Organics to energy: the Proponent is working with an off-site anaerobic digester facility, Massachusetts-based Harvest Power, and will be a key supplier for this facility;

- Smart-Grid: the backup generation equipment (and, to a small extent, the cogeneration equipment) will be configured to support smart-grid applications for Emergency Demand-Response and Economic Demand-Response needs;

- Solar: the Project design includes an approximately 2.7 MW PV system, of which approximately 1.45 MW will be building mounted, one of the largest private building-mounted PV arrays in the northeast United States;

- LED lighting: these fixtures will be used throughout the Resort to reduce overall energy consumption, with some of the applications including areas in the hotel, casino, garage, and exterior path lighting;

- Electric and Energy-Efficient Vehicles: the Proponent will purchase electric and energy-efficient vehicles where economically feasible, including vehicles proposed to make up the fleet of the extensive ground shuttle program;

- Heat Recovery Ventilation: heat recovery will be used to "recycle" heat in airstreams leaving the building, helping prevent it from escaping in winter and from entering in summer;

- Outside Air Pre-Conditioning (decoupling latent and sensible loads): this will allow the use of heating to be reduced while enabling good air distribution and indoor air quality;

- Occupancy-based controls: these will be included in guest-room thermostats in the proposed hotels;

- Hotel room automation;

- Daylighting control;

- Occupancy-based (carbon dioxide) ventilation control; and

- Hydronic economizer.

The Proponent and Green Team have also considered a number of sustainable design measures and technologies that have not been included in the Project design for various reasons. These are described in further detail in Section 7.4.

2.1 Site and Sustainable Design

The Proponent is committed to setting a new standard of excellence in sustainable design for gaming development projects around the world. The Proponent will achieve LEED Gold certification for the Project, which will be sustainably designed, energy efficient,

environmentally conscious, and healthy for its employees and visitors. Caesars has implemented an integrated design approach to review and analyze the following sustainable strategies and to achieve these sustainable goals and commitment to the City and the surrounding communities. Regular interdisciplinary meetings have been held since Project inception to ensure a fully integrated interdisciplinary approach to sustainability.

The approach to the proposed landscape design embraces the history of the Project site, its unique location between the waterfronts of Boston, Revere, and Chelsea, and its evolution over the last 100 years into an active racetrack and clubhouse. In fostering a regenerative approach to the site and landscape design, the Project will connect nature, people and place. Numerous goals for the Project and site design are tied to sustainability:

- *Understand the land and its history, and embrace the unique location:* Embrace the site's unique location, nestled between two of the historic waterfronts in Boston Harbor. Acknowledge the history of its marshes, creeks, and islands as well as the site's transformation over the last 100 years into the racetrack.

- *Restore landscape ecology:* Reduce impervious pavement on site and restore an ecological landscape that serves as green infrastructure, creates diverse public spaces, and provides an educational amenity to the neighborhood and visitors.

    - The proposed design will reduce impervious pavement by approximately 14 acres and add approximately 16 acres of open space.

    - The design promotes a diversity in the style of open spaces that ranges from active pedestrian plazas to passive ecological parks, offering a variety of amenities for public use.

- *Connect neighborhoods and ecosystems:* Connect the neighborhood and visitors to the Resort and its surroundings through a network of pedestrian walkways and bikeways. The design aims to promote pedestrian circulation and create a unique arrival sequence and visitor experience that embraces the setting of the site near the last remaining salt march in the City of Boston, and a landscape for the resort which is outwardly focused.

- *Develop innovative green infrastructure and pursue sustainable systems:* Use the landscape design to purify stormwater, improve soils, provide opportunities for environmental education, and create a cherished and elegant landscape.

- *Be innovative and sustainable:* Develop a landscape which embraces the beauty of native vegetation and is also low-maintenance and has low irrigation demand.

- *Make parking beautiful and functional:* Design parking lots to improve the visitor experience.
    - A series of planted bioswales along the parking bays will collect stormwater.
    - Shaded walkways, in many cases also supporting solar panels, will provide connections to public spaces and buildings.
- *Be creative:* The roof of Casino Area II will feature a 5,600-square-foot greenhouse with a hydroponic planting system that will produce fresh vegetables and fruits year-round for restaurants in the facility, thereby reducing the demand for delivery trucks.
- *Establish a framework for the future:* Use a balanced cut-and-fill soil strategy across the site. Connect the Resort landscape with the greater East Boston network of public open spaces.
- *Be resilient in response to climate change:* Use site and building design measures that are intended to make the Resort adaptive to climate change and its effects, including sea level rise:
    - The Project will increase the capacity of floodplain storage capacity by approximately 60,000 cubic feet;
    - A significant portion of Tomasello Drive will be raised above the potential future 100-year coastal storm flood elevation of 18.7 feet that may occur at high tide accounting for sea level rise;
    - The Project will reduce stormwater runoff from the site by increasing pervious surfaces and harvesting rainwater from roof areas for reuse;
    - First-floor elevations of proposed buildings will be at elevation 28 feet, significantly higher than anticipated flood elevations accounting for sea level rise and storm surge;
    - Critical mechanical and electrical equipment will be located between elevations 24 and 28 feet, significantly higher than anticipated flood elevations accounting for sea level rise and storm surge;
    - Small pumps will be located in lower levels of the parking garage and casino buildings to evacuate stormwater from these areas; and
    - Space will be reserved for future expansion of the major mechanical and electrical systems if needed to adapt to climate change, for example by adding emergency generators to increase the facility's capability of sheltering the public or by adding heating and cooling capacity.

2.2 LEED Credits and Certification

As required under Article 80, sub-Article 37 'Green Buildings' of the Boston Zoning Code, projects that are subject to Article 80B, Large Project Review, shall be LEED certifiable. There are seven categories in the LEED certification guidelines: Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, Innovation in Design Process, and the additional Regional Priority Credits. The Proponent is targeting several credits which span the seven categories and enable the Project to meet the Zoning requirement, as described below.

The Proponent is committed to achieving the LEED NC v2009 Gold Certification level with 63 credit points.

The following subsections contain a detailed credit-by-credit analysis of how the sustainable design measures incorporated into the Project translate to the LEED NC v2009 rating system. Please refer to the LEED NC v2009 Project Scorecard provided in Attachment E for a summary of the prerequisites and credits targeted for the Project.

Please note that credits listed in *italics* below are either still under consideration for inclusion in the Project or are not being attempted.

2.2.1 Sustainable Sites

The Project site is a previously-developed site in a dense urban neighborhood adjacent to the MBTA Blue Line. MBTA bus routes also pass by, and could pass through the Project site should the MBTA decide to do so. The overall site design and integrated landscaping will address the capture and treatment of stormwater, and the Project design will increase the pervious area on the site by approximately 14 acres relative to existing conditions. The proposed landscape design takes a natural approach, and planting design will extensively use native and adaptive species, reducing the need for potable water for irrigation.

Site stormwater will be re-charged and captured to the extent possible. Rainwater from roofs will be captured and stored to reduce potable water use demand for irrigation and for cooling tower make-up water. Stormwater discharged from the site will be treated to remove at least 80% of TSS.

Parking will be accommodated in multiple surface parking lots complimented by pedestrian walkways and landscaping as well as a new multi-level parking structure that will accommodate approximately 2,550 cars.

The design process of the off-site roadway improvements will seek to incorporate sustainability principles wherever possible. With MassDOT's GreenDOT Policy Directive as a guide, the Proponent will work with appropriate public and private stakeholders to consider, incorporate, and implement planning and design criteria and guidance from such sources as the Greenroads Foundation's Greenroads Rating System and the Institute for

Sustainable Infrastructure's Envision Sustainable Infrastructure Rating System. These programs are designed to encourage technically superior design outcomes with long-term metrics for environmental performance.

Designated bikeways will extend to and through the site and link major roadways, the East Boston Greenway, Revere Beach, and Belle Isle Marsh to Resort buildings and the MBTA Blue Line stations.

Prerequisite 1 Construction Activity Pollution Prevention

The Construction Manager will submit and implement an Erosion and Sedimentation Control Plan for construction activities related to demolition of existing and construction of new buildings specific to this Project. The Plan will conform to erosion and sedimentation requirements of the 2003 EPA Construction General Permit and specific municipal requirements for the Cities of Boston and Everett. In addition, the Project is required to submit a NPDES-compliant SWPPP, a draft of which is included in Attachment F.

During construction, the Construction Manager will implement appropriate measures to control dust and particulate matter on site, as well as measures to protect area waterways from silt run-off.

SSc1 Site Selection

This credit is NOT being pursued due to the proximity of the existing grandstand building and racetrack to natural wetlands areas.

Credit 2 Development Density and Community Connectivity

The Project site contains the existing Suffolk Downs racetrack, grandstand, and associated elements. The surrounding community includes low-rise housing, restaurants, shops, grocery stores, educational and religious institutions, and other community amenities. There is access to multiple modes of public transportation, including several bus lines and the MBTA Blue Line subway.

Credit 3 Brownfield Redevelopment

The existing building areas to be renovated include asbestos-containing materials (ACMs). The Construction Manager will implement a compliant ACM abatement and removal plan. Local, state, and federal regulations shall be followed regarding the safe removal and disposal of ACMs.

Credit 4.1 Alternative Transportation, Public Transportation Access

The MBTA's Suffolk Downs Station is located approximately a quarter mile from the Project site. In addition, bus routes pass directly adjacent to or in close proximity to the Project site, and if deemed desirable by the MBTA may be re-routed to travel through the site as part of the standard route once stage 1 construction is complete.

Credit 4.2 Alternative Transportation, Bicycle Storage

Bike storage locations and changing rooms for full time employees will be included in the Project. Bikes for visitors will be valet parked, and the bikes will be stored in a designated secure portion of the underground parking structure. An appropriate quantity of bike storage locations and showers/changing rooms will be incorporated into the Project design, though it may not meet the total amount required to achieve this LEED credit point.

Credit 4.3 Alternative Transportation, Low-Emitting & Fuel-Efficient Vehicles

The new surface parking lots and multi-level parking garage will have designated preferred parking spaces for Low-Emitting and Fuel-Efficient Vehicles. In addition, electric vehicle charging stations will be provided at select locations disbursed throughout the parking areas.

Credit 4.4 Alternative Transportation Parking Capacity

The quantity of available parking spaces in the new parking garage and surface parking will target a level that will not exceed the quantity allowed by local zoning requirements. Preferred parking spaces will be designated for vanpool and carpool vehicles. Preferred parking spaces for carpools and vanpools will equal not less than 5% of the total number of spaces available.

Credit 5.1 Site Development, Protect or Restore Habitat

The proposed landscape design for the Project includes significant use of natural and adaptive species throughout the site; however, it may not be possible for the Project to meet the specific criteria of the LEED credit. In addition, an approximately 5,600-square-foot greenhouse will be installed with the intent that fruits and vegetables grown within will be used by the restaurants and bars on site.

Credit 5.2 Site Development, Maximize Open Space

The amount of open space on the Project site will exceed the amount of open space on the existing site by approximately 20%. Some landscaped open areas will be accessible for public use, and pedestrian-oriented hardscape will improve the urban open space.

Credit 6.1 Stormwater Design, Quantity Control

Stormwater will be captured from roofs and hardscape areas and will be collected for re-use within the irrigation system and for cooling tower make-up. In addition, the site design will increase pervious area by approximately 14 acres relative to existing conditions, and stormwater management will include infiltration and recharge into the groundwater system through improved absorptive landscaped areas designed with native and adaptive plantings.

Credit 6.2 Stormwater Design, Quality Control

The proposed landscape design incorporates natural features to encourage recharge and mitigate stormwater runoff. Stormwater will be treated to remove a minimum of 80% of the TSS prior to discharge.

Credit 7.1 Heat Island Effect, Non-Roof

This Project will increase pervious surfaces on-site by creating landscaped open areas; in addition, the Project will use light-colored hardscape surfacing materials that meet or exceed Solar Reflectivity Index (SRI) value limits. A minimum of 50% of the parking will be located in a new parking structure.

Credit 7.2 Heat Island Effect, Roof

The roofing material will be light colored high-albedo TPO roof membrane with a minimum SRI of 78. High-albedo roof will cover at least 75% of the Project roof area.

2.2.2 Water Efficiency

The Project design will specify low-flow, high-efficiency, and/or waterless plumbing fixtures, high-efficiency irrigation systems, and will capture rainwater for reuse to reduce potable water use within the Resort. Restaurant tenants will be encouraged to specify low-water-use commercial kitchen equipment.

Prerequisite 1 Water Use Reduction, 20% Reduction

Through the use of low-flow, high-efficiency plumbing fixtures and waterless urinals, the Project will implement potable water use reduction strategies that use more than 20% less potable water than the baseline calculated for the building (not including irrigation) after meeting Energy Policy Act of 1992 fixture performance requirements.

Credit 1.1 Water Efficient Landscaping, Reduce by 50%

The Project will include a permanent irrigation system. Landscape design will incorporate native and adaptive plant materials, and a high-efficiency irrigation system will target a 50% reduction in potable water use when compared to a mid-summer baseline. Rainwater will be captured and stored on site, and a portion of that harvested rainwater will be available for use in the irrigation system to reduce on-site potable water use (see Section 9.2.3).

Credit 1.2 Water Efficient Landscaping, No potable water use or irrigation

This credit is not being attempted as it is not possible to provide 100% of the irrigation water demand through rainwater capture. Due to requirements, some irrigation will be required to maintain the racetrack infield and some ornamental landscaped areas. As indicated above, rain and stormwater will be captured and a portion will be re-used to mitigate the potable water demand for irrigation.

Credit 2 Innovative Wastewater Technologies

This credit is not being attempted. The Proponent considered using captured stormwater for sewage conveyance; however, due to the high cost of piping for both grey and potable water, it was determined be infeasible for this Project.

Credit 3 Water Use Reduction

Specified fixtures will include high-efficiency toilets, waterless urinals, low-flow lavatory faucets, and low-flow shower heads. The Proponent will target an overall potable water use savings of at least 30% above the calculated baseline.

2.2.3 Energy and Atmosphere

The Project will have a high-performance building envelope and high-efficiency building systems. An extensive PV array will be installed with a goal to generate approximately 10% of the Project's electricity use on-site. A combined heat and power (CHP) system will be constructed for use in supporting the domestic hot water demand. In addition, organic waste materials will be collected and supplied to a Massachusetts anaerobic digester facility.

The building heating, ventilation, and air conditioning (HVAC) and commercial refrigeration systems will be selected to reduce harm to the ozone layer and potential GHG emissions. The Proponent will engage a Commissioning Agent to confirm that building systems are installed and function as intended and designed.

Prerequisite 1 Fundamental Commissioning of the Building Energy Systems

A third party Commissioning Agent (CxA) will be engaged by the Proponent for purposes of providing basic and enhanced commissioning services for the building energy related systems including HVAC & R, lighting, and domestic hot water. The CxA shall verify that building systems are installed, calibrated, and perform to meet the requirements of the building owners' Project requirements.

Prerequisite 2 Minimum Energy Performance

The estimated building energy use will demonstrate a minimum of a 10% improvement when compared to the baseline building performance when calculated using the rating method in Appendix G of ANSI/ASHREA/IESNA Standard 90.1-2007. A whole building energy simulation will demonstrate the projected energy savings for the Project.

Prerequisite 3 Fundamental Refrigerant Management

Specifications for refrigerants used in the building HVAC and the commercial refrigeration systems will NOT permit the use of CFC based refrigerants.

Credit 1 Optimize Energy Performance

The proposed building systems will target a performance level which is at least a 15% improvement over a baseline building performance rating. The team will develop a whole building energy model to demonstrate the expected performance rating of the designed building systems. The Project will incorporate a central heating and cooling plant and target lighting power densities below code minimums.

Credit 2 On-Site Renewable Energy

The Project includes an extensive on-site PV array that will provide approximately 10% of the Project's estimated electricity use.

Credit 3 Enhanced Commissioning

The CxA will be engaged early in the design process to review Project requirements, create, distribute, and implement a commissioning plan, and to perform a design review of the design development and construction documents.

Credit 4 Enhanced Refrigerant Management

Long life high-efficiency mechanical equipment will be specified for the HVAC systems, and refrigerants specified for the systems will have low ozone-depletion and global warming potentials. Commercial walk-in coolers must be included in the calculations for credit compliance. Credit achievement is based on the final calculated amount of refrigerant in the system.

Credit 5 Measurement and Verification

Caesars Entertainment will develop and implement a measurement and verification plan for the Project. In addition, Caesars Entertainment will establish an Energy Star Portfolio Manager account to enable the USGBC to review whole building energy and water use for five years after occupancy.

Credit 6 Green Power

Caesars Entertainment will purchase Renewable Energy Certificates via a two-year renewable energy contract to provide a minimum of 35% of the building's electricity from renewable sources. In addition, the proposed solar array, at approximately 2.7 MW, will account for approximately 10% of the Resort's electricity consumption.

2.2.4 Materials and Resources

Throughout Project construction, the Construction Management team will endeavor to divert construction and demolition waste from landfills. To the extent possible, products and materials will have recycled content and will be procured from regional sources.

Prerequisite 1 Storage and Collection of Recyclables

Collection of recyclables including paper, cardboard, glass, plastic, and metal will be accommodated throughout the Resort buildings. Collection stations will be located in highly visible locations throughout the Resort, and on a regular basis collected materials will be transported to a central storage location. Food and organic waste will be collected and transported to a Massachusetts-based anaerobic digester plant for conversion to energy and compost. The Proponent will contract with Harvest Power, North America's largest organics management company, and Harvest will provide the Proponent with a Complete Organics Recycling program for all organic waste generated from the facility. Management of the estimated 3,100 tons of source-separated organics (SSO) generated annually will include hauling, disposal, processing, and all equipment and systems both inside and outside the property. In addition, Harvest Power will provide the management software and a sustainable reporting system to manage and report waste generation data. Through the Complete Organics Recycling program, Harvest Power will provide a customized

education and training program for the staff, including management personnel and hourly employees, which will be conducted in English, Spanish, and French as necessary. The SSO will be transported to an anaerobic digestion facility to be constructed in Massachusetts.

Credit 1.1 and 1.2 Building Reuse

These credits are not being pursued. The Project will reuse the entire existing grandstand building, with extensive renovations planned for the lower levels. However, due to the size of the new development, the Project does not meet the specific credit requirements.

Credits 2.1 and 2.2 Construction Waste Management

Prior to the start of construction, the Construction Management team will prepare a Construction Waste Management plan for implementation on site. The plan will include directions for handling demolition debris as well as for waste generated during construction. The goal is to divert at least 75% (by weight) of the demolition debris and construction waste from landfills.

Credits 3.1 and 3.2 Materials Reuse

The Project is not attempting these credits. If applicable, the Proponent may consider materials reuse; however, due to the high-end nature of the interior finishes for the proposed casino spaces, hotel, and restaurant, the Project will not attempt to meet the credit requirements.

Credits 4.1 and 4.2 Recycled Content 10%/20% (post-consumer & ½ pre-consumer)

Project specifications will require materials to include pre- or post-consumer recycled content. The Project will utilize at least 10% recycled materials (measured by cost), with a goal to achieve the 20% threshold. The Construction Manager will track the recycled content of each material with a Project goal to achieve 10% recycled-content materials based on overall Project materials costs.

Credit 5.1 and 5.2 Regional Materials, 10%/20% Extracted, Processed and Manufactured Regionally

Project specifications will indicate materials to be extracted, harvested, recovered, and manufactured within a 500-mile radius of the site. The Project has a goal to provide a minimum of 10% regionally sourced materials based on overall Project materials costs. The Project will endeavor to achieve the 20% threshold.

Credit 6 Rapidly Renewable Materials

The Project is not attempting these credits. If applicable, the Proponent may consider the use of Rapidly Renewable Materials; however, due to the high-end nature of the interior finishes for the casino spaces, hotel, and restaurants, the Project will not attempt to meet the credit requirements.

Credit 7 Certified Wood

The Project will use FSC and sustainably harvested wood to the extent possible and may achieve the credit requirement to provide a minimum of 50% FSC certified wood for wood permanently installed inside the building envelope.

2.2.5 Indoor Environmental Quality

Air quality will be monitored during Project construction and will be tested prior to occupancy. Low-emitting materials will be used throughout the Resort to maintain and improve air quality for construction personnel on site as well as future occupants. Building occupants will be able to maintain a comfortable environment through access to thermal and lighting controls.

Prerequisite 1 Minimum IAQ Performance

Building mechanical systems are designed to meet or exceed the requirements of ASHRAE Standard 62.1-2007 sections 4 through 7 and/or applicable building codes. Naturally ventilated spaces such as the hotel rooms shall comply with the applicable portions of ASHRAE 62.1.

Prerequisite 2 Environmental Tobacco Smoke Control

The entire resort shall be a non-smoking environment.

Credit 1 Outdoor Air Delivery Monitoring

The Project will incorporate permanent carbon dioxide sensors and outside airflow measuring stations and devices to provide feedback on the performance of the HVAC system. Devices shall be programmed to generate an alarm when conditions vary by 10% from a set point.

Credit 2 Increased Ventilation

This credit is not being pursued. The Project will improve the breathing zone outdoor air ventilation rates in regularly occupied spaces; however, the Project is unlikely to achieve the credit requirement to achieve a level of 30% above the required minimums of ASHRAE 62.1-2007.

Credit 3.1 Construction IAQ Management Plan (during construction)

The Construction Manager will develop an Indoor Air Quality Management Plan for construction and pre-occupancy phases of the Project to meet or exceed the recommended Control Measures of the SMACNA IAQ Guidelines for Occupied Buildings Under Construction 2nd Edition 2007, ANSI/SMACNA 008-2008 (Chapter 3). Absorptive materials stored on site will be protected from moisture damage.

Credit 3.2 Construction IAQ Management Plan (before occupancy)

After the completion of construction and prior to occupancy, Caesars Entertainment may decide to conduct baseline IAQ testing to demonstrate contaminant maximum concentrations are not exceeded.

Credits 4.1 Low-Emitting Materials, Adhesives & Sealants

Specifications include requirements for adhesives and sealants to meet low Volatile Organic Compound (VOC) limits for adhesives and sealants installed within the building envelope.

Credits 4.2 Low-Emitting Materials, Paints and Coatings

Specifications include requirements for paints and coatings to meet low VOC limits for paints and coatings installed within the building envelope.

Credits 4.3 Low-Emitting Materials, Flooring Systems

Specifications will include requirements for hard surface flooring materials to be Floor Score certified, and carpet systems will endeavor to comply with the Carpet Institute Green Label program. Several carpets may be custom fabricated and may not be able to demonstrate compliance with CRI programs as required.

Credit 4.4 Low Emitting Materials, Composite Wood and Agrifiber Products

The Project will specify and install composite wood and agrifiber products that contain no added urea-formaldehyde.

Credit 5 Indoor Chemical and Pollutant Source Control

The Project team will design buildings to minimize and control the entry of pollutants and to contain chemical use areas. Entryway systems will be installed at all regularly used building entrances.

Credit 6.1 Controllability of Systems, Lighting

This credit is not being pursued. The Project will include applicable lighting controls in all back of house offices and support spaces and within the hotel guest rooms; however, due to the need for specific lighting applications in the gaming and dining areas, the Project cannot achieve the requirements of this credit.

Credit 6.2 Controllability of Systems, Thermal Comfort

This credit is not being pursued. The Project will include applicable thermal controls in all back of house offices and support spaces and within the hotel guest rooms; however, due to the need for specific controls in the gaming and other assembly areas, the Project cannot meet the requirements of this credit.

Credit 7.1 Thermal Comfort, Design

The Project's HVAC design will comply with ASHRAE 55 for all applicable mechanically ventilated regularly occupied spaces.

Credit 7.2 Thermal Comfort, Verification

The Proponent may choose to conduct an annual anonymous survey to determine if employees are comfortable in their work environment.

2.2.6 Innovation & Design Processes

The team has identified several possible ID credits, limited to five ID credits total. ID credits under consideration are identified below.

Exemplary Performance for SSc4.1

The Project site is located on several bus and transit routes with a frequency of service that may include over 200 transit rides per day.

Exemplary Performance for MRc2.2 Construction Waste Management

The goal is to divert at least 75% (by weight) of the demolition debris and construction waste from landfills. Due to the inclusion of recyclable demolition debris, however, it is likely the Construction Manager could divert 95% of the demolition and construction waste by weight from landfills.

Building as an Educational Tool

The Proponent will implement two public outreach programs to inform the public about the sustainable design features incorporated into the Project.

Reduced Process Water Use

The Project will target a reduced process water load for the building cooling systems.

Green Housekeeping

Caesars Entertainment will implement a cleaning program that uses "green" cleaning products.

Credit 2 LEED Accredited Professional (required ID credit for LEED certification)

A LEED AP will provide administrative services to oversee the LEED credit documentation process.

2.2.7 Regional Priority Credits

Regional Priority Credits (RPC) are established LEED credits designated by the USGBC to have priority for a particular area of the country. When a project team achieves one of the designated RPCs, an additional credit is awarded to the project. RPCs applicable to the Boston area include: SSc3, SSc6.1, SScC7.1, EAc2, and MRc1.1. The Proponent expects to achieve three RPCs: (1) SSc6.1 Stormwater Design, Quantity Control; (2) SSc7.1 Heat Island Effect, Non-Roof; and (3) SSc7.2 Heat Island Effect, Roof.

The Proponent will explore parameters of the following rating systems and metrics, and will endeavor to incorporate applicable elements into the Project, where feasible:

- International Dark Sky Association: The Proponent will explore the possibility of establishing some park areas within the Master Site that meet requirements of International Dark Sky Parks.

- International Living Future Institute: Living Building Challenge is a rigorous green building certification program. To be certified under the Challenge, projects must meet a series of ambitious performance requirements including net zero energy, waste, and water over a minimum of 12 months of continuous occupancy. Due to the 24/7 operations inherent in this type of project, the Project would have an extremely difficult time meeting criteria for this performance standard.

- Zero Net Energy (ZNET) buildings and projects: The Proponent is exploring the possibility of making the proposed maintenance building a zero net energy building.

- 2030 Architectural Challenge: The Project design contains numerous measures that will significantly reduce GHG emissions. These measures are described in the GHG emissions analysis in Section 7.2.

2.3 Climate Change and Adaptation

Climate change, climate change adaptation, and climate change resiliency are increasingly becoming a part of the daily vernacular, and these subjects are the topics of much study and debate. With increasingly warmer average temperatures and more frequent and intense storm events, the scientific consensus is that climate change is a reality and that it requires preparation and adaptation. All 50 states experienced a warmer than average year in 2012, and effects from Superstorm Sandy made the potential scale of threats and impacts from climate change more tangible.

As part of the preparation of the site and building design processes for this Project, the Proponent and its development team gave climate change and its ramifications significant consideration. This section describes the Project team's research into climate change and measures that have been incorporated into the Project's design to ensure it will have a significant measure of climate change resiliency.

Most of the mechanical and electrical systems, including all major equipment and critical life safety equipment (e.g., generators, associated switchgear, and distribution) will be located above elevation 24 feet (Boston City Base, BCB) to help ensure they will not be taken down by a climate change-related event.

Space is being reserved for future expansion of the major mechanical and electrical systems if needed to adapt to climate change, for example by adding emergency generators to increase the facility's capability of sheltering the public or by adding heating and cooling capacity.

2.3.1 Integrating Mitigation and Adaptation

First and foremost, the Project design goal is to reduce its ecological footprint and mitigate potential GHG emissions that contribute to climate change and its effects, including sea level rise. Using an integrated design approach, the Proponent's design team has developed conservation and efficiency strategies that will reduce energy consumption, and the Project also includes a significant amount of on-site renewable energy generation from an extensive PV array. Other energy-related design measures, including CHP and daylighting, are discussed in Sections 9.4 and 9.5. The balance of this section also describes "Smart Growth" low-impact development (LID) and LEED strategies incorporated into the Project.

2.3.2 Enhance Emergency Preparedness

Hazard mitigation, evacuation, and emergency response plans for the Resort will reflect the needs of the new development to respond to current risks as well as future effects from climate change. The Proponent will develop partnerships with local and state agencies to coordinate efficient responses to climate change events. Caesars is accustomed to assembling detailed response plans for each of its facilities that are tailored to the specific

features and risks of each geographic location. Although the response plan for the Resort is still under development, a sample response plan is provided in Attachment G. In addition, the site has been designed proactively to make it resilient to climate change issues such as sea level rise (see Section 2.3).

2.3.3 Ecosystem-Based Adaptation

The Project will restore and protect natural ecosystems to increase their viability and strengthen their functions and values. Natural ecosystems provide resilience and reduce the vulnerability of natural and built environments to hazards. The natural habitats on the Project site will serve as ecological infrastructure to reduce risk posed by some climate change impacts, including increased storm frequency. Project design measures, including increasing pervious surfaces by 14 acres and managing stormwater, will promote infiltration and reduce stormwater discharge from the site.

2.3.4 Climate Change Analysis and Proactive Site Design

The Project team has developed a landscape design that responds to the threat of sea level rise by elevating buildings, critical mechanical and electrical equipment, roadways, and access points in a manner that will maintain site access and building safety and operations during future coastal storms assuming sea level rise; this will enable the Project site to function as a safe haven for the community should an extreme event occur. In such an event, access for emergency vehicles would be available at the Bennington Street gate to the property.

The Project team reviewed a number of published reports while studying climate change and its implications for the Project. While no report can definitely estimate the impacts of climate change, perhaps the most quantifiable measure of climate change is sea level rise. Scientific literature contains reports with a wide range of sea level rise predictions, usually carrying those predictions through the middle and end of the century. Despite the variability in predictions, one noticeable trend in the literature over the past decade or more is that estimated sea level rise appears to be trending higher as more studies and analyses are performed. Reports reviewed and consulted during ongoing Project design include:

- Intergovernmental Panel on Climate Change (IPCC). 2007. *Climate Change 2007: The Physical Science Basis.* Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.

- Pfeffer, et al. 2008. *Kinematic Constraints on Glacier Contributions to 21st–Century Sea Level Rise.* Science. Vol. 321, no. 5894. pp. 1340-1343.

- Massachusetts Executive Office of Energy and Environmental Affairs and the Adaptation Advisory Committee. 2011. *Massachusetts Climate Change Adaptation Report, September 2011.*

- Douglas, Ellen M.; Kirshen, Paul H.; Paolisso, Michael; Watson, Chris; Wiggin, Jack; Enrici, Ashley; and Ruth, Mathias. 2011. *Coastal flooding, climate change and environmental Justice: Identifying obstacles and incentives for adaptation in two Boston Metropolitan communities.* Published in "Mitigation and Adaptation Strategies for Global Change," October 21.

- Douglas, Ellen; Kirshen, Paul; Li, Vivian, Watson, Chris; and Wormser, Julie. 2013. *Preparing for the Rising Tide.* Published by The Boston Harbor Association, February.

As mentioned above, there is no consensus on the rate or magnitude of future sea level rise. For example, the IPCC report estimates that global average sea level will rise 7.2 to 23.6 inches by the year 2100, and acknowledges there may be substantial variability in sea level rise depending on geographic location. The Pfeffer report, on the other hand, concludes that the most likely range of sea level rise by 2100 is 2.5 to 6.6 feet, but also acknowledges that "substantial uncertainties" exist regarding this estimate. The most current thinking is that sea level will rise between 6 and 16 inches by 2050, and between two and six feet by the year 2100.

The most recent report, published by The Boston Harbor Association (TBHA) in 2013 ("Preparing for the Rising Tide") assesses impacts of sea level rise with storm surge throughout the City of Boston in three scenarios:

1. The first scenario estimates flooding impacts by adding 2.5 feet to the elevation of Mean Higher High Water (MHHW), essentially mimicking the flooding that was experienced in the City of Boston at high tide five hours before Superstorm Sandy's maximum storm surge hit.

2. The second scenario adds 5 feet to MHHW, thus estimating the impact that Superstorm Sandy would have had if the storm surge had hit during high tide.

3. The third scenario approximates the 100-year coastal storm surge at high tide when sea levels are approximately 2.5 feet higher than current levels, effectively adding 7.5 feet to existing MHHW to estimate flooding impacts that could occur at projected mid-century sea levels during a 100-year coastal storm surge at high tide.

The third scenario in the TBHA report has the most profound flooding impacts throughout the City of Boston, and it is the scenario that the Project team considered when proceeding through site and building design for the Project. Adding 7.5 feet to the existing MHHW elevation on the Project site yields a potential 100-year coastal storm flood elevation of 18.7 feet that may occur at high tide accounting for sea level rise. This elevation provides an important design benchmark for the Project's site design with regard to providing resiliency for sea level rise and storm surge.

When considering climate change and sea level rise, there are no standard accepted practices or regulatory standards associated with site and building design. Absent any standards or regulations regarding climate change preparation and adaptation, the Project team primarily relied on recent scientific literature as well as solid engineering judgment and common sense. The result is a site plan and building design that is resilient to climate change.

2.3.5 Floodplain

The existing 100-year floodplain elevation on the Project site is 15.46 feet BCB, and MHHW is 11.2 feet BCB. The 100-year floodplain is mapped throughout the Project site and is depicted by those areas below elevation 15.46 feet (see Figure 6-32 in Section 6.9, which shows the 100-year floodplain). In general, areas of the Project site within the existing 100-year floodplain include the stable areas at the northern end of the site, the parking lot located north of the existing building adjacent to Sales Creek, areas adjacent to the western property boundary near the wetlands, areas adjacent to Sales Creek, and portions of the racetrack infield. Floodplain elevations are based on Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Numbers 25025C0019G and 25025C0038G, effective September 25, 2009; floodplain areas on the Project site are described as Zone AE.

The Project design includes cutting and filling activities over approximately 600,000 square feet of the existing 100-year floodplain area on the Project site, including a part of the existing stable area north of Sales Creek in Revere, the parking lot south of Sales Creek and north of the proposed building, and areas located along Tomasello Drive to accommodate construction of the new roadway. Within the parking areas, the site has been designed to include both cut and fill areas, with a net gain in floodplain storage of approximately 52,200 cubic feet. A proposed parking area is located near the Resort entrance off Winthrop Avenue in the current location of stable buildings and in the existing 100-year floodplain. The stable buildings in this particular location are proposed to be demolished, and the grade in this area will be lowered to provide additional floodplain storage. Along Tomasello Drive from Route 1A and past the proposed parking garage, there will be fill associated with road construction to raise the proposed Tomasello Drive above elevation 18.7 feet (the projected 100-year floodplain elevation at high tide accounting for sea level rise). A large floodplain compensation area is proposed north of Tomasello Drive along the site entrance from Route 1A that will provide floodplain compensation for filling associated with construction of the new roadway. This proposed floodplain compensation area is sized to provide greater than required floodplain compensation volume on the magnitude of 8,000 cubic feet, contributing to the overall net new floodplain compensation volume of over 60,000 cubic feet.

As currently designed, the Project's cut and fill impacts within existing floodplain on the site are quantified in Table 2-1 and shown in Figure 2-1. These calculations document the proposed compensatory flood storage that has been incorporated into the Project design.

Table 2-1 Cut and fill impacts in existing 100-year floodplain along Tomasello Drive.

Elevation (feet)	*Fill (cubic feet)*	*Cut (cubic feet)*	*Net (cubic feet)*
Along Tomasello Drive			
14-15	3000	-9000	-6000
15-15.5	10000	-12000	-2000
total	*13000*	*-21000*	*-8000 (compensatory storage)*
North Parking Lot/CAFO Parking Lot			
11-12	800	-1000	-200
12-13	7000	-10000	-3000
13-14	20000	-27000	-7000
14-15	33000	-58000	-25000
15-15.5	19000	-36000	-17000
total	*79800*	*-132000*	*-52200 (compensatory storage)*
Total Site			
11-12	800	-1000	-200
12-13	7000	-10000	-3000
13-14	20000	-27000	-7000
14-15	36000	-67000	-31000
15-15.5	29000	-48000	-19000
total	*92800*	*-156000*	*-60200 (compensatory storage)*

As shown with the cut and fill numbers in Table 2-1, the Project site design will provide approximately 60,200 cubic feet of net additional floodplain storage. This new floodplain storage will serve two purposes: first, additional floodplain storage will help reduce off-site stormwater impacts (see Section 9.3 for a description of how off-site stormwater impacts will be reduced by less impervious surface, increased infiltration, increased water quality treatment, and rainwater harvesting); second, greater floodplain storage will accommodate additional water that may enter the site due to combined sea level rise and storm surge.

All floodplain areas on site are adjacent to wetlands and/or Sales Creek, and these areas represent the lowest elevation points on the property. The 100-year floodplain elevations on site are reached when water levels in both Sales Creek and the wetlands rise due to extreme storm events and essentially flood adjacent areas. The proposed site design will maintain these connections between floodplain, wetlands, and Sales Creek. The parking area located on the northern portion of the site will continue to experience flooding during extreme storm events due to rising water levels in Sales Creek. Along the Tomasello Drive entrance, the new floodplain compensation area will effectively accept water from adjacent wetlands displaced by construction and raising of the roadway.

The Proponent does not anticipate the need for large-scale pumping to evacuate storm or flood waters; however, some small pumps will be located in lower levels of the parking garage and casino buildings to evacuate stormwater that will drain into these areas. As described in Section 9.3, the Project design demonstrates resiliency to climate change since it will discharge less stormwater and will store significantly more water than under existing conditions. Therefore, the Project will reduce off-site impacts.

Resort buildings will be located outside of the floodplain, with the ground floor elevations of Casino Areas I and II well above the 100-year floodplain. Even the below-grade parking slab elevation will be located above the floodplain.

2.3.6 Sea Level Rise

The Project site has been designed to prepare for projected sea level rise as well as increased storm surges that may be caused by global climate change. The site has a natural advantage in terms of rising sea levels and storm surge due to its existing topography as well as its location between Chelsea Creek and the Belle Isle Marsh. Current upland elevations on site range between approximately 12.5 feet BCB (adjacent to Sales Creek) to approximately 28.5 feet (adjacent to the existing grandstand and clubhouse). Although some of the site is within the 100-year floodplain, the approximately 16-foot elevation change between low and high points provides a great amount of flexibility in creating a site design that is resilient to sea level rise (see Figure 2-2).

When designing the site, the Project team evaluated future sea level rise and storm surge conditions using a methodology similar to the approach used in TBHA's 2013 report, "Preparing for the Rising Tide." The Project team applied the same adjustments for projected sea level rise and storm surge that are described in the report to MHHW elevations on the site. As defined above, MHHW on the Project site is at elevation 11.2 feet. Applying the Scenario 3 elevation adjustment described in the TBHA report results in a storm surge elevation of 18.7 feet on the Project site, which includes an assumed sea level rise of 2.5 feet. This 18.7-foot elevation was used as a design elevation for locating and designing the proposed buildings, access, and critical infrastructure.

The Project entrance along Tomasello Drive via Route 1A is currently at approximately elevation 30 feet, but the roadway descends into the property and is mostly below elevation 18.7 feet throughout the site. Near the entrance from Winthrop Avenue, the elevation of Tomasello Drive is at approximately 15 feet. To mitigate the impacts of sea level rise and storm surge, the Project design includes substantially raising the elevation of a section of Tomasello Drive from Route 1A to a point just north of the proposed parking garage to bring it above elevation 18.7 feet. This will provide access to the site and proposed buildings from Route 1A even during severe storm events; including taking into account the effects of sea level rise (see Figures 2-2 and 2-3).

All proposed buildings will be located in the vicinity of the existing grandstand and clubhouse. First floor elevations of the proposed buildings will be at elevation 28 feet, which is significantly higher than current MHHW, 100-year floodplain, and the anticipated flood elevations accounting for both sea level rise and storm surge. All critical mechanical and electrical equipment needed to operate the buildings, including the heating plant, cooling plant, emergency generators, fire pump, gas service entrance, and ventilation equipment, will be located near the CUP that will be connected to Casino Area I. This equipment will be located adjacent to the CUP between elevations 24 and 28 feet (see Figure 2-3).

Underground parking below Casino Area II will have a floor elevation of 16.5 feet; this area will be used exclusively for vehicle parking, and vehicles will not be parked on this level during severe storm events. Pumps will be used to evacuate any water that accumulates in this parking level during extreme storm events. With regard to the proposed parking garage, the first-floor elevation will be at elevation 27.25 feet, while the below-grade floor elevation will be at elevation 16.25 feet. During severe storm events, these areas will not be occupied by people or vehicles. Pumps will be used to evacuate any water that accumulates in the garage during extreme storm events.

A number of factors generally protect the Project site from storm surge. Storm surge is typically evaluated through complex engineering models that take into account factors such as proximity to the shoreline, prevalent wind direction, amount of uninterrupted ocean that approaches the shoreline, topography of the site and surroundings, and topography below the ocean surface approaching the shoreline. Although Sales Creek experiences tidal influences, in general the site is well protected from open ocean or tidal bodies of water. Existing buildings on-site are located over one-half of a mile from Chelsea Creek and are separated from Chelsea Creek by the adjacent tank farm, Route 1A, and a variety of businesses located west of Route 1A. The tank farm is surrounded by containment berms that restrict the movement of fuel off the property in the event that one of the tanks ruptures. These berms are located just west of the Project property line adjacent to existing wetlands which are situated between the existing parking lots and the containment berms. The upper elevations of the berms vary but are generally between elevations 23 and 25 feet. Therefore, these berms have been constructed to an elevation that is four to six feet higher than the expected flood elevation described under Scenario 3 of the TBHA report. These berms will provide the Project site with significant protection from storm surge and will also ensure that any tank leaks will be contained off the Project site, even during an extreme storm event coupled with sea level rise.

The eastern portion of the Project site is approximately three-quarters of a mile from the coastline, and is separated from the coast by the Beachmont neighborhood, which is located on a drumlin with elevations that rise above 100 feet. Therefore, the site is not subject to direct coastal influences. During extreme storm events at high tides, water will rise in Belle Isle Marsh from the Boston Harbor, thus influencing Sales Creek since the

creek is connected to the Belle Isle Marsh through a tide gate at Bennington Street. The gate closes during high tide and storm events, providing the site with substantial protection from rising tidal waters in the Belle Isle Marsh. During extreme storm events at high tide, it is conceivable that water could pond along the eastern side of Bennington Street. The approximate road elevation along Bennington Street at the tide gate is 14 feet BCB, and elevations along Bennington Street directly east of the site range from 13 to 15 feet. Therefore, it is conceivable that floodwaters could overtop Bennington Street and flow into the Project site; however, it is unlikely that such floodwater would impact access to the site from Route 1A or the proposed buildings.

The proposed site design limits impacts from projected sea level rise and storm surge to areas on the northern portion of the property near the parking lot and existing horse stables. Even in those areas, however, the Project design will improve site resiliency by converting approximately 2.3 acres of the existing 23-acre stable area and lowering the elevation in this area to provide additional floodplain capacity. An additional benefit of this conversion is that it will also effectively reduce the spatial extent of the Concentrated Animal Feeding Operation by 2.3 acres, thus reducing CAFO waste discharged to the recently-installed sanitary system by approximately 10%.

2.3.7 Increased Frequency of Storms

One of the anticipated impacts from climate change is an increase in the frequency and intensity of storm events. In a July 2011 report entitled "Forging the Link – Linking the Economic Benefit of Low Impact Development and Community Decision," the University of New Hampshire's Stormwater Center evaluated climate change as part of a benefits analysis of LID stormwater infrastructure. This report suggested that design depths for specific storms will increase over time as climate changes and storms intensify.

As described in Section 9.3, the proposed Project uses LID stormwater design to promote infiltration and effectively reduce the potential impact from increased storm frequency and intensity. LID stormwater strategies have a number of benefits, including providing greater resiliency to climate change. The Project design uses water quality swales, bioretention basins, biofiltration swales, rainwater harvesting tanks, and pervious pavers to promote infiltration. Through careful site design, the Project will increase pervious surface on-site by approximately 14 acres relative to existing conditions.

2.4 Energy Conservation

The Proponent is committed to a sustainably designed and energy-efficient facility. Caesars' CodeGreen initiative focuses on building operations, its employees, guests, and suppliers to ensure a leadership position in environmental stewardship. Along with conservation and efficiency measures, on-site renewable strategies will be deployed to maximize energy savings. By incorporating numerous energy conservation measures into the Project design, the Proponent will reduce annual energy consumption by approximately 25% through

conservation strategies, efficiency measures, and on-site renewable production. Energy-consuming systems will be monitored and tracked using an advanced building management system and metering. This system will allow the Proponent to analyze and reduce energy consumption over time by identifying areas of high energy consumption for targeted reductions.

Multiple energy conservation strategies will reduce Resort energy consumption, including PV arrays which will generate approximately 2.7 MW of "carbon free" onsite renewable energy per year. The building-mounted portion of the PV system (approximately 1.45 MW) will be one of the largest private building-mounted PV deployments in the northeastern United States. The entire PV system will account for approximately 10% of the Resort's electricity consumption.

Heating and cooling will be generated through the use of high-efficiency systems that perform substantially better than what the building code requires, and high-performance low-e glazing paired with enhanced thermal performance wall and roof assemblies will reduce energy consumption and thermal loss. A CHP installation will provide heat and power to the Resort while producing fewer GHG than the equivalent utility-fed system. Engine(s) will be used to generate electrical power, and the heat produced by these engines will be used to heat water for use in the facility. This approach is far more sustainable (i.e., reduces carbon dioxide emissions) than using electricity and natural gas from "the grid". High-efficiency mechanical equipment will be used to provide heating and cooling.

Advanced lighting controls and architectural daylighting strategies will take advantage of natural light and reduce artificial lighting. Natural lighting will be used throughout the facility, including in gaming spaces, allowing the lighting control system (which will use photocells, occupancy sensors, and other systems) to dim and shut off artificial lights when they are not needed. Interior and exterior lighting systems of the Resort buildings will employ high-efficiency fixtures, reducing energy consumption. Guest rooms will be equipped with smart controllers that shut off lighting and reduce heating and air conditioning when guests are not present, saving electricity and natural gas.

A high-performance air system design will reduce the energy required to move heating and cooling energy around the facility. Space heating, cooling and ventilation will be accomplished efficiently with less restrictive ventilation ducts, and high-efficiency fans, a design which will reduce energy consumption without compromising air quality or guest comfort. Heat recovery devices will reduce the amount of waste heat (including moisture) that leaves the facility.

High-efficiency plumbing fixtures (e.g., low-flow and waterless fixtures) will reduce the consumption of domestic hot water, thus reducing heating energy consumption. Economizer cycles (using air and water) will use outside, untreated air to cool the space when possible. A high-performance envelope will reduce envelope heat gain and loss. Metering provisions will allow the owner to monitor and improve building operations to reduce energy consumption.

Section 3.0

Regulatory and Legal Information

3.0 REGULATORY AND LEGAL INFORMATION

3.1 Project Identification and Project Team

Project Name:	Caesars Resort at Suffolk Downs
Address/Location:	Suffolk Downs Racecourse East Boston and Revere, Massachusetts
Developer	Sterling Suffolk Racecourse, LLC 525 William F. McClellan Highway P.O. Box 581 East Boston, MA 02128
Architects	Elkus/Manfredi Architects Ltd. 300 A Street Boston, MA 02110 (617) 426-1300 David Manfredi Kevin Lennon
Landscape Architect	Sasaki Associates, Inc. 64 Pleasant Street Watertown, MA 02472 (617) 923-7167 Gautam Sundaram Isabel Zempel
Permitting Consultants	Epsilon Associates, Inc. 3 Clock Tower Place, Suite 250 Maynard, MA 01754 (978) 897-7100 Elizabeth Grob Holly Carlson
Transportation and Parking Consultants	Vanasse Hangen Brustlin, Inc. 99 High Street Boston, MA 02110-2354 (617) 728-7777 David Black, Erica Guidoboni, John Kennedy, Douglas Landry

Legal Counsel	DLA Piper LLP (US) 33 Arch Street Boston, MA 02110-1447 (617) 406-6000 Charles A. Baker III Bryan Connolly Emma Rothfeld Yashar
Transportation Counsel	Foley Hoag LLP 155 Seaport Boulevard Boston MA Boston, MA US 02210-2600 617.832.1000 Jeffrey Mullan
Geotechnical Engineer	Haley & Aldrich 465 Medford Street, Suite 2200 Boston, MA 02129-1426 (617) 886-7304 Mark Balfe
Structural Engineer	McNamara/Salvia, Inc. 160 Federal Street Boston, MA 02110 (617) 737-0040 John Matuszewski
Civil Engineer	Nitsch Engineering, Inc. 186 Lincoln Street, Suite 200 Boston, MA 02111 (617) 338-0063 Scott Turner Gary Pease
Mechanical Engineer	Vanderweil Associates 274 Summer Street Boston, MA 02210 (617) 574-8132 Alex Vanderweil Joe Manfredi
Sustainable Design	The Green Engineer 50 Beharrel Street, Concord MA 978-844-1464 Christopher Schaffner Sarah Michelman

Estimated Commencement:	To be determined by the Gaming Commission (see Section 3.3.2)
Estimated Completion:	Approximately 24 months following commencement of construction (see Section 1.11.2)
Approximate Development Cost:	$1 billion
Status of Project Design:	25%

3.2 Regulatory Controls and Permits

3.2.1 History of Boston Redevelopment Authority and Massachusetts Environmental Policy Act Reviews

This section describes the current status of Project review under Article 80 of the City of Boston Zoning Code as well as MEPA.

3.2.1.1 City of Boston Article 80 Review

The Project is subject to Large Project Review pursuant to Article 80 of the Boston Zoning Code ("Article 80"). Consistent with Mayor Thomas M. Menino's Executive Order dated October 10, 2000 relative to the provision of mitigation by development projects in Boston, the Proponent has filed a Letter of Intent with the BRA prior the submission of a Project Notification Form for the Project and will seek a pre-review planning meeting with BRA as encouraged pursuant to Section 80B-5 of the Boston Zoning Code. To continue to facilitate review by the City of Boston, the Proponent has included in this DEIR/EPNF information required to be included in a typical Project Notification Form pursuant to Section 80B-5 of the Boston Zoning Code, as well as additional information responsive to comment letters that it received from City of Boston agencies on the EENF. To maximize coordination between the MEPA and Article 80 review processes the Proponent has filed a combined DEIR/EPNF.

3.2.1.2 Massachusetts Environmental Policy Act Review

The content of this DEIR/EPNF responds to the scope of analysis defined in the EEA Secretary's Certificate on the ENF issued April 5, 2013. A copy of the Certificate is included in Section 11.0, Response to Comments. While the Project does not involve financial assistance from the Commonwealth, MEPA jurisdiction extends to those aspects of the Project within the subject matter of required or potentially required state permits with the potential to cause Damage to the Environment as defined in the MEPA regulations (301

CMR 11.00), which in this case include: transportation, wastewater generation, air quality, land alteration/stormwater, wetlands, and GHG emissions. In addition, the subject matter of the Gaming License confers broad scope jurisdiction and extends to all aspects of the Project that may cause Damage to the Environment.

3.2.2 Anticipated Permits, Reviews, and Approvals

Table 3-1 contains a list of federal, state, and local agencies from which permits or other actions are or may be required.

Table 3-1 Anticipated Permits, Reviews, and Approvals Required for the Project

Agency	*Permit, Review or Approval*
Federal	
U.S. Environmental Protection Agency	National Pollutant Discharge Elimination System (NPDES) Construction General Permit (if required)
Federal Aviation Administration (FAA)	Notice of Proposed Construction/Determination; Federal Airspace review
State	
Executive Office of Energy and Environmental Affairs	Massachusetts Environmental Policy Act Review (incl. Public Benefit review for landlocked tidelands)
Massachusetts Department of Environmental Protection (MassDEP)	♦ Sewer Connection Permit ♦ Plan Approval or Environmental Results Program Certification (for stationary air pollutant sources) ♦ Demolition Permit ♦ Asbestos Removal Permit (if required) ♦ Superseding Order of Conditions (only upon appeal of local Order)
Massachusetts Office of Coastal Zone Management (CZM)	Federal Consistency Certification (if required)
Massachusetts Department of Transportation – Highway Division	♦ Vehicular Access Permit(s) (Category III) ♦ Non-Vehicular Access Permit ♦ Air Space Review
Massachusetts Water Resources Authority (MWRA)	♦ Sewer Use Discharge Permit (or waiver) ♦ Dewatering Permit (if required)
Massachusetts Gaming Commission	Category 1 Gaming License
Massachusetts Historical Commission	State Register Review
Massachusetts Department of Conservation and Recreation	Access Permit(s)
Municipal	
BOSTON	
City of Boston	Host Community Agreement Curb Cut Permit (if required)
Boston Civic Design Commission	Project Review
Boston Conservation Commission	Order of Conditions
Boston Fire Department	Fuel Storage Permit
Boston Redevelopment Authority and if required Boston Zoning Commission	♦ Applicable Zoning relief and Project Review to the extent required by the Boston Zoning Code. ♦ 121 A Agreement
Boston Public Works Department	Street Occupancy Permit

Table 3-1 Anticipated Permits, Reviews, and Approvals Required for the Project (Continued)

Agency	*Permit, Review or Approval*
Municipal	
Boston Transportation Department	Transportation Access Plan Agreement
Boston Public Improvement Commission	Approval of improvements to public streets
Boston Water and Sewer Commission	♦ Local Sewer Connection Permit and Site Plan Approval ♦ Drainage Discharge Permit, if required
Committee on Licenses	Flammable Storage License/Garage Permit
Inspectional Services Department	Building Permit
REVERE	
City of Revere	Host Community Agreement Approval of improvements to public streets
Building Department	Building Permit
Revere City Council	Applicable Zoning Relief and Project Review to the extent required by the Revere Zoning Ordinance
Revere Conservation Commission	♦ Flood Plain Approval ♦ Order of Conditions
Site Plan Review Committee	Site Plan Review
CHELSEA	
City of Chelsea	Approval of improvements to public streets
Chelsea Conservation Commission	Order of Conditions (off-site transportation infrastructure improvements)

3.3 State Gaming Process

3.3.1 Expanded Gaming Act

Chapter 194 of the Acts of 2011: An Act Establishing Expanded Gaming in the Commonwealth (the "Expanded Gaming Act") was signed into law by Governor Deval Patrick on November 22, 2011 with the goal of providing economic investment and job creation within the Commonwealth (and to continue to preserve racetracks in the Commonwealth, including the distribution of purse funds to those racetracks). The Expanded Gaming Act provides for the licensing of up to three destination resort casinos in diverse geographic locations within the Commonwealth as well as one slots facility and the creation of a Gaming Commission to oversee the implementation of expanded gaming within the Commonwealth. The Proponent plans to file an application with the Massachusetts Gaming Commission ("Commission") seeking a license to operate a Category 1 gaming establishment at Suffolk Downs pursuant to the provisions of M.G.L. chapter 23K (on August 10, 2012, the Proponent paid to the Massachusetts Gaming Commission a statutorily-established fee to commence that process and filed its RFA-1 suitability application with the Commission pursuant to the Commission's requirements set forth in more detail in Section 3.3.2 below). With the potential creation of approximately 2,500 construction jobs and more than 4,000 permanent jobs, as well as substantial proposed

investment in infrastructure and the local economy, the Project is in keeping with the economic development and job creation goals of the Expanded Gaming Act, as well as the goal of continued preservation of racetracks.

As referenced above, the Expanded Gaming Act provides for the licensing of three destination resort casinos and one slots-only facility and for the support, promotion, and encouragement of horse racing in the Commonwealth. The Expanded Gaming Act refers to a destination resort casino as a "Category 1" gaming establishment. A Category 1 Gaming License permits the licensee to operate table games, as well as slot machines, within the licensed gaming establishment. Additionally, the Expanded Gaming Act refers to the slots-only establishment as a "Category 2" gaming establishment and restricts the establishment to operating only slot machines.

Although the Expanded Gaming Act permits the Commission to license up to three (3) Category 1 gaming establishments, the Expanded Gaming Act restricts where those establishments can be located. The Expanded Gaming Act carved the Commonwealth into three separate and distinct regions: Region A, Region B, and Region C. The Commission is permitted to license up to one (1) Category 1 gaming establishment in each of the aforementioned regions. The Proponent is seeking to apply for and win the Category 1 Gaming License for "Region A." Region A consists of the following areas: Suffolk, Middlesex, Essex, Norfolk, and Worcester counties.

Under the Expanded Gaming Act, the single Category 2 gaming establishment is to be located in any of the aforementioned three regions of the Commonwealth.

The Massachusetts Legislature provided a number of protections to the communities of the Commonwealth when drafting the Expanded Gaming Act. The Act defines a community where a gaming establishment is located as a "host community." For purposes of the Expanded Gaming Act, the Proponent has two host communities: the City of Boston and the City of Revere.

An applicant for a gaming license must negotiate an HCA with its host community (or communities) prior to submitting an application to the Commission. (Note: the gaming license application process is discussed in detail in Section 3.3.2.) The HCA will set forth conditions for locating the gaming establishment within the community, as well as other requirements, such as a community impact fee. Additionally, applicants for a gaming license are required to hold and win a referendum in the host community (or communities) on the proposed location of the gaming establishment prior to submitting an application to the Commission. Applicants for a gaming license are also required to negotiate agreements with communities in proximity to the host community that are likely to experience impacts from the operation or development of the gaming establishment; these are referred to in the Expanded Gaming Act as "surrounding communities." Surrounding communities are not required to vote on the casino proposal, but surrounding community agreements ensure that the mitigation concerns of these communities are met.

3.3.2 Project Application Process

The Expanded Gaming Act contemplated that an applicant for a gaming license would submit a single application to the Commission, along with a non-refundable $400,000 application fee, for review. To expedite the arrival of the anticipated benefits of expanded gaming, the Commission altered the application process by creating a phased application process that enabled applicants to pay the application fee prior to submitting their gaming application and also bifurcated the application process into two separate application phases, referred to as RFA-1 and RFA-2. The Proponent took advantage of this early payment process and submitted its application fee to the Commission on August 10, 2012.

The RFA-1 phase of gaming applications refers to the background investigations conducted by the Investigations and Enforcement Bureau (IEB) of the Massachusetts Gaming Commission. The RFA-1 application review process began on January 15, 2013, which was the deadline for applicants to submit their background investigation forms. The Proponent submitted its RFA-1 application on January 15, 2013. In the normal course of review, the IEB has requested additional information from multiple applicants, including the Proponent. The Proponent has responded to all such requests from the IEB for additional information. The IEB is currently conducting the background investigations to determine if the Proponent is "suitable" for licensure in Massachusetts. The background investigations, or suitability reviews, consist of in-depth analysis of the applicants' personal as well as business records. The purpose of the background investigation is to ensure that those licensed to operate a gaming establishment in Massachusetts are individuals or entities that display the requisite level of integrity, honesty, and character.

The IEB anticipates that it will deliver its suitability recommendations for Category 1 applicants to the Commission in September 2013. In turn, the Commission will review the IEB's recommendations and vote to determine if the Proponent is suitable for licensure in the Commonwealth.

The RFA-2 phase of gaming applications refers to the site-specific gaming establishment proposal prepared by a gaming license applicant. A gaming license applicant may not advance to the RFA-2 phase of gaming applications unless they have been issued a positive determination of suitability by the Massachusetts Gaming Commission during the RFA-1 application process. Included among the main pre-conditions to filing an RFA-2 application is the requirement that the applicant must have filed its ENF and received a Certificate on the ENF from the Secretary of EEA. The Proponent filed its ENF for the Project on January 31, 2013 and received its Certificate on April 5, 2013. The Commission has established December 31, 2013 as the deadline for an applicant's RFA-2 application.

3.3.3 Host and Surrounding Community Agreements

Consistent with the Expanded Gaming Act requirements, the Proponent has negotiated HCAs with each of its host communities: Boston and Revere. Copies of these HCAs are provided in Attachment B. In addition, the Proponent continues to engage in negotiations with the surrounding communities of Chelsea and Winthrop, as well as other nearby communities.

3.4 Consistency with Planning

3.4.1 EO384, Sustainable Development Principles

The Project is consistent with and promotes Governor Patrick's Sustainable design principals as described below.

3.4.1.1 Concentrate Development and Mix Uses

Caesars Resort at Suffolk Downs consists of a redevelopment of existing site, structures, and infrastructure along with new construction. The site plan will create pedestrian-friendly connections to surrounding districts and neighborhoods. Both the restored and newly created recreational open space will provide a variety of activities for public use.

3.4.1.2 Advance Equity

The Proponent has worked with the communities and surrounding cities to ensure inclusive community planning and decision making that take into account the interests of future generations. Furthermore, pursuant to Chapter 23K, a portion of the taxes on the Resort's gross gaming revenue will be allocated to a community mitigation fund from which the Massachusetts Gaming Commission will allocate funds to the cities of Boston and Revere and others to address potential Project impacts.

3.4.1.3 Protect Land and Ecosystems

A regenerative approach to site design will restore and protect environmentally sensitive natural ecosystems and provide an additional 16 acres of open spaces and recreational opportunities.

3.4.1.4 Use Natural Resources Wisely

The cornerstone principle of the new development is based on conservation of natural resources by reducing waste and pollution through efficient use of land, energy, water, and materials.

3.4.1.5 Provide Transportation Choice

The Project has been designed to take advantage of its superior location and proximity to multiple transportation options, including Logan International Airport. The multi-mode transportation systems planned for the Resort include two Blue Line transit stops, taxi service, on-site shuttle bus, off-site ground transportation system, a potential on-site MBTA bus stop, and pedestrian and bike paths. The Proponent will also encourage shared-vehicle and shared-ride services for all employees. The City of Boston is planning to expand the Hubway bike-share program to include East Boston, and the Proponent has committed to install two Hubway stations (one near the Suffolk Downs MBTA Station and another near the entrance to Casino Area II) when the program is expanded.

3.4.1.6 Increase Promote Clean Energy

The Project will produce approximately 2.7 MW of "carbon free" on-site renewable energy through the use of PV arrays. The goal of this design is to maximize the amount of solar resource deployed without placing an undue annual financial burden on the Proponent with regards to cost of power from the solar PV system.

3.4.1.7 Increase Job and Business Opportunities

The Resort will bring significant new investment to the cities of Boston and Revere, increased governmental revenue, and new permanent employment opportunities as well as construction opportunities for residents of the host cities and other local communities. In addition to new jobs, public funding, and direct investment at Suffolk Downs, the Resort will promote small business and the tourism industry and will have positive economic effects on surrounding cities and the Commonwealth of Massachusetts.

3.4.1.8 Plan Regionally

Caesars Resort at Suffolk Downs is being planned to consider regional impacts and benefits.

3.4.2 East Boston Master Plan (April 2000)

The Project is consistent with the policy and planning objectives set forth by the City of Boston in the East Boston Master Plan (April 2000). Specifically, the Resort will promote the goals of supporting economic development in East Boston and increasing the quality and variety of employment opportunities for residents in and around the community. The Project will improve existing infrastructure, including transportation networks, and enhance access to and from the MBTA Blue Line Suffolk Downs Station. Bicycle and pedestrian access to the site will be accompanied by improved access to the Belle Isle Marsh as well as other local amenities. Due to careful site design, the Project will create additional pervious area in a location dominated by existing surface parking lots, and stormwater management will promote better water quality. Furthermore, the Project will preserve existing open spaces and create new open spaces for the public to enjoy.

3.4.3 City of Revere FY2010-2015 Strategic Plan

The Project is also consistent with the planning objectives set forth by the City of Revere in the City of Revere Strategic Plan, FY2010-2015. Specifically the Project will increase economic development and employment opportunities, one of the major objectives of the Strategic Plan. The Project will also provide funding to the City which will be available to fund infrastructure improvements, another objective in the Plan.

The Project will increase access to open space on site and will provide bicycle accommodations to enhance access to open spaces and beaches. On-street bicycle accommodations will connect Constitution Beach and Belle Isle Marsh with Revere Beach along the Bennington Street corridor, and will also establish connections to and through the Project site from the MBTA Suffolk Downs Station and from Winthrop Avenue. This network will establish access to a walkway in the Belle Isle Marsh that is being constructed as part of a separate project associated with a U.S. Environmental Protection Agency (EPA) consent decree and in accordance with a plan developed by the Friends of Belle Isle Marsh.

3.4.4 Boston Regional Metropolitan Planning Organization Journey to 2030

Journey to 2030 is the Metropolitan Planning Organization's current Transportation Plan. Project consistency with the plan is established by proposing growth near transit services, improving the streetscape, and supporting pedestrians and bicycle use, which will reduce single-occupant vehicle trips in the area. The Project will improve the pedestrian environment by providing new lighting, landscaping, and walkways, will improve access to and from Suffolk Downs Station, and will provide upgraded pedestrian and shuttle connections to the Resort. In addition, the Project includes on-street bicycle accommodations to connect Constitution Beach and Belle Isle Marsh with Revere Beach along the Bennington Street corridor, along with connections to and through the Project site from the Suffolk Downs Station and from Winthrop Avenue. This network will establish access to a walkway in the Belle Isle Marsh that is being constructed as part of a separate project associated with an EPA consent decree and in accordance with a plan developed by the Friends of Belle Isle Marsh.

Based on an analysis of the existing wastewater infrastructure and the estimated proposed sewer generation, the existing BWSC 12-inch gravity sewer line demonstrates adequate capacity to accept and convey the increase in flow from the proposed Resort. Furthermore, water capacity problems are not anticipated within the existing system as a result of Project construction.

3.5 Zoning

3.5.1 Revere

Within Revere, the Project site is located in an area designated in the City's Zoning Ordinances as PDD (Planned Development District) 1. Currently, the Project includes only racing and ancillary maintenance and parking uses within the City of Revere, which are permitted by right in the PDD1. Gaming facilities are permitted within the PDD1 by special permit. The Proponent will apply for the necessary special permit at the appropriate time.

3.5.2 Boston

Within Boston, the Project site is located in the Suffolk Downs EDA and the Suffolk Downs Special Study Overlay Area, both of which are contained within the East Boston Neighborhood Zoning District, which is governed by Article 53 of the Boston Zoning Code. The Proponent intends to comply with the relevant provisions of the Boston Zoning Code, including obtaining any applicable zoning approvals or zoning relief and undergoing project review to the extent required by the Boston Zoning Code for development of the Project. Dimensional requirements currently applicable to the Project site are set forth in Table L of Article 53, and preliminary zoning information for the Project is included in Table 3-2.

Table 3-2 Preliminary Zoning Information for the Project

	Preliminary Zoning Calculations for the Project
FAR	0.385
Building Height (ft.)	170
Lot Size (sq. ft.)	4,739,040
Lot Width (ft.)	approx. 3,250
Lot Frontage (ft.)	approx. 680
Front Yard (ft.)	approx. 30
Side Yard (ft.)	approx. 165
Rear Yard (ft.)	approx. 20

The Proponent anticipates that the Project will comply with all use and dimensional requirements applicable to the Project site with the exception of use and maximum height. Gaming uses are not currently permitted under the Boston Zoning Code. An amendment to the Boston Zoning Code for these purposes is contemplated.

Required off-street parking spaces and loading facilities for the Project will be determined through the Large Project Review process consistent with the requirements of Section 53-56 of the Boston Zoning Code.

As noted above, the Proponent will fully comply with the project review requirements of the BRA and will undergo Large Project Review in accordance with these requirements, including any design review of proposed buildings required pursuant to the BRA's development review guidelines. The Proponent will pay to the BRA any Development Impact Project Fees required under Article 80. At the completion of any required development review, the Proponent and the BRA will enter into a Cooperation Agreement pursuant to Article 80 in which the Proponent will commit to undertake such mitigation measures and such additional undertakings as are typically included in Cooperation Agreements for similar projects. The Proponent understands that any mitigation and other commitments that may be made by the Proponent in the HCA may also be incorporated by reference in the Cooperation Agreement for the Project.

3.6 Legal Information

3.6.1 Legal Judgments Adverse to the Proposed Project

The Proponent is not aware of any legal judgments that are adverse to the proposed Project.

3.6.2 History of Tax Arrears on Property Owned in Boston by Proponent

The Proponent has controlled the parcel for approximately 21 years, and there have been no tax arrears during this period.

3.6.3 Site Control and Public Easements

The Proponent owns fee title to the Project site. As discussed in further detail in Section 5.0, the Project includes certain off-site traffic improvements along Route 1A in East Boston, and the Proponent also plans to either design and construct or finance other off-site improvements along Revere Beach Parkway and elsewhere. The Proponent has already begun discussions with certain property owners who own property in the proposed Right of Way (ROW) of the Route 1A improvements and will continue to work with these property owners to obtain all rights required for the construction and ongoing maintenance of these improvements.

Once constructed, ownership of the improvements and the necessary rights in land on which the improvements have been made will be transferred to the owner of the roadway facility.

3.7 Coordination with Massachusetts Port Authority, MassDOT and the Federal Aviation Administration on Aviation Issues

The Project team has consulted with Massport senior aviation staff to review Project concepts in relation to airfield and airspace operations and identify potential impacts to aviators and the traveling public and has also discussed the Project with the Aeronautics Division of MassDOT. The design team, in close coordination with Massport engineers, is

presently working on an extensive solar glare study to avoid, minimize, and mitigate potential impacts resulting from the Project, including the proposed PV array. Massport has reviewed preliminary massing studies, and the Project has been designed with a goal to avoid creating any new hazard to air navigation by carefully selecting building height and location. The design and permitting teams will continue to coordinate with the FAA. Following FAA's guidance, the Project team anticipates filing Notices of Proposed Construction or Alteration (FAA Form 7460-1) for each building, crane, and PV array, as dictated by FAA regulations and ongoing guidance by FAA and Massport.

Section 4.0

Urban Design

4.0 URBAN DESIGN

This section describes the character of East Boston and Revere in terms of their history, land use, and important urban design goals as well as the Project's design response.

4.1 Existing Urban Context

The story of East Boston and Revere has a common beginning. Both communities were annexed to Boston in colonial times, were shaped over time by connecting harbor islands with landfill, and have a strong connection with the waterfront. However, that is where the similarities end, as over a span of two hundred years the cities have transformed along different paths.

4.1.1 East Boston

Urban life in East Boston began in 1833 when William Sumner and his business partners formed the East Boston Company. Soon after, the East Boston Company conceived an urban development plan for what was then known as Noodle Island. This established an urban street grid, squares for open space, piers, and a public garden. The street grid divided Noodle Island into three sections, known today as Jeffries Point, Central-Maverick Square, and Eagle Hill. The hilly terrain of Orient Heights prevented the strict grid-like plan from extending northeast (see Figure 4-1).

The East Boston Company shaped the development of East Boston for nearly one hundred years. Through the 19th century and into the 20th century, most of the East Boston waterfront was an active port, industrial center, and hub of clippership building. A ferry service also linked East Boston residents to an expanding metropolis across the harbor. The neighborhoods, which were originally planned as single family residences, changed over time as waves of immigrant workers increased the demand for multi-family housing.

During the early 20th century, advancements in transportation and the progression of Boston as an intellectual, political, and cultural center of the northeast shaped the modern urban history of East Boston. In 1905, the first under-sea subway tunnel opened connecting East Boston to the rest of the city. A small airfield was developed in 1923, eventually leading to commercial flights between Boston and New York and establishing East Boston as a gateway to the city. The Sumner Tunnel, another major transportation project, was constructed in 1934 allowing residents to travel freely to Boston via automobile. With the increase in transportation options and construction of Suffolk Downs in 1935, East Boston became a significant hub in Boston's rich sporting, cultural, and social fabric.

For decades, East Boston has maintained a unique identity. The character of the community echoes back to its urban roots and is largely described by its historic neighborhoods, with dense urban housing for a diverse population. Other principal land use functions that exist today include commercial corridors, maritime industrial, and, of course, thoroughbred

racing (see Figures 4-2 and 4-3). East Boston is also the home of Logan International Airport, which makes it a gateway to visitors from around the world. Over the past decade the residential character has been enhanced with the additions of new neighborhood commercial centers, the creation of new public open space, and renewed activity on and around the waterfront.

Several planning studies have been conducted over the past seven to ten years which focus on future development in East Boston. These studies provide an outline of the planning goals that are important to the neighborhoods, which include:

- reconnecting the neighborhoods to the waterfront;
- preserving and maintaining the historic character of the Eagle Hill, Maverick Square, Jefferies Point, and Orient Heights neighborhoods; and
- promoting connections to the East Boston Greenway and Bell Isle Marsh Reservation.

4.1.2 Revere

Revere was originally part of the Rumney Marsh settlement that was annexed to Boston during colonial times. The settlement was subdivided into Chelsea, North Chelsea, and Winthrop, and in 1871 North Chelsea was renamed Revere. During the late 19th century Revere came into prominence as a resort destination for the greater Boston area, with the main attraction being Revere Beach, America's first public beach. The popularity of the long crescent-shaped beach established Revere as the resort and entertainment destination of the northeast. Soon after Revere Beach opened, Wonderland Park – a new theme park – opened just a few hundred feet from the beach. While the park was only in existence for five years, its mark on the city is still evident today and the name carries on.

The Boston, Revere Beach, and Lynn Railroad played a major role in the rapid growth and development of Revere Beach as a summer resort. Streetcars placed visitors only a few hundred feet from the beach, which provided easy access to area attractions. For nearly seven decades, Revere Beach Boulevard was lined with the activity of hotels, dance pavilions, carousels, fine dining, movie theaters, roller coasters, fun houses, and all sorts of special entertainment activities.

Today, Revere is a diverse, densely-populated neighborhood with over 70% of its land devoted to residential uses. The city also has small pockets of industry and several neighborhood commercial corridors (see Figures 4-2 and 4-3). Residents of Revere enjoy access to tremendous natural and recreational assets, and a revitalized Revere Beach again attracts visitors to the City.

Several planning studies and economic initiatives have been developed over the past five years which are common in purpose and vision: to reestablish Revere Beach Boulevard as a gateway to beach. Currently, Revere is in the early phases of a four-phase redevelopment of Revere Beach Boulevard. The project, Waterfront Square, promises 1.3 million square feet of new construction with a mix of uses including luxury hotel, housing, office, retail, restaurants, and entertainment venues. The Waterfront Square development embodies the following urban design principles which are key to the city:

- improve pedestrian access to the waterfront, particularly from the MBTA stations;
- encourage mixed-use developments;
- provide active ground floor uses to enliven the pedestrian realm; and
- create a mixed-use pedestrian boardwalk/promenade along significant sections of the beachfront.

4.2 Defining the Urban Resort Casino

The common perception of resort casinos is based on the themed mega-resort complexes of Las Vegas, with their immense, sprawling, windowless podiums and soaring hotel towers containing thousands of guestrooms. Mega-resort casinos are typically inward-oriented, cities unto themselves, and not linked to their metropolitan hosts since guests are encouraged to check-in and never leave the footprint of the resort.

The ambition for Caesars Resort at Suffolk Downs is nothing short of redefining the paradigm of resort casino developments. By design, Caesars Resort at Suffolk Downs is an outward-oriented urban resort casino, meaning that the development will be integrated, not physically but in a business sense, with the pre-existing business community, restaurants, shops, hotels, and attractions in the Boston and Revere metropolitan areas. This distinction is important, as the urban resort casino philosophy intentionally limits the scope and intensity of development and tailors the Project's program to its urban context. Low-intensity development, a commitment to sustainability, and a forward-thinking regenerative approach to site development will set Caesars Resort at Suffolk Downs apart as a world class urban resort casino. Furthermore, Caesars Resort at Suffolk Downs will be a leading example of responsible site development in environmentally sensitive areas.

4.3 Building Design

The proposal is a redevelopment of the 161-acre Project site with a series of buildings for a diversity of uses and organized by a street grid. The Project program is described in Section 1.1.1.

4.3.1 Urban Design Principles

The design of the Project embodies several key urban design goals specific to East Boston, Revere, and the Project site, which include:

- limiting development intensity through an outward-oriented approach that markets the cities of Boston and Revere and their attractions;
- establishing a hierarchy of street, open space, and building;
- fostering a regenerative approach to the site and landscape design that embraces the ecological history of the site;
- using a regenerative approach to site development to restore a marsh-like ecological landscape that will serve as green infrastructure;
- embracing the history of the neighborhoods while creating a new identity for the district's revitalization;
- increasing connectivity of the district with improved pedestrian, bicycle, and vehicular access into, through, and around the site; and
- creating a diversity of new urban open spaces.

4.3.2 Massing, Form and Response to Urban Context

The master plan, shown in Figure 1-6, establishes the primary spatial hierarchy of street, open space, and building. Tomasello Drive, the main circulation spine for vehicles, pedestrians, and bicycles, winds through the site connecting the entrances from both Route 1A and Winthrop Avenue. A street pattern grid organizes the site into blocks, arrival courts, and plazas, creating an urban streetscape. The blocks establish a series of buildings beginning with Hotel I, Casino Area II, Hotel II, a winter garden connecting Casino Areas I and II (in the renovated grandstand and clubhouse), and a parking structure.

The infusion of an urban street grid is just one of several key factors that contribute to the Project's form and massing. Limiting development intensity through an outward-oriented approach and repurposing the historic grandstand building as a casino are also central to the overall massing and organization of the Project program.

4.3.2.1 Hotel I and Hotel II

In keeping with the philosophy of an outward-oriented development, the hotel program for Project is set at a modest 450 guestrooms, which is 70% less than typical resort casino developments. In response to the scale of the historic neighborhood context, the critical surface elevations of nearby Logan Airport, and to provide diversity, Hotel I will contain 300 guestrooms and Hotel II will contain 150 guestrooms.

When considering the massing of Hotel I, the initial concept was to reduce the scale and articulate the form with a language appropriate for its urban context, while maintaining a relationship to its legacy property of Caesars' original property in Las Vegas. The nine-story Hotel I will be approximately 130 feet tall and will face east/west, offering the narrowest profile to the Orient Heights neighborhood while providing the opportunity for the form to be self-shading from early morning to late evening. The scale of the massing will be further articulated with a modern tripartite organization of base, body, and top.

The 12-story Hotel II, approximately 170 feet tall, will be the taller of the two hotels and is sited away from the Orient Heights neighborhood. Hotel II is envisioned as a focal point along the southern edge of the North Plaza. Hotel II may be developed by the Proponent or a third-party hotel developer in the future. Thus, the design of Hotel II depicted within this submission is only one representation of the future project. Diversity in architectural design is an important consideration in the overall composition of the Project; therefore, the intent of this document is to generally describe the massing of the building in terms of building height and density.

4.3.2.2 Casino Area I and Casino Area II

The approximately 220,000 square feet of gaming/casino area will be split equally among two casino floors: Casino Area I and Casino Area II. Splitting the gaming/casino program into two separate casino floors has some important benefits to the Project design. The arrangement of the two casino buildings promotes the creation of open spaces and plazas between the buildings, and the reduction in casino floor depth and additional building perimeter pull active uses to the exterior. The outward expression of restaurants and active uses will contribute to vibrant pedestrian plazas and streetscapes.

Casino Area I will be on the ground floor of the renovated grandstand and clubhouse buildings, which were originally built in 1935. The west elevation of the existing grandstand structure consists of a 630-foot-long, two-story massing which steps back to the upper grandstand. Originally an open-air grandstand, in 1962 the grandstand was renovated and enclosed with windows. In 1979, the grandstand's west façade was covered over with a blank stucco wall. The design for the renovated façade recalls the previous design by incorporating a significant amount of new windows along with elements such as

an entry porte cochere, restaurant facade, and the winter garden to break up the massing. A two-story CUP addition is planned just north of Casino Area I. The massing of the CUP will be lower than and set back from the massing of the grandstand.

Casino Area II will be a two-story podium linking the bases of the two hotels. The second story of the massing will step back along the eastern edge to a scale more complementary to the existing grandstand and clubhouse buildings, and will be shielded from the Orient Heights neighborhood by the crescent form of Hotel I.

4.3.2.3 Parking Structure

The parking garage will be a seven-level standalone structure, approximately 60 feet tall, with one level of below-grade parking and six levels of above-grade parking. The open-air parking structure will be located away from the Orient Heights neighborhood and will provide approximately 2,550 self-park spaces.

4.3.3 Façade Design Fenestration and Building Materials

4.3.3.1 Hotel I

As described above and illustrated in Figure 1-8, the façade of Hotel I will be articulated as base, body, and top. The façade design features a contemporary expression of 21st century hotel design that is intended to enrich and complement the character of the surrounding neighborhoods while reinforcing the Caesars brand. The base of the hotel will be lined with active uses including restaurants and lobbies, providing abundant transparency to make the building engaging to pedestrians. Base materials will consist of course limestone walls and piers, metal and glass storefront openings, and a metal and glass porte cochere structure. The glass storefront openings will include operable doors to allow restaurants to spill out onto sidewalks and adjacent patio spaces, thus creating a vibrantly scaled and lively public realm adjacent to the main entry lobbies.

The second floor will be recessed, allowing the perimeter structure, clad in metal, to be revealed. Floor-to-ceiling glazing and generous balconies to the north and south will provide further separation of the base from the body of the hotel.

A high-performance glass curtainwall will form the main body of the hotel, and will be scaled using a two-story framework of horizontal and vertical mullions. Within the framework, the curtainwall will emphasize a vertical proportion. Operable windows will be incorporated, adding a subtle pattern and a finer grain.

A cantilevered roof form will float above the top floor of the building, and again the floor-to-ceiling glazing will be pulled back to allow the structure to articulate itself and to provide balconies at both ends of the crescent.

4.3.3.2 Casino Area I and Casino Area II

The existing clubhouse and grandstand buildings, constructed in 1935, will undergo complete renovations and will house Casino Area I on the first floors. The west facade of the existing grandstand building will be completely reconstructed in a design sympathetic to the 1930s deco-style facades that have been retained at the clubhouse and southern portion of grandstand. The new design for the facade, as seen in Figures 1-10, 1-20, and 1-21, will be organized along the grandstand's 25-foot-wide column bay that is marked by a constant rhythm of pilasters that provide a vertical counterpoint to the grandstand's horizontality. Expressed mullion covers will subdivide each 25-foot bay into two smaller window bays. Tower elements will be used to further modulate the façade, creating a secondary rhythm of vertical elements to further break down its 630-foot length. Two larger towers will flank a three-bay section of the façade that will step up to announce the main entrance to Casino Area I. Consistent with the retained historic portions of the building, the wall, tower, and pilasters surfaces will be finished in stucco. A finer layer of detail will be introduced with a series of band courses and inset relief panel treatments to articulate the façade's primary architectural elements and to further break down and give a human scale to the façade's considerable length.

Along its length, the west façade of Casino Area I will feature three interventions. A porte cochere at the main entry is designed to clearly read as a latter day addition to the building and speak to its new use. Its exposed-steel aesthetic is based on expressing the structural elements from which it is composed. Mid-way down the façade, a one-story retail bay (marking the location of a third-party restaurant) will assert its own unique stylistic expression. Further south, the winter garden is designed as a glassy pavilion linking Casino Area I and Casino Area II. Collectively, these three additions will describe the historical layering of the 78-year-old grandstand.

The façade of Casino Area II will be articulated by using separate forms and materials with large glazed openings to provide a scaled and responsive set of individual buildings tied together by horizontal datum bands. This approach will provide flexibility to respond to context, site, orientation, and function in a meaningful way. The buildings that encompass Casino Area II will be defined by pulling forward and articulating the exterior walls of individual elements such as restaurants, bars, and club rooms. A granite base will form a horizontal datum linking the Hotel I base to the podium.

Along the north façade, a strong articulated form of buff-colored fiber cement rain-screen will emerge with a large glazed double-height entry point framing views into and out of the heart of the casino floor. A glass and steel bridge will span from the parking garage to where it will be received by the second floor of the entry lobby leading to the casino floor (see Figure 1-26).

A recessed metal band set 12 feet above the floor will provide a mid-base datum, organizing doors and windows along the façade. Further along the façade, the podium form will be recessed at the North Plaza, awaiting insertion of Hotel II. This façade will change color, articulation, and scale. A large two-story glazed opening will provide fenestration and will be the future connection to the Hotel II lobby.

A glazed winter garden will link Casino Area I and II across a north/south street running parallel to the grandstand. The structure will be built in the grand tradition of the great glasshouses and glazed courtyards. Housed inside will be a tourism welcoming center functioning as a gateway to all that Boston has to offer. Natural light will filter through clear and translucent glazing to create a serene transition from Casino Areas I and II as well as from the north to the plaza.

Adjacent to the winter garden, a second buff-colored fiber cement building will form the east façade of Casino Area II. This building, as seen in Figure 1-28, will be informed by the scale and proportion of the clubhouse façade opposite and will have modulated glassed openings 18 feet high, forming a second horizontal datum around these buildings. With clerestory glass, canopies, and a series of doors leading to outdoor terraces, an engaging streetscape of dining and social activities in the South Plaza will be formed by the west clubhouse façade and eastern casino building.

A recessed secondary building will form a connective tissue. Clad in a lighter-colored and finer-grained architectural metal wall panel, it will turn the corner and meet the casino's southern building. The major architectural elements of framed openings organized around a structural bay of 30 feet will be further scaled by vertical mullions running up to the recessed metal datum band. Clerestory glazing above will provide daylight deep into a series of VIP and specialized gaming rooms. Canopies will shelter activities spilling out onto landscaped terraces. Awnings will create a finer pedestrian scale, encouraging pedestrian engagement and activity.

These buildings will collectively promote active and animated facades and will form an urban and diverse series of streetscapes punctuated with engaging views into and out the casino floor, surrounding lounges, restaurants and other areas. Together this unified composition of streets and plazas populated by individually articulated buildings will work together to form an urban and pedestrian-friendly resort.

4.3.3.3 Parking Structure

The exterior design of the precast concrete parking structure is comprised of an offset array of gunmetal-colored panels mounted within a white metal grid which will group floors vertically and will reveal the precast structure and horizontal steel cable barriers beyond. The density of the vertical panels is intentionally designed to provide a sense of enclosure,

making the garage more building-like to enrich and complement the character of its urban setting, which will front the North Plaza. The base of the east elevation has been designed to accommodate future retail to help enliven the plaza.

The top of the garage will be outfitted with a PV canopy that will be part of the approximately 2.7-MW solar array system deployed on-site. The PV canopy will be supported by a thin steel structure integrated into the building design (see Figure 1-31).

4.4 Site Design and Open Space

The Project's landscape design embraces the site history, its unique location between the waterfronts of East Boston, Revere, and Chelsea, and its transformation over the last 100 years into an active racetrack and clubhouse. In fostering a regenerative approach to the site and landscape design, the Resort connects nature, people, and place. The Project's site design will accomplish the following goals:

- **Understand the land and history, and embrace the unique location:** The Project embraces the site's unique location, nestled between the waterfronts of East Boston and Revere. By improving ecological conditions and maintaining the racing program, the Project acknowledges the site history of transformation from marshes, creeks, and islands into the racetrack over the last 100 years. Figure 4-4 provides historic maps for context.

- **Restore landscape ecology:** The proposed landscape design will remove acres of deteriorating asphalt on the Project site and restore a marsh-like ecological landscape that will serve as green infrastructure, creating diverse public spaces and providing an educational amenity to the neighborhood and visitors. The proposed design will reduce existing impervious pavement by approximately 14 acres and will add approximately 16 acres of open space relative to existing conditions (see Figures 4-5 and 4-6, Existing Impervious Area and Site Plan).

- **Provide diverse types of open spaces:** The Project design promotes diverse open spaces that range from active pedestrian spaces and vibrant streetscapes to passive ecological areas with walking trails and viewing areas for the public. Specific open spaces are described in further detail in Section 4.4.

- **Connect neighborhoods and ecosystems:** A network of public pedestrian walkways and bikeways will connect surrounding neighborhoods to the Project site. The proximity of the East Boston Greenway and trails of the Belle Isle Marsh offer the opportunity to connect the Project site to the greater East Boston network of public open spaces. Figures 4-7 and 4-8, Boston Greenway Context and Local Greenway Context illustrate the greater context of the Project site.

- **Develop innovative green infrastructure and pursue sustainable systems:** The Project design utilizes the landscape to purify and infiltrate stormwater, rehabilitate poor soils, and create a special and distinct environment. It also provides opportunities for environmental education with interpretive signage along pathways to describe the ecological restoration on-site. Off-site infrastructure will be designed with the latest sustainable technologies in mind. Local schools may use the site to explore marsh ecology and ecological restoration (see Figure 4-9, Entry Road Landscape).

- **Be innovative and sustainable:** The Project landscape will not only embrace the beauty of native plants, but will also have low maintenance and irrigation needs.

- **Make parking attractive and functional:** The parking lot design will improve the visitor experience with shaded walkways and connections to the buildings. Bio-swales are proposed to treat stormwater run-off. Portions of the surface parking will be covered by the proposed PV array.

- **Be responsive to sea level rise:** The Project design responds to the real concern of future sea level rise by elevating buildings, roadways, and access points to create a safe haven for the community (see Section 2.3 for a detailed discussion of climate change and adaptation). Figures 2-2 and 2-3 show Existing Topography and Proposed Topography.

- **Community Connectivity:** Pedestrian connections on the site also offer the opportunity for future connection to the East Boston Greenway, amplifying the amount of public open space available to the community.

The Project design includes a number of public open spaces to activate the site and to offer unique programming opportunities and outdoor leisure. Proposed open spaces are shown on Figure 1-38.

4.4.1 Entry Landscape

The Entry Landscape as envisioned will encompass an approximately 27-acre area along Tomasello Drive that will set the tone for the Resort for visitors entering from Route 1A (see Figure 4-10, Entry Drive Detail Plan). The open space will be comprised of pathways meandering through native marsh-like vegetation that will filter stormwater before it leaves the site. Pathways will peel away from the road to provide a more enjoyable pedestrian experience. Low-energy lighting with reflectors to minimize light pollution as well as site furnishings along the path will enhance the pedestrian experience. Views of the Entry Landscape from the road are designed to create a memorable visitor experience that changes through the seasons and through the years.

4.4.2 Entry Court

The Entry Court will be a 1.9-acre plaza at the main entry to Casino Area II that will include a drop-off area at the Port Cochere for valet, taxis, shuttles, and bicycles (see Figure 4-11). Plaza materials will be a mixture of high-quality hardscape and permeable pavers to create an elegant surface while allowing stormwater infiltration. A water feature will create a memorable arrival experience and focal point for the Resort, but use of potable water will be minimized. Seating areas will be provided within the plaza.

4.4.3 South Plaza

The South Plaza will be a 0.9-acre space at the entry to Casino Areas I and II from the South Parking Lot (see Figure 4-12). It will include areas paved with pervious pavers that will create an attractive surface at the building entry. Native plantings will also provide visual interest and shade to cool the environment. Outdoor café seating will extend from the Resort's restaurants onto the plaza, creating a space that will be active and vibrant day and night.

4.4.4 North Plaza

The North Plaza will be a 2.2-acre area flanked by Casino Area I, Casino Area II, and the proposed parking garage (see Figures 4-13 and 1-10). This plaza will include paved areas open to limited vehicular access serving the Casino Area I Port Cochere; these paved areas will be created with a combination of elegantly designed hardscape and permeable pavers. Large green areas at the center of the plaza will create a cool oasis for informal gatherings and planned events, and lines of trees at the plaza's edges will provide shade for pedestrians. The space will be programmed for outdoor events, festivals, and live entertainment. Portions of the plaza may be closed off to vehicles for dedicated pedestrian use during outdoor events.

4.4.5 Apron and Track Viewing Landscape

The apron and track viewing landscape will be an approximately 3-acre landscape stepping down from Casino Area I and the grandstand to the edge of the racetrack (see Figure 4-14). A hardscape terrace will extend approximately 20 feet from the building for expansive views. From there, a softer landscape will be introduced, with green seating terraces to the south, a paddock at the center for parading horses, and a relatively flat green landscape to the north for large tents and a viewing area. A continuous pedestrian path will allow controlled access along the racetrack and paddock. Plantings at the edges of the apron will provide shade for informal seating areas and the playground.

4.4.6 Racetrack Infield

The racetrack infield is an approximately 33-acre green space surrounded by the racetrack. The Project will maintain the horse racing program at Suffolk Downs, and there will be no specific change in use of the racetrack infield. Similar to past use by Suffolk Downs, the Proponent anticipates using the infield for special events and public gatherings such as concerts, festivals, and other community events.

4.4.7 Walkways and Pedestrian Connections

A network of public pedestrian walkways and bikeways will connect the Resort with surrounding neighborhoods, and the proposed entry paths will create a unique arrival sequence and visitor experience by embracing the marsh-like setting and establishing a Project site landscape that is outwardly-focused. Sidewalks will encompass approximately 2.75 acres of the Project site, and pedestrian circulation is shown on Figure 1-35. All pedestrian areas and pathways are designed to support universal access, and are sized to appropriately accommodate the anticipated volume of users. Site furnishings (e.g., benches) along pathways will support pedestrian comfort, and pedestrian areas will be well-lit with high-quality lighting fixtures chosen to ensure safety, be energy-efficient, and minimize light pollution. All streetscapes on the site are being designed in compliance with Boston Complete Streets standards. Sidewalks and bikeways along roadways are designed in smooth materials to comply with ADA regulations.

Attractive, shaded multi-use pathways for bikes and pedestrians will move along Tomasello Drive and Blue Line Road, providing connectivity to the Project site from neighborhoods and the Suffolk Downs MBTA Station. At the southern edge of the site, a pedestrian path will provide access from the Orient Heights neighborhood to the Resort and Tomasello Drive.

The site's proximity to the East Boston Greenway and trails of Belle Isle Marsh offers the opportunity to connect into the greater East Boston network of public open spaces. In conjunction with deployment of the East Boston Hubway network, the Proponent will install two Hubway stations along the pathway near the Suffolk Downs MBTA Station and near the entrance to Casino Area II to promote bike access to the site and its surroundings. Bicycle circulation is shown on Figure 1-36 and Pedestrian Circulation is shown on Figure 1-35.

4.4.8 Winthrop Avenue Improvements

An enhanced landscape along Winthrop Avenue in Revere will improve the connection to the Beachmont MBTA Station and will serve as another main entry to the Resort. This landscape will include a generous eight-foot-wide path, an attractive new fence, and native plantings and trees to provide shade and visual interest along the neighborhood edge (see Figure 1-37). As described in Section 5.6.2, traffic and pedestrian safety improvements will

be implemented in Donnelly Square, which will incorporate streetscape improvements to the east of Beachmont Station. In addition, pedestrian accommodations at the Tomasello Drive intersection will be significantly improved with introduction of concurrent pedestrian phasing and the provision of a new "missing" crosswalk on Winthrop Avenue east of Tomasello Drive (see Figure 1-37, Winthrop Avenue Section).

4.4.9 Existing Surface Parking Lots

The site plan proposes to convert a substantial amount of existing impervious pavement currently used for parking into open space. The proposed surface parking areas (cumulatively approximately 2,000 parking spaces, see Table 1-2) will be defined with trees to reduce the heat island effect as well as shaded walkways to the public spaces and Resort buildings. A portion of the surface parking will be covered by the proposed PV array. The Project will introduce a series of planted bioswales along the parking areas to collect, filter, and slow stormwater. Walking paths through parking lots are being designed to keep pedestrians safe, comfortable, and separated from moving vehicles.

4.5 Sustainability and Green Infrastructure

Stormwater infiltration landscapes are designed not only to improve environmental quality, but also to serve as visual and passive recreational amenities for visitors.

Stormwater will be filtered through carefully selected native vegetation in a two-step treatment process. First, it will reach the lined pre-treatment area where 40% of total suspended solids (TSS) will be removed; second, stormwater will flow into a bio-infiltration area where more than 80% of TSS will be removed. The treated stormwater will then be allowed to infiltrate into the ground to recharge groundwater or enter adjacent wetlands. Stormwater management is described further in Section 9.3. Figure 4-15 illustrates the entryway plantings, and Figures 4-16 and 4-17 show planned improvements from sustainable design and plantings.

Permeable paving will be used in areas of the site with elevations high enough to allow proper drainage and infiltration. Resort plazas will include permeable paving to improve groundwater recharge and reduce site runoff (see Figures 4-18 and 4-19, Existing Condition Drainage and Proposed Condition Drainage).

Low-energy pedestrian lighting fixtures that minimize light pollution are proposed along pedestrian paths to enhance the pedestrian experience.

4.6 Plant Selection

Native and adaptive plant selections for landscaped areas will help reduce the urban heat island effect, provide visual interest in all seasons, and offer the opportunity for environmental education in the landscape. Using native and adaptive plant species will also help minimize the need for site-wide irrigation. Irrigation will instead be focused only

around the more manicured spaces immediately adjacent to the casino areas. In these locations, stormwater collected from building roofs into three large rainwater harvesting tanks will be used to meet irrigation demands. To minimize water use, the irrigation system will be equipped with timers, soil moisture indicators, and rainfall sensors. The Entry Landscape and other areas outside the designed spaces surrounding the casinos will be landscaped with plants selected to filter stormwater and will not require irrigation. A maintenance plan minimizing the use of chemical fertilizers will be applied to the site.

Section 5.0

Transportation

5.0 TRANSPORTATION

This section describes the multi-modal transportation characteristics of the proposed Caesars Resort at Suffolk Downs, including evaluations of existing conditions and projected future conditions without and with the proposed Project (i.e., No-Build and Build conditions, respectively). A range of associated transportation improvements and mitigation measures are identified to address existing local and regional transportation problems in the area in addition to minimizing potential negative impacts of the Project. These include physical multi-modal transportation infrastructure improvements and strategies as well as a robust TDM plan designed to reduce single-occupant vehicle (SOV) travel and encourage use of alternative transportation modes by patrons and employees.

The Proponent has committed to these improvements through the execution of separate HCAs with both the City of Boston and the City of Revere. The proposed transportation plan for the Resort will go far beyond mitigating potential traffic impacts of the Project, and will address long-standing issues of local and regional concern.

5.1 Introduction

VHB was retained by Sterling Suffolk Racecourse LLC (the Proponent) in 2009 to study the access needs and potential impacts of a resort casino project at Suffolk Downs and to identify existing local and regional transportation issues. VHB performed a preliminary analysis of the transportation needs and impacts of a resort gaming project including approximately 3,000 slot machines and 60 gaming tables along with supporting hotels, restaurants, bars, retail, and entertainment facilities. The study also identified specific existing local and regional traffic problems on the study area roadway network and developed infrastructure improvement concepts that would address existing traffic and safety problems as well as mitigate potential Project impacts and provide satisfactory access for the Project site.

Among other key findings, the 2009 study confirmed substantial existing peak period congestion and delay at the Boardman Street intersection on Route 1A as well as inadequate capacity and safety of the existing site access on Route 1A at Tomasello Drive. Indeed, the overriding concern expressed by community representatives from the time Project representatives began discussing the Project with the public was the need to address traffic backups at the Boardman Street/Route 1A intersection. Plans for a flyover at this location to assist Route 1A motorists entering and exiting Boardman Street in both directions have been discussed in various forums for the better part of three decades. For many reasons, the project has not been realized. Time and again, nearby residents explained to Resort representatives that the traffic situation was such an issue that a police detail has been assigned to the interchange during extended peak periods on a regular basis. In many ways, the detail has become a symbol of problems with the intersection and has been, far and away, the number one transportation issue expressed by the community during the extensive public participation process the Proponent has undertaken.

The flyover concept was officially developed as one of the post Central Artery/Tunnel (CA/T) projects aimed at regional mobility. Over the years, support for the concept was strong enough that the flyover was included in the "Journey to 2030" transportation plan of the Boston Region Metropolitan Planning Organization (MPO), was a recommendation of the Congestion Management Systems Report published by CTPS in 2004, was on the list added to the MPO's long range Transportation Improvement Program (TIP), and was in line for state funding. It was removed from the TIP in 2009 as the Commonwealth's transportation resources became more constrained and priorities were adjusted. Despite being removed from the TIP, the issues to be addressed at Boardman Street and Route 1A have not gone away.

In response to this issue and other community concerns about local access and potential impacts from Resort-related traffic to the neighborhoods, a preliminary improvement concept to address these issues was developed. The concept, referred to as the Boardman Street flyover solution, has been widely presented publicly and advocated for by the Proponent, recognizing that it is a concept subject to subsequent discussion with, and approval by, MassDOT and BTD.

The original study area (as presented in the ENF) included 20 intersections over a wide area to capture both local and regional traffic data. New traffic counts were performed at all locations where then-current data were not available. This program included Friday evening peak and Saturday afternoon peak period turning movement counts (TMCs) at study intersections and automatic traffic recorder (ATR) counts over a seven-day week at key locations.

In response to the EEA Secretary's Certificate on the ENF, comment letters on the ENF, and as requested through discussions with MassDOT, BTD, and the City of Revere, additional TMCs and ATRs were performed to provide a consistent set of 2010 base-line data. The number of study intersections was expanded to include a total of 28 intersections, and additional TMC and ATR counts were performed in late 2012 and early 2013.

In addition, MassDOT asked that a range of alternatives for the Route 1A corridor through the Boardman Street area be explored. The concept for the flyover solution as presented in the ENF and advocated for publicly by the Proponent comprises a Route 1A northbound flyover at Boardman Street, an additional Route 1A southbound lane, traffic signal control at Waldemar Avenue, and signalization of the Tomasello Drive intersection. This is referred to as "Option 4" in this DEIR/EPNF. At MassDOT's specific request, several alternatives have been considered and are presented in this document for the purpose of conducting an alternatives analysis. Although all of the analyses presented in the DEIR/EPNF are anchored on Option 4, the overall study-area traffic impact analysis for the Project remains the same under any of the Route 1A Infrastructure Improvement options considered here except, of course, within the specifics of each Route 1A option.

5.1.1 Project Overview

The Project is described in detail in Sections 1.1 and 4.4. In brief, Caesars Resort at Suffolk Downs is a redevelopment proposed on approximately 161 acres of land that will contain two distinct gaming areas (referred to as "Casino Area I" and "Casino Area II"), two hotels with up to 450 rooms, a multi-purpose meeting/entertainment space, parking, restaurants including fine dining and bars, and retail space while maintaining and enhancing the existing horse racing facilities. Specific Project elements are described in detail in Sections 1.1.1 and 4.3.

In addition, the Project includes major off-site roadway, traffic, and safety improvements. More specifically, as part of the Project, major new roadway infrastructure will be constructed on Route 1A in the vicinity of the site. As requested by MassDOT, an analysis of alternatives for the Route 1A improvements was performed and is presented in Section 5.5. The proposed concept presented in this DEIR/EPNF (and ENF), and advocated for publicly (referred to as Option 4 in the Route 1A Alternatives analysis) would deliver to the community the grade separation at Boardman Street that has been sought-after for many years. In doing so, it would address existing local and regional traffic issues at Boardman Street, improve safety, and provide ample capacity to accommodate Project trips entering and exiting the Project site. As described in Section 5.5, the other Route 1A options that have been developed are intended to accomplish these same objectives.

The Proponent has committed to a substantial number of traffic and roadway improvements under the City of Boston and the City of Revere HCAs (many of which do not relate to Project impacts or regional traffic conditions). The HCA transportation commitments are described in Section 5.6. In addition to TDM commitments and improvements for alternative modes of transportation, the commitments include local and regional traffic/roadway safety as well as operational and capacity enhancements at many locations, some of which address pre-existing issues that are not expected to be significantly worsened by the Project. All improvements will be subject to coordination with the appropriate state and city agencies.

As part of the discussions for the HCAs and Surrounding Community Agreements, the cities of Revere and Chelsea asked that existing regional traffic issues along the Route 60 and Route 1 corridors be addressed. The HCA commitments include alternatives for new ramp connections at the Route 1/Route 16 interchange and improvements along the Revere Beach Parkway corridor, which, consistent with the Boston Metropolitan Planning Organization (Boston MPO)'s Lower North Shore Transportation Improvement Study (prepared by the Central Transportation Planning Staff for the Massachusetts Highway Department in October 2000), would shift some regional traffic from the Route 60 and Route 107 (Broadway) corridors to Route 1/Route 16. Such strategic new connections will address long-standing regional traffic and safety issues in the Cities of Revere and Chelsea along the Route 60 corridor through Butler Circle and Bell Circle, as well as along Route 16/Revere Beach Parkway between Webster Avenue and the split to Route 145. Indeed,

the Route 16WB to Route 1NB and Route 1SB to Route 16EB connections that are being pursued as a part of the Proponent's HCA and Surrounding Community Agreement commitments were also (in addition to a flyover at Boardman Street) a part of CTPS's recommendation in its 2004 Congestion Management System Report.

These improvements are on state-controlled roadways (MassDOT and the Department of Conservation and Recreation, DCR). While they offer improvements from which the Project will benefit, the improvements are intended to address pre-existing regional traffic problems, independent of the proposed Project and are expected to realize benefits for regional traffic that significantly exceed the potential impacts of Project traffic.

5.1.2 Study Scope

MassDOT has requested that the DEIR/EPNF transportation analysis for the Project be performed for the year 2022 (and that subsequent analysis for infrastructure design should be based on year 2032). The DEIR/EPNF transportation analysis for the Project considers four scenarios, as follows:

1. 2012 Existing conditions, based on latest traffic counts at study area locations and inventory of the existing transportation infrastructure;
2. 2022 No-Build future conditions, with associated traffic growth but assuming that the Project is not built;
3. 2022 Build future conditions, with the Project complete and operational overlaid on No-Build future conditions; and
4. 2022 Build with HCA (Host Community Agreement) Improvements (where appropriate).

The study area and study intersection locations are presented in Figure 5-1, and are described in Section 5.2.6.

In addition to the roadway and traffic analysis, the study also evaluates parking demand, transit, bicycle, and pedestrian access, and identifies the robust TDM program and strategies to be implemented by the Proponent.

5.1.3 Key Findings and Project Benefits

Key findings of the transportation analysis presented in the following sections include the following:

5.1.3.1 Existing Transportation Conditions

1. The Project site is very well located in relation to the Interstate and regional roadway systems and enjoys direct connections via Route 1A and the Ted Williams Tunnel to I-93 North, I-93 South (Southeast Expressway), and I-90 West, as well as to and from Downtown Boston and I-93 via the Sumner and Callahan Tunnels.

2. The traffic analysis confirms significant existing regional congestion in the Route 1A corridor, and continuing north on Route 60 through Revere to Route 1. Difficulties on Route 60 are exacerbated by lack of complete direct connections between Route 1 and Route 16 (Revere Beach Parkway), and by congestion on Route 1 at Copeland Circle and beyond.

3. Existing regional traffic congestion impacts local access for East Boston and Winthrop, particularly at Boardman Street.

4. The Project site is served by three vehicular access points, but the regional traffic congestion impacts local access to the Project site especially on Route 1A.

5. Regional and local traffic congestion is expected to prevail in the foreseeable future in the absence of any specifically programmed and funded major transportation infrastructure improvements. No such improvements are currently programmed in the TIP, and none are expected in the near future.

6. The Project site is well served by public transportation and benefits from MBTA Blue line service at the abutting Suffolk Downs Station, as well as local and express bus routes within one-quarter mile of the site.

7. Sidewalks are provided on the majority of the study area roadways, but the physical condition of sidewalks and ADA compliance is deficient in several locations, and inadequate pedestrian crossing accommodations are provided at many locations.

8. The existing bicycle infrastructure in the immediate vicinity of the Project site is limited, although significant bicycle improvements have been made, particularly in the East Boston neighborhoods.

5.1.3.2 Project Travel Characteristics and Trip Generation

1. Consistent with what has been observed in other gaming locations, it is expected that Project trip generation will be spread over the 24-hour day, and throughout the 7-day week, with approximately 55% of weekly gaming activity occurring on Friday, Saturday and Sunday combined.

2. The Project is expected to generate very limited trips during the morning commuter period. Peak Project traffic generation will occur after the evening peak commuter period during the week and after the afternoon peak on Saturdays. Therefore, the existing commuter peak periods do not coincide with peak Project trip generation.

3. As a result of the regional highway connections, nearly 70% of Project patron trips are expected to arrive from Route 1A south of Suffolk Downs. Very limited use of the Bennington Street corridor and neighborhood streets by Project traffic is expected.

4. It is expected that approximately 11% of patrons will use public transit and 5% of patrons will use high-occupancy vehicles (private coaches or shuttle buses). Thirty (30%) percent of employees are expected to commute by transit and 7% by bicycle or walking. While the Proponent will encourage water transportation to the site and is supportive of the City's plans to strengthen water transportation options to East Boston, it is not expected that a measureable number of patrons or employees will travel to the site by water.

5.1.3.3 Potential Traffic and Transit Impacts

1. The Route 1A infrastructure improvements will yield significant positive impacts to traffic operations and capacity compared to No-Build conditions throughout the day, even during peak occupancy of the Project.

2. The detailed traffic operations analysis shows limited degradation in overall LOS grades at study area intersections during critical peak periods due to Project impacts.

3. Capacity and operational improvements accrue as the result of the proposed roadway improvements, generally providing positive impacts compared to No-Build conditions and, at many locations, existing conditions.

4. Significant new ridership on the MBTA system will be generated by the Project, largely on the Blue Line as a collector from the rest of the MBTA system.

5. While use of the Suffolk Downs Station will increase substantially as a result of the project, such increase is well within the capacity of this extremely under-utilized station, the most underutilized station on the Blue Line.

6. Relatively limited volumes of Project trips using other Blue Line stations in East Boston are projected, with no significant impact anticipated.

7. Currently, the MBTA Blue Line has excess available capacity throughout most of the day, especially on weekends.

8. Blue Line ridership at the peak loadpoint (between Maverick and Aquarium Stations) is projected to meet or exceed available capacity during the weekday 8:00 AM to 11:00 AM period as a result of projected MBTA 2022 ridership growth. Project-related ridership is expected to be very limited during these morning periods.

9. Similarly, capacity is projected to be exceeded in the weekday 3:00 PM to 4:00 PM and 10:00 PM to midnight hours, regardless of any Project-related trips. For limited times in the late evening on Thursdays and Fridays, between 7:00 PM and 10:00 PM, some increase in crowding may occur largely as a result of Project-related trips rather than projected MBTA 2022 ridership growth.

10. Adverse impacts to MBTA bus capacity and operations and not expected.

5.1.3.4 Project Benefits Addressing Existing Local & Regional Transportation Issues

1. Subject to design development in coordination with MassDOT and the City of Boston, the proposed Route 1A improvements that are integral to the Project will go far beyond mitigating the potential impacts of Project trips, significantly improving safety and traffic capacity in the vicinity of the site, with reduced queuing and delays for both local and regional traffic as well as excellent access to the site for Project trips.

2. Of key importance, the incorporation of well-designed facilities for all sidewalks at intersections and roadway crossings will enhance pedestrian safety. In addition, the Project site layout has been designed to encourage pedestrian activity to, from and within the site by creating an attractive on-site pedestrian network and making appropriate connections to the existing off-site pedestrian network in the area.

3. As part of the Boston and Revere HCAs, and a proposed Surrounding Community Agreement to be executed with the City of Chelsea, and subject to design development in coordination with MassDOT, DCR and the Cities of Revere and Chelsea, the Proponent has committed to provide new ramp connections at the Route 1/Route 16 interchange, consistent with the Lower North Shore Transportation Improvement Study, and to improvements at other strategic locations along the Revere Beach Parkway corridor.

4. Subject to design development in coordination with MassDOT, DCR and the City of Revere, these improvements are expected to relieve the Route 60 corridor through Revere. As they are intended to address pre-existing regional traffic and safety problems, independent of the proposed Project, they would realize benefits for regional traffic that significantly exceed the potential impacts of Resort traffic.

5. The Route 1/Route 16 improvements provide significant relief to current safety and congestion at the Route 16/Webster Avenue/Garfield Avenue intersection in Chelsea with the removal of existing heavy u-turn movements from the westbound direction in order to access existing ramps or Route 16 eastbound.

6. A limited, but effective, lane widening improvement at Bell Circle will improve operations at that location, and is expected to mitigate the impact of Project trips.

7. Traffic, roadway and safety infrastructure improvements to address existing conditions will be provided at more than 10 other local intersections in Boston and Revere, as identified in Section 5.6, some of which are expected to experience limited or minimal Project impacts.

8. The Project site plan will provide an enhanced pedestrian and bicycle connection to the site and to Suffolk Downs Station, and will improve the existing ground shuttle service with more frequent service, thereby strengthening the connections between the Project and public transportation. In addition, the Proponent is working with the MBTA to create a more direct connection between the station entry/exit and the Project site/shuttle stop.

9. The Proponent is working with the MBTA to define improvements to be made at the Suffolk Downs Station, and is discussing enhancements of rapid transit service and local bus connections/facilities.

10. The Project will provide on-street bicycle accommodations, with spur bicycle connections to and through the Project site. These improvements will create an on-street 'beach-to-beach' connection between Constitution Beach to the south, Revere Beach to the north, and to Belle Isle Marsh, and will enhance bicycle access to the Project's on-site bicycle accommodations and parking. The Proponent has also committed to install two bike-share Hubway stations on the Project site, one near the Resort and one near Suffolk Downs Station, when the program is expanded to East Boston.

11. The Project site plan will enhance and strengthen the safety and quality of the existing pedestrian link across the site from the Orient Heights neighborhood and to the Crescent Beach neighborhood in Revere, and effectively create pedestrian as well as bicycle linkages connecting communities and open space through the new landscape of the Project site.

5.1.3.5 Parking and Transportation Demand Management (TDM)

1. The existing site parking supply of some 6,000 spaces far exceeds the demand associated with the proposed Project, and the total number of parking spaces will be reduced to a supply of 5,100 spaces, which will adequately accommodate the Project's peak parking demand.

2. With the exception of disabled employees and a limited number of parking spaces (estimated to be less than 50) for key management and essential employees, employee parking will not be provided on site. Employee parking will be provided in multiple remote locations, and employees choosing to drive will arrive and depart the site by shuttle bus.

3. Parking management and enhancement of connectivity/access to alternate travel modes (including transit, bicycle and pedestrian) will be supported by a robust TDM Plan. The TDM plan will comprise a comprehensive package of incentives to encourage non-single occupant vehicle travel, including public transit as an access mode, particularly for employees.

5.1.3.6 Sustainable Design Principles

Regardless of the design option selected, the design process of the off-site roadway improvements will seek to incorporate sustainability principles wherever possible. With MassDOT's GreenDOT Policy Directive as a guide and recognizing the City of Boston's strong and longstanding commitment to sustainability, the Proponent will work with appropriate public and private stakeholders to consider, incorporate, and implement planning, design and construction criteria and guidance from such sources as the Greenroads Foundation's Greenroads Rating System and the Institute for Sustainable Infrastructure's Envision Sustainable Infrastructure Rating System. These programs are designed to encourage technically superior design outcomes with long-term metrics for environmental performance.

5.2 2012 Existing Conditions

This section describes existing transportation conditions in the study area including transit service, pedestrian and bicycle accommodations, the local and regional roadway networks, existing traffic volumes, crash data, and parking (on- and off-site).

5.2.1 Public Transit

The Project site is well-served by public transportation, with several public transportation options within one-quarter mile of the site including bus routes and Blue Line rapid transit services provided by the MBTA. These services are illustrated in Figure 5-2, and their service and operational characteristics are described in further detail below.

5.2.1.1 Blue Line Rapid Transit Service

The Blue Line rapid transit line provides service from Wonderland Station in Revere to Bowdoin Station in Boston, running every five minutes during the weekday peak period. The closest station to the Project site is Suffolk Downs Station, which is accessible from both Bennington Street and Waldemar Avenue. The Blue Line connects with the Orange Line at State Street, the Green Line at Government Center, and water shuttle service at Aquarium. According to the 13th Edition of the Ridership and Service Statistics Blue Book published by the MBTA in 2010 (the "Blue Book"), on a typical weekday approximately 44,233 riders board the Blue Line, 794 of whom are reported to board at Suffolk Downs Station, equivalent to less than 2% of the line ridership.

Rolling Stock

The MBTA's Blue Line trains are unique to the rest of the MBTA's system: the propulsion system is powered from the third rail and an overhead pantograph. The third rail, which provides power to the rail cars, is placed alongside the track from Bowdoin Station to Airport Station, where the line is underground. Between Airport Station and Wonderland Station, where the line operates on the surface in a dedicated right-of-way, the overhead pantograph is used. The pantograph is mounted on top of the Blue Line car and draws power from the overhead catenary system.

As stated in the Blue Book, the Blue Line uses Number 5 East Boston cars (manufactured by Siemens in 2007-2009) that were introduced to replace the older Number 4 cars. Each car is 48.8 feet long and approximately nine feet wide, with a seating capacity of 37 passengers.[1]

In September 2008, MBTA began operating six-car trainsets in revenue service on the Blue Line. All Blue Line stations can accommodate the six-car trains except the eastbound (outbound) platform at Bowdoin Station.

Hours of Operation

According to the 2010 MBTA Service Delivery Policy, Blue Line service operates from 5:00 AM to 1:00 AM on weekdays and Saturdays, and 6:00 AM to 1:00 AM on Sundays. Presently, Bowdoin Station is closed weekday evenings and on weekends after the 6:18 PM train. During those periods, Blue Line service begins and ends at Government Center).[2]

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[1] Massachusetts Bay Transportation Authority *Ridership and Service Statistics* Manual, Thirteenth Edition, 2010. MBTA Subway Operations Fleet Roster as of February 2010, Chapter 2, Page 7.

[2] Massachusetts Bay Transportation Authority, *Service Delivery Policy*, 2010 Update.

Headways

The headway is the elapsed time between one vehicle and the next traveling in the same direction. For this analysis, typical MBTA Blue Line service headways were provided by the Blue Book and verified using the MBTA subway schedule for spring 2013.[3] The headways for Blue Line operations are currently at 5-, 9-, or 13-minute intervals, depending on the time of day. Blue Line service operates at 5-minute headways during weekday peak periods and at 9-minute headways for weekday off-peak periods. On weekend days, the service operates at 9-minute headways. Blue Line service is provided by 13-minute headways during late night service after 10:00 PM on weekdays and weekends, and also for early Sunday morning service before 9:00 AM.

The 2010 MBTA Service Delivery Policy outlines the weekday time periods of service to determine how much service should be provided, as reflected in Table 5-1.

Table 5-1 MBTA Weekday Rail Time Period Definitions

Time Period	*Definition*
Early AM	6:00 AM - 6:59 AM
AM Peak	7:00 AM - 8:59 AM
Midday Base	9:00 AM - 1:29 PM
Midday School	1:30 PM - 3:59 PM
PM Peak	4:00 PM - 6:29 PM
Evening	6:30 PM - 9:59 PM
Late Evening	10:00 PM - 11:59 PM
Night/Sunrise	12:00 AM - 5:59 AM

As presented in Table 5-2, to determine current MBTA Blue Line capacity using existing ridership estimates and to more closely compare the hourly data supplied by the MBTA, peak periods were rounded to the nearest hour.

[3] Massachusetts Bay Transportation Authority, Service Schedules. Viewed on June 17, 2013 at http://www.mbta.com/uploadedFiles/Documents/Schedules_and_Maps/Subway/frequency-schedule.pdf

Table 5-2 Revised MBTA Weekday Time Periods

Time Period	*MBTA Weekday Definition*	*Subject Capacity Analysis*
Midday Base	9:00 AM - 1:29 PM	9:00 AM - 12:59 PM
Midday School	1:30 PM - 3:59 PM	1:00 PM - 3:59 PM
PM Peak	4:00 PM - 6:29 PM	4:00 PM - 6:59 PM
Evening	6:30 PM - 9:59 PM	7:00 PM - 9:59 PM

Loading Standard

The MBTA's Service Delivery Policy provides that its purpose is "to ensure that the MBTA provides quality transit services that meet the needs of the riding public," which is consistent with the MBTA's enabling legislation and other external mandates.

Vehicle Load Standards, as detailed in the Service Delivery Policy, define the levels of crowding that are acceptable by time period, mode, vehicle type and location. It should be understood that the vehicle load standards represent average maximum loads over the particular time period, expressed on a per-car basis. This means that, depending on scheduling constraints and passenger peaking characteristics (including the different loadings between individual cars on a train), some individual trips or vehicles may exceed the values expressed in the standards even though the average load complies.

In the case of the Blue Line, the Service Delivery Policy stipulates a Peak Maximum Load of 95 passengers per car for the 45-seat Number 4 cars, which amounts to a Peak Load Standard of 225 percent, the ratio of maximum passengers to seats. However, since the issuance of the 2010 Update of the Service Delivery Policy, the Number 4 cars have been retired and been replaced by the Number 5 cars with 37 seats along with spaces for wheelchairs and/or carriages. The length and width of Number 4 and 5 fleets are the same, and the 95-passenger-per-car capacity is effectively unchanged, except that there is slightly more circulating room within the redesigned car interior. However, for the purpose of this analysis, the conservative estimate of 225% for the vehicle load standard is used making each Blue Line Car's capacity 79 people as seen in Table 5-3 in the next section.

During off-peak time periods, the vehicle load standard varies depending on the location of the train. In the MBTA-defined "core" area of the Blue Line between Bowdoin and Maverick, the Load Standard is 140 percent, while outside of this "core" area, the Load Standard is 100 percent.

Hourly Blue Line Capacity

Utilizing information gathered as previously described, the hourly capacity per hour, per time period was established. Utilizing the conservative vehicle load standard and the number of cars per train, the capacity of each train during the peak period within the core is estimated at 473 people. Utilizing the headways prescribed by the Spring 2013 schedule, an hourly capacity during the peak periods within the core is determined to be 5,670 people. Table 5-3 shows the hourly Blue Line capacity throughout the day.

Table 5-3 Blue Line Hourly Capacity per Time Period

Period	*Seats/ Car*	*Passengers/ Seats (Load Standard)*	*Total Calculated Capacity/Car*	*# Carss*	*Capacity/ Train*	*Train Headways (minutes)*	*Trains/ Hour/ Period*	*Capacity/ Hour/ Period*
Rush Hour	35	225%	79	6	473	5	12	5,670
Midday Core	35	140%	49	6	294	9	7	1,960
Midday	35	100%	35	6	210	9	7	1,400
Midday School	35	225%	79	6	473	9	7	3,150
Evening Core	35	140%	49	6	294	9	7	1,960
Evening	35	100%	35	6	210	9	7	1,400
Late Night Core	35	140%	49	6	294	13	5	1,357
Late Night	35	100%	35	6	210	13	5	1,400

Existing Blue Line Ridership Demand

While occasional events may trigger unusual ridership spikes, it is the service demand during weekday rush hours that generally determines the capacity of a transit line. For this analysis, the MBTA provided one-day passenger count data for Thursday, September 20, 2012, which represents typical weekday MBTA service demand. This weekday data consisted of boardings and alightings at each station.

Saturday passenger count data were also provided by the MBTA as a composite of fifty-three (53) Saturdays between July 1, 2011 and July 1, 2012. The existing analysis for the composite Saturday data includes total line volume by hour and station exit information.

Using the information supplied by the MBTA, existing Blue Line travel demand in terms of riders per hour and direction was analyzed.

Existing Suffolk Downs Station Passenger Boardings & Alightings

Based on the MBTA-supplied data from 2012, existing hourly passenger boardings and alightings by direction at Suffolk Downs Station for a typical weekday and Saturday are presented in Table 5-4 and Figure 5-3.

Table 5-4 Suffolk Downs Blue Line Station Existing Platform Activity

Time Period	*Weekday Ridership*		*Saturday Ridership*	
	Inbound Platform	*Outbound Platform*	*Inbound Platform*	*Outbound Platform*
5:00 AM - 6:00 AM	9	4	3	6
6:00 AM - 7:00 AM	59	12	7	4
7:00 AM - 8:00 AM	102	7	7	6
8:00 AM - 9:00 AM	126	15	30	2
9:00 AM - 10:00 AM	59	19	17	27
10:00 AM - 11:00 AM	58	24	21	64
11:00 AM - Noon	31	44	22	113
Noon - 1:00 PM	30	78	46	122
1:00 PM - 2:00 PM	49	52	54	113
2:00 PM - 3:00 PM	44	73	60	48
3:00 PM - 4:00 PM	48	109	63	36
4:00 PM - 5:00 PM	54	97	93	27
5:00 PM - 6:00 PM	52	103	106	21
6:00 PM - 7:00 PM	34	50	36	22
7:00 PM - 8:00 PM	25	30	26	20
8:00 PM - 9:00 PM	33	49	10	18
9:00 PM - 10:00 PM	3	28	15	26
10:00 PM - 11:00 PM	6	27	6	14
11:00 PM - Midnight	12	19	4	12
Midnight - 1:00 AM	2	4	10	5
Total	836	844	636	706

Source: MBTA

As shown, the existing use of Suffolk Downs Station is very low, and it is by far the least-used station on the Blue Line. Total weekday daily boardings and alightings at the station are limited to approximately 1,680 riders, which represent less than 2% of all daily Blue Line passenger volume.

Peak Loadpoint

The peak loadpoint is defined as the location of maximum utilization of a transit line (in other words, the station-to-station pair with the highest ridership). The heaviest loadings on the Blue Line during most daytime intervals occurred mostly between Maverick and Aquarium stations. Hourly ridership by direction between Maverick and Aquarium stations is presented for a weekday and Saturday in Figure 5-4. The charts also include line capacity as it varies during the course of the day.

On a typical service weekday, westbound (inbound) trains towards Bowdoin carry approximately 32,000 riders. The peak loadpoint occurred between 8:00 AM and 9:00 AM with over 5,000 passengers. The maximum hourly volume during the weekday evening peak is approximately 4,000 riders on trains travelling eastbound (outbound) towards Wonderland between 5:00 PM and 6:00 PM, where the expected combination of MBTA commuter peak and Project peak is to occur. These volumes represent 80 percent of the maximum volume when compared to the morning peak. Therefore, from a capacity standpoint, the morning peak period governs the capacity requirements of the Blue Line service.

As shown, using the conservative load standards the Proponent has adopted for this analysis, the Blue line operates within its capacity throughout weekday and Saturday operations with the exception of some over-crowding between 9:00 and 10:00 AM on a weekday and 10:00 PM and midnight (understood to occur only on Thursday and Friday).

5.2.1.2 Bus Service

The two local MBTA bus routes operating closest to the Project site are described below:

- **Route 119** operates along the northern end of the Project site on Winthrop Avenue and stops at 560 Winthrop Avenue when operating from Northgate Shopping Center towards the MBTA Blue Line's Beachmont Station. When Route 119 buses are operating from Beachmont Station in the direction toward Northgate Shopping Center, the nearest stop to the Project site is at 209 Revere Beach Parkway.

- **Route 120** operates on the southern side of the Project site in the Orient Heights neighborhood. Route 120 provides service to Orient Heights as it operates the MBTA Blue Line's Maverick station to the MBTA Blue Line's Orient Heights station. This is the only direction (northbound) in which the bus stop adjacent to 160 Waldemar Avenue, the closest stop to the proposed Resort, is served.

Bus Fleet

Bus Routes 119 and 120 operate out of the MBTA Lynn Bus Garage.[4] Based on assignments of the MBTA overall fleet, the buses operating out of the MBTA Lynn Bus Garage are 2008 New Flyer Emission Controlled Diesel (ECD) buses.[5] As stated in the Blue Book, these buses are 40 feet long and 8.5 feet wide and have a seating capacity for 39 passengers.

Hours of Operation

MBTA Route 119 and Route 120 services operate from 5:00 AM to 1:00 AM on weekdays and Saturdays, and 6:00 AM to 1:00 AM on Sundays.

Loading Standard

The MBTA's 2010 Update of its Service Delivery Policy states its purpose is "to ensure that the MBTA provides quality transit services that meet the needs of the riding public" and is consistent with the MBTA's enabling legislation and other external mandates. Vehicle Load Standards, included in the Service Delivery Policy document, define the levels of crowding that are acceptable by time period, mode, vehicle type, and location. In the case of bus service, the main determinant of the Load Standard is the time period. The 2010 MBTA Service Delivery Policy outlines the time periods of service to determine how much service should be provided, as reflected in Table 5-5.

Table 5-5 MBTA Weekday Bus Time Period Definitions

Time Period	*Definition*
Early AM	6:00 AM - 6:59 AM
AM Peak	7:00 AM - 8:59 AM
Midday Base	9:00 AM - 1:29 PM
Midday School	1:30 PM - 3:59 PM
PM Peak	4:00 PM - 6:29 PM
Evening	6:30 PM - 9:59 PM
Late Evening	10:00 PM - 11:59 PM
Night/Sunrise	12:00 AM - 5:59 AM

[4] MBTA Line Statistics Vehicle Recap as of September 2009, 2010 MBTA Blue Book Chapter 03, page11.

[5] MBTA Bus Assignments by Vehicle Class and Garage, July 2010, 2010 MBTA Blue Book Chapter 3, page 24.

In the case of the 2008 New Flyer ECD buses, the Service Delivery Policy stipulates a Peak Maximum Load of 54 passengers per bus, with a Peak Load Standard of 140 percent (the ratio of maximum passengers to seats). During off-peak time periods, the Load Standard on buses is 100 percent.

Existing MBTA Route 119 & 120 Capacity

The existing conditions analysis was completed using MBTA average passenger count data at each bus stop for service during the fall of 2012. The provided data consisted of boardings and alightings at each bus stop while also showing the total line volume by bus trip. For Route 120, ridership peaks on weekdays were approximately 35 passengers, while Saturday's peak volume was approximately 24 passengers. For Route 119, ridership peaks on weekdays were approximately 41 passengers, while Saturday peak volumes were approximately 25 passengers. Overall, the line volume never approaches the peak load capacity of 54 or even having all seats filled. Overall, both bus routes are primarily used by these local neighborhoods to get to and from the MBTA Blue Line.

In addition to local bus routes in the vicinity of the Project site, several commuter/express bus routes operate in the Route 1A corridor:

- **Routes 424, 434, 448 and 449** are all commuter buses running from different communities in the north shore to Haymarket Station or Downtown Crossing Station. Commuter routes have local service at the ends of the routes, but run express for the majority of the routes in and out of Boston. Although the routes travel down Route 1A/McClellan Highway/Lee Burbank Highway, there are no stops in the vicinity of the Project site.

- **Routes 450** (Salem Depot to Haymarket Station) runs from 4:46 AM to 1:42 AM on 30-minute headways during peak periods and 60- to 80-minute headways during non-peak periods. This bus route stops on Route 1A/McClellan Highway/Lee Burbank Highway in the vicinity of the Project site.

- **Route 459** (Salem Depot to Downtown) runs from 5:40 AM to 8:15 PM on 60- to 65-minute headways through the day. This bus route stops on Route 1A/McClellan Highway/Lee Burbank Highway in the vicinity of the Project site.

Table 5-6 presents a summary of existing MBTA transit service serving the Project site.

Table 5-6 Summary of Public Transit (MBTA) Service

Route #	*Description*	*Service Area*	*Peak Hour Headway (minutes)*	*Start Time*	*End Time*
119	Northgate – Beachmont Station	Cutler Circle, Linden Square, Revere Center, Coolidge Housing, Revere City Hall, and connections to the Blue Line	25-35	5:00 am	10:48 pm
120	Orient Heights – Maverick Station via Bennington Street	Waldemar Loop, Day Square, Eagle Square, Central Square East Boston, Jeffries Point and Connections to the Blue Line	16	5:25 am	1:18 am
424	Eastern Avenue & Essex Street – Haymarket or Wonderland Station	express	30	6:00 am	5:40 pm
434	Peabody – Haymarket Express via Goodwin's Circle	express	1 time/day	6:45 am	6:30 pm
448	Marblehead – Downtown Crossing	Paradise Road or Humphrey St, Lynnway and Airport	2 times/day	6:28 am	7:30 pm
449	Marblehead – Downtown Crossing	Paradise Road or Humphrey St, Lynnway and Airport	3 times/day	6:00 am	7:06 pm
450	Salem Depot – Haymarket Station	express	30-60	5:40 am	1:29 am
459	Salem Depot – Downtown	Logan Airport and Central Square, Lynn	15-30	5:00 am	1:10 am
Blue Line	Wonderland – Bowdoin Street	All stops	4	5:13 am	12:49 am

Source: MBTA

5.2.1.3 Shuttle Buses

Suffolk Downs racetrack operates a shuttle bus service between Suffolk Downs Station and the racetrack facilities. The shuttle runs with approximately 10-minute headways when the racetrack is open, with relatively low load factors.

5.2.2 Pedestrian Environment

In addition to collecting vehicle volume data, pedestrians were counted at many intersections. Data collection sheets are included in Attachment A. A brief overview of pedestrian activities in the study area follows.

Sidewalks are provided on the majority of the study area streets except for Tomasello Drive, a private way, which provides a sidewalk only for a short distance in the vicinity of the north driveway into the Project site. The physical condition of sidewalks is deficient in several locations.

Crosswalks are provided on the majority of the study area intersections, although ADA compliance is deficient at many locations. In addition, there are malfunctioning or missing pedestrian signal equipment (e.g., pedestrian push buttons or signal heads) at several locations.

Peak hour pedestrian volumes in the area are relatively low, with the exception of the commercial/transit nodes at Beachmont Station and Orient Heights Station.

In addition to localized repair and ADA deficiencies, there are missing or inadequate pedestrian accommodations at several key locations, most notably at the following intersections:

- No crosswalk is provided on Winthrop Avenue to the east of Tomasello Drive; and
- Although crosswalk guidelines are provided at the intersection of Route 16 with Route 145 (Winthrop Avenue) and Harris Street, there are no protected pedestrian accommodations in the signal phasing, and pedestrian signal heads and push buttons are not provided.

5.2.3 Bicycle Accommodations

The existing bicycle infrastructure in the immediate vicinity of the Project site is limited, although significant bicycle improvements have been made in the East Boston neighborhoods. The East Boston Greenway and bicycle accommodations along Chelsea Street and Bennington Street provide good connectivity south of the Project site.

Figure 5-5 presents existing local area bicycle accommodations, and also includes currently-planned future facilities.

5.2.3.1 East Boston Greenway

The East Boston Greenway is a linear park that runs within a former rail corridor approximately three miles between the East Boston waterfront and East Boston neighborhoods just north of Prescott Street. The Greenway is "L-shaped" and starts at Piers Park, runs along Marginal Street, turns 90 degrees and runs parallel to Bremen Street, and then terminates near Lovell Street. The Greenway provides mixed use pedestrian and bicycle paths and provides a good recreational connection between several parks in East Boston.

5.2.3.2 Chelsea Street and Bennington Street Corridors

The City of Boston has installed on-street bicycle lanes along Chelsea Street between Maverick Square in the south and Day Square to the north (approximately three-quarters of a mile). These bicycle lanes serve both directions and provide on-street accommodations parallel to the East Boston Greenway. A typical cross section of the road includes curbside parallel parking, a bicycle lane, and a single vehicular travel lane in each direction.

Shared lane markings exist on the length of Bennington Street between Neptune Road and Saratoga Street. Shared lane markings are provided on both sides of the street, which has a typical cross-section containing parking lanes on each side and two vehicular travel lanes in each direction. The shared lane markings are located on the travel lane adjacent to the curbside parking.

There is a gap in on-street bicycle accommodations between Day Square and Bennington Street, and no on-street bicycle accommodations are provided on Bennington Street north of Saratoga Street.

5.2.3.3 Planned Bicycle Infrastructure

The City of Boston has plans to extend the East Boston Greenway from its existing northern terminus to the new Neptune Green Park, adjacent to the Wood Island MBTA Station, between the Blue Line tracks and Logan Airport's new Green Bus depot, and to a small Wood Island Marsh Overlook park to be built at the end of Short Street. Construction of the extension is expected to begin in the near future.

Additional discussions regarding extending the Greenway to connect to Constitution Beach and even further to the Belle Isle Marsh Reservation are currently in the early phases of planning, and the future of these plans is unknown. This extension to the Belle Isle Marsh would provide a bicycle/pedestrian connection for the entire length of East Boston.

5.2.4 Roadway Network

The location of the Project site in relation to the regional roadway network is shown in Figure 5-6. The Project site is surrounded by Route 1A to the west, Route 145 (Revere Beach Pkwy/Winthrop Avenue) to the north, Bennington Street to the east, and Waldemar Avenue to the south.

The Project site is well located in relation to the Interstate and regional roadway systems. Specifically, the site is located on Route 1A approximately one mile north of the eastern terminus of I-90 (Massachusetts Turnpike) near Logan Airport, and therefore enjoys direct connections via the Ted Williams Tunnel to I-93 North and I-93 South (Southeast Expressway), as well as I-90 West continuing west through central Massachusetts. In

addition, Route 1A connects to and from Downtown Boston and I-93 via the Sumner (to downtown Boston) and Callahan (from downtown Boston) Tunnels. There is a toll for vehicles travelling toward downtown Boston in both the Sumner and Williams Tunnels.

From the north, Route 1 is an important regional corridor, but it relies on connections via Route 60 through Revere and a tenuous connection with Route 16/Revere Beach Parkway to access the Project site via Route 1A or Route 145 (Winthrop Avenue). Regional access issues associated with the Route 1/Route 16 connection are discussed in more detail in Sections 5.6 and 5.7. Additional sub-regional access from the north is provided by Route 1A through Swampscott and beyond, and via Route 60 to Route 107 to Salem.

Immediately to the west, Route 145 (Revere Beach Parkway) provides connections to Route 16, which in turn connects with I-93 in Medford, and, somewhat circuitously, to Routes 2 and 3 to the northwest.

5.2.5 Site Access

As shown in Figure 5-7, existing vehicular access to the site is provided by Tomasello Drive, a privately-owned roadway through the site, with connections to Route 1A and Route 145 (Revere Beach Pkwy/Winthrop Avenue). Furlong Drive, a public way from Route 1A to the Target/Stop & Shop plaza, provides an additional access connection between Route 1A and Tomasello Drive via a publicly-accessible private drive through the plaza.

Tomasello Drive at Route 1A is unsignalized, and left-turns out of the site to Route 1A southbound are prohibited, except during large events at Suffolk Downs when a police detail is provided. At Route 145 (Revere Beach Pkwy/Winthrop Avenue), Tomasello Drive is signalized in coordination with the off-set intersection at North Shore Road. While Furlong Drive connects with Tomasello Drive at a stop-controlled intersection within the site, turning movements to and from Furlong Drive at Route 1A are limited to right-in and right-out on the northbound side of Route 1A.

5.2.6 Study Area

The study area, as proposed in the ENF and expanded to include additional intersections requested by MassDOT, MBTA, and the cities of Boston and Revere, is presented in Figure 5-1. The study intersections (under signal control unless otherwise noted) include the following:

1. Route 1A at Suffolk Downs/Tomasello Drive (unsignalized/signalized with Project);
2. Route 1A at Furlong Drive (unsignalized);
3. Winthrop Avenue (Route 145) at Route 1A southbound On-Ramp;

4. (a) Winthrop Avenue (Route 145) at North Shore Road;
   (b) Winthrop Avenue (Route 145) at Suffolk Downs (Tomasello Drive);
5. Bennington Street/State Road at Winthrop Avenue;
6. Bennington Street at Saratoga Street;
7. Boardman Street at Route 1A;
8. Winthrop Avenue (Route 145) at Revere Beach Parkway (Route 16)/Harris Street;
9. (a) Route 60 (American Legion Highway) at Bell Circle;
   (b) Route 1A (VFW Parkway) at Bell Circle;
   (c) Route 16 and Route 1A at Bell Circle;
   (d) Beach Street at Bell Circle;
10. Ocean Avenue at State Road/Revere Beach Parkway;
11. Eliot Circle (roundabout);
12. Route 1A at Jughandle;
13. (a) Bennington Street at Neptune Road;
    (b) Neptune Road at Route 1A NB off-ramp;
14. Butler Circle (roundabout);
15. Revere Street at Route 60;
16. Brown Circle (roundabout);
17. Copeland Circle (three weave locations, three merge locations)
18. Route 1/Route 16 Interchange (three merge locations);
19. Route 16 (Revere Beach Parkway) at Garfield Avenue/Webster Avenue;
20. Route 1A northbound at Waldemar Avenue (unsignalized/signalized with Project);
21. Bennington Street at Crescent Avenue (unsignalized);
22. Route 1A SB at Curtis Street (unsignalized);
23. Neptune Road at Saratoga Street (unsignalized);
24. Neptune Road at Bremen Street (unsignalized);
25. Route 1A (North Shore Road) at Wonderland MBTA Station;
26. Route 1A (North Shore Road) at Revere Street;
27. Route 60 (Squire Road) at Charger Street; and
28. Route 60 (Squire Road) at Sigourney Street/ Mall Driveway.

Although the majority of study intersections in the Project vicinity operate under traffic signal control, three locations on Route 1A (Furlong Drive, Tomasello Drive, and Waldemar Avenue) are under stop control. The expanded study area includes four additional unsignalized locations (Bennington Street at Crescent Avenue, Route 1A SB at Curtis Street, Neptune Road at Saratoga Street, and Neptune Road at Bremen Street), and three rotaries or roundabouts (Elliot, Butler, and Brown Circles). Despite its name, Bell Circle (the intersection of Routes 1A, 16, and 60 (a.k.a. Mahoney Circle) is not a roundabout or rotary, but rather it is controlled by a set of four traffic signals. Similarly, Copeland Circle is not a roundabout, but comprises a series of weave and merge sections within its rotary-style layout. Because it comprises a series of on- and off-ramps, the Route 1/Route 16 interchange also involves merge locations.

The differences in the types of intersection control are reflected in the traffic operations analysis presented in Section 5.7.

5.2.7 Data Collection

To evaluate the existing operational conditions of the study area, existing traffic volumes were established and validated by conducting several count programs. Initially, bi-directional daily traffic volume data were collected for an entire week in June 2010 along Route 1A (two locations), Route 16, and Route 60, the key roadways surrounding the Project site.

Supplemental daily counts were performed for a full week in July 2012 along Route 1A, as well as at the three site access roads: Tomasello Drive at Route 1A, Tomasello Drive at Route 145, and Furlong Drive.

In addition to daily traffic volumes, manual TMCs were conducted in June 2010 at the majority of the study area intersections. These counts were conducted during the critical Friday evening commuter peak hours and Saturday afternoon hours to analyze the worst case scenario for projected Project trip generation. Where 2010 intersection data was not available, peak period TMCs were performed in April and May 2013, as well as for all additional intersections required in the Secretary's Certificate on the ENF.

To validate the 2010 traffic counts, MassDOT asked that the ATR counts performed at the four arterial locations in 2010 be repeated to determine if traffic levels generally have increased or decreased since that time. ATR counts were performed over the course of a full week in April 2013 at the same locations as the 2010 ATR counts, as follows:

1. Route 1A south of Furlong Drive;
2. Route 1A north of Route 145;
3. Route 60 north of Bell Circle; and
4. Route 16 west of Route 145.

Raw data collection sheets for all counts are included in Attachment A.

A comparison of 2010 and 2013 daily volumes is presented in Table 5-7, including average weekday, Friday, and Saturday volumes. As shown, weekday average daily traffic volumes have decreased consistently between 2010 and 2013, ranging from 2 to 4 percent on Route 1A to 7 percent on Route 60 and 12 percent on Route 16. A similar, but higher, pattern of decreasing traffic volumes between 2010 and 2013 is shown for Friday, with decreases ranging from 3 to 17 percent. Saturday daily volumes between 2010 and 2013 have increased by 3 percent on Route 1A south of Furlong Drive, but have decreased by 1 percent north of Route 145 and by 5 percent on Route 16.

Table 5-7 2010/2013 ATR Comparison Summary

		Weekday ADT[a]			*Friday ADT*			*Saturday ADT*		
Location	*Dir.*	*2010[b]*	*2013[c]*	*% Growth*	*2010[b]*	*2013[c]*	*% Growth*	*2010[b]*	*2013[c]*	*% Growth*
Route 1A	NB	30,323	29,884	**-1%**	31,846	30,545	**-4%**	26,249	28,143	**7%**
(south of Furlong Drive)	SB	30,745	29,870	**-3%**	31,471	30,800	**-2%**	27,734	27,202	**-2%**
	Total	61,068	59,754	**-2%**	63,317	61,345	**-3%**	53,983	55,345	**3%**
Route 1A	NB	23,999	22,994	**-4%**	25,274	23,566	**-7%**	22,525	22,084	**-2%**
(north of Route 145 ramps)	SB	22,527	21,737	**-4%**	23,33	22,302	**-4%**	19,981	20,160	**1%**
	Total	46,526	44,731	**-4%**	48,607	45,868	**-6%**	42,506	42,244	**-1%**
Route 60	NB	19,779	18,473	**-7%**	21,135	19,084	**-10%**	18,477	18,269	**-1%**
(north of Bell Circle)	SB	19,857	18,430*	**-7%**	20,356	n/a	**n/a**	17,499	17,662	**1%**
	Total	39,636	36,903	**-7%**	41,491	n/a	**n/a**	35,976	35,931	**0%**
Route 16	EB	23,963	20,660	**-14%**	25,424	20,858	**-18%**	21,478	20,101	**-6%**
(west of Route 145)	WB	21,521	19,152	**-11%**	22,428	18,716	**-17%**	19,287	18,515	**-4%**
	Total	45,484	39,812	**-12%**	47,852	39,574	**-17%**	40,765	38,616	**-5%**

Source: VHB, Inc.
ADT Average Daily Traffic (vehicles per day)
a Average Daily Traffic (Monday-Friday)
b Based on automatic traffic recorder counts conducted in June 2010
c Based on automatic traffic recorder counts conducted in April 2013
* Southbound data for Route 60 is based only on Monday data as the counter was damaged later in the week n/a
Southbound ATR tube damaged – no Friday data available at this location, so comparison is not available

Based on this analysis, MassDOT confirmed that the 2010 counts are valid as a basis for analysis, particularly as a growth rate of 0.5 percent per year is applied to the 2010 volumes to derive Existing (2012) volumes developed as the baseline for this analysis.

5.2.8 Existing Daily Traffic Volumes

Daily traffic volumes were established by ATR counts at seven locations in June 2010, as presented in Figure 5-8. Off-site ATRs across Routes 1A, 16, and 60 were conducted in April 2013. On-site ATRs, across Tomasello Drive and Furlong Drive, were conducted in July 2012. These counts were performed over a full week (seven-day) period, and include a repetition of the off-site ATRs near the Project site to provide a comparison with 2010 data.

The daily traffic volume information derived from the ATR data is summarized in Table 5-8. In addition to illustrating the pattern of traffic flow in the study area, as influenced by nearby land use and commuting patterns, these data also serve as the basis for identifying the critical analysis and design periods for the Project. As discussed in Section 5.4.1, it was determined that the critical (i.e., worst case) analysis periods for Project-related traffic impacts are the Friday evening peak hour and the Saturday afternoon peak hour, although it should be noted that the peak in Project trips does not coincide with these times due to the projected trip generation characteristics of resort traffic.

Daily traffic patterns from the ATRs show that the most traveled corridor of the locations counted currently is Route 1A south of Furlong Drive, with an average weekday daily traffic of approximately 59,360 vehicles per day. The directional split is slightly greater in the northbound direction towards Revere (57%). Route 16 west of Route 145 has a slightly higher split in the eastbound direction towards Route 1A (57%). On Saturday, traffic on Route 1A is approximately 10% less compared to Friday, the highest volume weekday. At other locations, traffic volume is approximately 2 to 8% lower on Saturday compared to Friday.

The three vehicular access points to the Suffolk Downs site have a combined average weekday daily traffic of approximately 15,940 vehicles per day. Of the 15,940 vehicles per day, 63% of the volume enters/exits on Tomasello Drive south of Route 145, 20% enters/exits on Furlong Drive east of Route 1A, and 17% of the volume enters/exits on Tomasello Drive east of Route 1A. On Tomasello Drive south of Route 145, the majority of traffic is exiting the site during the Friday evening peak hour (63%) and Saturday afternoon peak hour (56%). On Tomasello Drive east of Route 1A, the majority of traffic is entering Suffolk Downs during the Friday evening peak hour (85%) and exiting during the Saturday afternoon peak hour (52%). Traffic on Furlong Drive is mostly exiting Suffolk Downs during the Friday evening peak hour (56%) and entering during the Saturday afternoon peak hour (51%).

Table 5-8 Daily Traffic Volume Summary

Location	Average Weekday[1]				Friday				Saturday			
		Evening Peak Hour				Evening Peak Hour				Afternoon Peak Hour		
	Daily Volume[2]	Total Volume[3]	% of Daily[4]	Directional Split	Daily Volume	Total Volume	% of Daily	Directional Split	Daily Volume	Total Volume	% of Daily	Directional Split
Route 1A (South of Furlong Drive)												
Northbound	29,719	2,213	7.4	57%	30,545	2,075	6.8	54%	28,143	1,927	6.8	53%
Southbound	29,638	1,664	5.6	43%	30,800	1,779	5.8	46%	27,202	1,708	6.3	47%
Total	59,357	3,887	6.5	100%	61,345	3,854	6.3	100%	55,345	3,635	6.6	100%
Route 1A (North of 145 Ramps)												
Northbound	22,851	1,370	6.0	56%	23,566	1,621	6.9	56%	22,084	1,480	6.7	54%
Southbound	21,596	1,073	5.0	44%	22,302	1,267	5.7	44%	20,160	1,242	6.2	46%
Total	44,447	2,443	5.5	100%	45,868	2,888	6.3	100%	42,244	2,722	6.4	100%
Route 60 (North of Bell Circle)												
Northbound	18,320	1,268	6.9	54%	19,084	1,241	6.5	55%	18,269	1,276	7.0	54%
Southbound	18,596*	1,080*	5.8	46%	18,381	1,002	5.5	45%	17,662	1,109	6.3	46%
Total	36,885	2,348	6.4	100%	37,465	2,243	6.1	100%	35,931	2,385	6.6	100%
Route 16 (West of Route 145)												
Eastbound	20,610	1,664	8.1	57%	20,858	1,605	7.7	59%	20,101	1,572	7.8	57%
Westbound	19,261	1,237	6.4	43%	18,716	1,117	6.0	41%	18,515	1,200	6.5	43%
Total	39,871	2,901	7.3	100%	39,574	2,722	6.9	100%	38,616	2,772	7.2	100%
Tomasello Drive (East of Route 1A)												
Eastbound	2,131	238	11.2	82%	2,117	236	11.1	85%	2,253	140	6.2	48%
Westbound	590	51	8.6	18%	574	42	7.3	15%	773	151	19.5	52%
Total	2,721	289	10.6	100%	2,691	278	10.3	100%	3,026	291	9.6	100%
Tomasello Drive (South of Route 145)												
Northbound	5,659	624	11.0	66%	5,548	601	10.8	63%	5,826	529	9.1	56%
Southbound	4,448	318	7.1	34%	4,870	355	7.3	37%	4,811	409	8.5	44%
Total	10,107	942	9.3	100%	10,418	956	9.2	100%	10,637	938	8.8	100%
Furlong Drive (East of Route 1A)												
Eastbound	1,572	91	5.8	41%	1,610	105	6.5	44%	1,575	140	8.9	51%
Westbound	1,533	129	8.4	59%	1,671	131	7.8	56%	1,524	132	8.7	49%
Total	3,105	220	7.1	100%	3,281	236	7.2	100%	3,099	272	8.8	100%

Source: Automatic Traffic Recorder (ATR) counts conducted by VHB, Inc. in July 2012 and April 2013.
Note: Peak hours from the ATRs do not necessarily coincide with the peak hours of the TMCs. Evening peak hour is between 4:00PM and 6:00PM. Saturday peak hour is between 2:00PM and 5:00PM.

1. Average weekday represents average of Monday-Thursday.
2. Two-way daily traffic expressed in vehicles per day (vpd)
3. Two-way peak hour volumes expressed in vehicles per hour (vph)
4. The percent of daily traffic that occurs during the peak hour.

* SB ATR tubes damaged mid-week. Counts estimated based on 2010 ATR at same location.

5.2.9 Peak Hour Traffic Volumes

The Friday and Saturday peak period TMCs were evaluated to identify the peak one-hour (60-minute) period for analysis. The actual peak hour is not necessarily the same at each study location, but occurs between 4:00 PM and 6:00 PM on a weekday and between 2:00 PM and 5:00 PM on a Saturday. For analysis purposes, however, the actual peak for intersections in the vicinity was selected to reflect a conservative (worst case) analysis. In addition, it should be noted that the Friday afternoon peak volumes are generally higher than other weekdays, so the Friday afternoon analysis is more conservative than for other weekdays.

As noted previously, a nominal growth factor of 0.5% per year was applied to 2010 TMCs to establish a consistent 2012 Existing condition baseline, incorporating the April/May 2013 TMCs at the additional study locations. Again, the previous analysis shows that very limited, if any, growth has been experienced on area roadways over approximately the past five years, and indeed volumes at many locations have declined since that time.

The 2012 Existing condition Friday evening and Saturday afternoon peak hour traffic volumes at all study locations are presented in Figures 5-9 (A, B & C) and 5-10 (A, B & C), respectively. Traffic capacity and operational analyses for the 2012 Existing conditions are presented in Section 5.7.

5.2.10 Harbor Tunnels Traffic Volumes

Incomplete traffic volume data are available for the Williams and the Sumner/Callahan tunnels. Available data include:

1. Massport-provided volume data for the Sumner/Callahan Tunnels and eastbound Ted Williams Tunnel (TWT). Westbound TWT data was not available at the time of request. These included the following:

    - Hourly Sumner Tunnel data collected in June 2010 on a Monday through Friday. Saturday & Sunday data were not provided.

    - Average weekday hourly Callahan Tunnel data collected on a Monday through Friday in June 2010. Saturday & Sunday data were not provided.

    - Average hourly eastbound TWT data collected in May and June 2012. The data provided represent an average hourly volume for each day over the course of the months mentioned.

The data indicate that, of the average daily eastbound TWT traffic volume, approximately 60% is destined for Logan International Airport. According to the counts, Friday is the heaviest daily volume in the Sumner Tunnel while Thursday is the heaviest daily volume in the TWT eastbound. Callahan Tunnel data do not provide a breakdown by day.

While the TWT eastbound volume is higher on Thursday evenings, Friday is considered to be the critical day for analysis as it represents the highest projected Project impact to the study area with projected Project traffic volumes 33% higher on an average Friday than an average Thursday, while TWT eastbound daily traffic volumes only show a 1% higher volume on Thursday than Friday.

2. MassDOT volume data are available at the permanent count location 9101 for TWT in both directions from June 2005. While these data are useful for order of magnitude and directional distribution information, the data are somewhat dated for analysis purposes and likely reflect fluctuating changes associated with the CA/T project.

Available raw data for the tunnels are presented in Table 5-9, and calculated and/or adjusted data are presented in Table 5-10.

Table 5-9 Summary of Harbor Tunnel Volume Data (Raw)

Location (Direction)	*Average Weekday Daily Volume (vpd)*	*Friday Daily Volume (vpd)*	*Saturday Daily Volume (vpd)*	*Friday Evening Peak Hour Volume (vph)*	*Sat. Afternoon Peak Hour Volume (vph)*
Callahan Tunnel (EB)	26,310	n/a	n/a	1,874*	n/a
Sumner Tunnel (WB)	25,883	28,312	n/a	1,687	n/a
Ted Williams Tunnel (EB)	41,780	42,403	34,374	2,812	2,207
Ted Williams Tunnel (WB)	n/a	37,359^	27,711^	1,989^	1,562^

Source: Massport Authority/MassDOT (Loc. 9101) – Callahan and Sumner data collected June 2010; TWT EB data collected June 2012; TWT WB data collected June 2005

^ Data from 2005 is considered outdated, especially due to CA/T redistribution of regional highway travel patterns

* Represents average weekday peak – day of week breakdown not available

n/a Data not available at time of DEIR/EPNF filing

vpd Vehicles per Day

vph Vehicles per Hour

Table 5-10 Summary of Harbor Tunnel Volume Data (Calculated/Adjusted)

Location (Direction)	*Average Weekday Daily Volume (vpd)*	*Friday Daily Volume (vpd)*	*Saturday Daily Volume (vpd)*	*Friday Evening Peak Hour Volume (vph)*	*Sat. Afternoon Peak Hour Volume (vph)*
Callahan Tunnel (EB)	26,574	n/a	n/a	2,076*	n/a
Sumner Tunnel (WB)	26,142	28,596	n/a	1,704	n/a
Ted Williams Tunnel (EB)	41,780	42,403	34,374	2,812	2,207
Ted Williams Tunnel (WB)	n/a	38,323^	29,199^	1,829^	1,579^

Source: Massport Authority/MassDOT (Loc. 9101) – Callahan and Sumner data collected June 2010; TWT EB data collected June 2012; TWT WB data collected June 2005

^ Data from 2005 is considered outdated, especially due to Big Dig redistribution of regional highway travel patterns

* Represents average weekday peak – day of week breakdown not available

n/a Data not available at time of DEIR/EPNF filing

vpd Vehicles per Day

vph Vehicles per Hour

5.2.11 Existing Project Site Traffic

Under existing conditions, the Project site generates trips associated with the Suffolk Downs racetrack which, although somewhat seasonal in nature, is operational throughout the year. In addition, the three vehicular site access points (Route 1A/Tomasello Drive, Route 145/Winthrop Avenue/Tomasello Drive, and Route 1A/Furlong Drive) attract other users not associated with the Project site itself. These include trips associated with the retail plaza abutting the site on Furlong Drive and un-related trips that utilize Tomasello Drive as a connection between Route 1A and Route 145/Winthrop Avenue.

It is difficult to distinguish accurately between different users of the three site access points, but the aggregate traffic volumes on each access road are identified in the Friday evening and Saturday afternoon peak turning movement network figures. Based on the daily driveway volumes presented previously in Table 5-8, approximately 63% of total existing driveway volumes use Tomasello Drive at Route 145, compared to approximately 17% on Tomasello Drive at Route 1A and 20% on Furlong Drive.

5.2.12 Crash Analysis

Study-area crash data were obtained from MassDOT records for the three-year period from January 2008 through December 2010. At the time the analysis was performed, this was the most recent data available.

Analysis of the crash data is summarized in the Table 5-11. The table includes the calculated crash rates (i.e., number of reported crashes per million entering vehicles) based on the Friday afternoon peak traffic volumes. A detailed summary by crash type is included in Attachment A.

The average crash rates at signalized intersections are 0.77 and 0.76 for District 4 and District 6, respectively, and for unsignalized intersections the average crash rates are 0.58 for both District 4 and District 6. Within the study area, all unsignalized intersections fall below the average crash rate. There are 13 signalized intersections that are at or below the average crash rate for their respective district, with no fatalities. Four signalized locations are above the average crash rate or involved a fatality, as follows:

5. Bennington Street & State Road at Winthrop Avenue;
8. Winthrop Avenue (Route 145) at Route 16 & Harris Street;
19. Route 16 at Garfield Avenue & Webster Avenue; and
26. Route 1A (North Shore Road) at Revere Street.

The number of crashes at most intersections below the average crash rate declined each year from 2008 to 2010. Most crashes at these locations were angle and rear end, causing property damage only. The crashes primarily occurred on weekdays outside of the peak hour on dry pavement. Of all the crashes at these intersections, only seven involved non-motorists.

Currently there are no metrics for average crash rates at roundabouts and interchanges. The crash rates for these intersections are all much higher than the average crash rate at a signalized intersection. Copeland Circle has the highest crash rate, over double the rate of all the traffic circles. Also, there was one fatal crash each at Copeland Circle, Butler Circle, and Bell Circle during the 2008 to 2010 analysis period.

The majority of these crashes were rear-end, angle, and single vehicle crashes. They were primarily property damage only, occurring on weekday and weekends outside of the peak hours on dry pavement.

Table 5-11 MassDOT Crash Analysis Summary

Intersection		*Total Crashes (3-year period)*	*Calculated Crash Rate*	*Average Crash Rate (District)*	*Intersection Type*
1	Route 1A / Suffolk Downs / Tomasello Drive	2	0.04	0.58 (6)	Unsignalized
2	Route 1A / Furlong Drive	8	0.29	0.58 (4)	Unsignalized
3	Winthrop Ave (Route 145) / Route 1A On-Ramp	39	0.60	0.77 (4)	Signalized
4(a)	Winthrop Ave (Route 145) / North Shore Road	18	0.45	0.77 (4)	Signalized
4(b)	Winthrop Ave (Route 145) / Tomasello Drive	19	0.50	0.77 (4)	Signalized
5	Bennington St & State Road / Winthrop Ave	20	0.91	0.77 (4)	Signalized
6	Bennington Street / Saratoga Street	21	0.75	0.76 (6)	Signalized
7	Route 1A / Boardman Street	10	0.19	0.76 (6)	Signalized
8	Winthrop Ave (Route 145) / Route 16 / Harris St	52	1.04	0.77 (4)	Signalized
9	Bell Circle (System)	97	n/a	(4)	Signalized
10	Ocean Ave & State Rd / Revere Beach Pkwy	12	0.43	0.77 (4)	Signalized
11	Eliot Circle	25	n/a	(4)	Roundabout
12	Route 1A Jughandle	11	0.23	0.77 (4)	Signalized
13(a)	Bennington Street / Neptune Road	6	0.21	0.77 (4)	Signalized
13(b)	Neptune Rd / Rte. 1A NB Off-Ramp/ Vienna St	2	0.11	0.77 (4)	Signalized
14	Butler Circle	55	n/a	(4)	Roundabout
15	Revere St / American Legion Highway (Rte. 60)	18	0.44	0.77 (4)	Signalized
16	Brown Circle	88	n/a	(4)	Rotary
17	Copeland Circle	224	n/a	(4)	Interchange
18	Route 1 / Route 16	33	n/a	(4/6)	Interchange
19	Route 16 / Garfield Avenue & Webster Avenue	61	1.12	0.76 (6)	Signalized
20	Route 1A / Waldemar Avenue	1	0.04	0.58 (6)	Unsignalized
21	Bennington Street at Crescent Avenue	0	0.00	0.58 (4)	Unsignalized
22	Route 1A SB at Curtis Street	2	0.07	0.58 (6)	Unsignalized
23	Neptune Road at Saratoga Street	0	0.00	0.58 (6)	Unsignalized
24	Neptune Road at Bremen Street	1	0.11	0.58 (6)	Unsignalized
25	Rte. 1A (North Shore Rd) at Wonderland Station	10	0.28	0.77 (4)	Signalized
26	Route 1A (North Shore Road) at Revere Street	20	0.45	0.77 (4)	Signalized
27	Route 60 (Squire Road) at Charger Street	8	0.18	0.77 (4)	Signalized
28	Rte. 60 (Squire Rd) at Sigourney St/Mall Driveway	12	0.27	0.77 (4)	Signalized

Source: MassDOT

5.2.13 Parking

A substantial portion of the Project site comprises surface parking, with a total capacity of approximately 6,000 spaces. Parking areas are generally defined by surface striping and limited raised curbing. Although crosswalks are marked along Tomasello Drive, there are no sidewalks or formal pedestrian walkways on the site. Relatively limited on-site parking occurs on a day-to-day basis, other than during racing season when up to approximately 1,200 cars are parked during the peak time (Saturday at 3:00 PM).

Off-site parking in the vicinity of the site is presented in Figure 5-11. While some time-restricted on-street parking is available, portions of the abutting residential neighborhoods are controlled by Resident Parking Permit restrictions. Limits of the East Boston and City of Revere Resident Parking Permit zones and time-restricted parking largely cover residential streets that are within easy walking distance of the MBTA stations, as a restriction to deter commuter parking in the neighborhoods.

The approximately 110-space MBTA parking lot at Suffolk Downs is typically fully occupied during weekdays, reflecting the level of park-and-ride activity associated with the Blue Line station.

5.3 2022 No-Build Traffic Projections

This section describes the projection of traffic volumes over a 9- to 10-year period to the 2022 horizon year assuming that the proposed Project is not built. The projections comprise general background growth due to regional growth and traffic associated with specific planned developments or transportation projects.

5.3.1 Background Growth

To inform the annual growth rate, MassDOT provided sample traffic growth projections developed by the Central Transportation Planning Staff (CTPS) for the 25-year period from 2009 to 2035, expressed as Vehicle Miles Travelled (VMT). This period encompasses both the 2012 Build analysis year and the 2032 Route 1A infrastructure design year analysis. Data include projections for Everett, Chelsea, and East Boston, and distinguish between "Freeway" and "Arterials/Local" roadways. The "Arterial/Local" data are presented in Table 5-12 below.

Table 5-12 CTPS Vehicle Miles Traveled (VMT) Growth Projections between 2009 and 2035

Time Period	*Arterial Vehicle Miles Traveled* [a]		*% Annual Growth* [b]	*% Cumulative Growth* [c]
	2009	*2035*		
AM Peak [d]	213,600	219,040	**0.1%**	2.5%
PM Peak [d]	139,100	140,060	**0.0%**	0.7%
Night [d]	180,570	188,040	**0.2%**	4.1%
Daily [e]	645,170	659,090	**0.1%**	2.2%

Source: CTPS (Central Transportation Planning Staff)/ MassDOT
a Arterial VMT in Everett, Chelsea, and East Boston
b Percent growth per year
c Percent cumulative growth from 2009 to 2035
d Presented as vehicle miles traveled per hour
e Presented as vehicle miles traveled per day

As clearly shown in Table 5-12, the state's projections for background regional growth in traffic are relatively limited, with only 0.1 percent growth per year during morning peak periods (yielding cumulative 2.5 percent by 2035), but no growth projected during evening peak periods. For nighttime, 0.2 percent growth per year is projected (yielding cumulative 4.1% by 2035), and on a daily basis 0.1 percent growth per year is projected (yielding cumulative 2.2% by 2035).

As agreed by MassDOT, a conservative (high) 0.5 percent per year background growth rate is incorporated in this analysis (in addition to the specific planned projects as noted previously). This will represent a conservative analysis, and will make allowance for projects not yet in the cities' planning processes, as documented in the following section. Growth from 2012 at 0.5 percent per year would yield cumulative growth of 5.1 percent by 2022 and 10.5 percent by 2032, significantly less than what is predicted in the CTPS model.

5.3.2 Planned Projects

In addition to regional background, traffic associated with other projects under construction or in the planning process is included in the No-Build condition projections. The cities of Boston and Revere identified the following projects for consideration, the locations of which are presented in Figure 5-12:

Revere Projects:

- Market Basket, consisting of approximately 83,000 square feet of retail;
- Verizon, an approximately 4,000-square foot retail store;
- Tedeschi Food Mart, approximately 4,700 square feet;

- Wonderland Market Place, consisting of approximately 62,000 square feet of retail;
- Harley Davison, a 40,000-square-foot specialty retail store;
- A Mobil gas station with approximately 10 pumps and 4,500 square feet of retail;
- A Prime gas station with approximately 10 pumps and 2,200 square feet of retail;
- Ward Street Residential, consisting of approximately 261 units;
- 526-646 Revere Beach Boulevard, an approximately 145-unit residential development;
- 525 Beach Street, an approximately 35-unit residential development;
- Thayer Avenue, an approximately 45-unit residential development;
- 55 Revere Beach Boulevard, consisting of approximately 55 residential units;
- Waterfront Square (Parcel I), consisting of approximately 194 residential units;
- Waterfront Square (North Lot), consisting of approximately 500 residential units;
- Wonderland Greyhound Track, a mixed-use development;
- Waterfront Square (Parcel H), a project involving approximately 400 hotel rooms, 149 residential units, and 50,000 square feet of retail;
- 197 Broadway, consisting of approximately 40 residential units and 4,000 square feet of retail'
- Wonderland Ballroom site, consisting of approximately 200 hotel rooms;
- Shaw's site, which is in the planning stage for an approximately 300-room hotel;
- For Kids, an academic facility for approximately 120 students;
- An elementary school relocation for approximately 690 students; and
- Della Russo stadium, which will seat approximately 2,000.

East Boston Projects:

- Clippership Wharf, consisting of approximately 400 residential units;
- Portside at Pier 1, consisting of approximately 178 residential units;

- Boston East, with approximately 191 residential units;
- Hodge Boiler Works, consisting of approximately 95 residential units;
- New Street Development, with approximately 224 residential units and a 235,000-square-foot hotel;
- 415 McClellan Highway, an approximately 117,060-square-foot hotel and retail project; and
- An approximately 42,800-square-foot Charter School.

Weekday afternoon peak and Saturday afternoon peak associated with each project was incorporated in the No-Build networks in one of the following ways:

1. Estimated traffic impacts available from studies or environmental documents;
2. Performed a trip generation, trip distribution and/or trip assignment analysis;
3. Project already included in background regional traffic growth;
4. Project already included in existing traffic counts; or
5. Project is too small or remote from the Project study area to have any meaningful effect.

As part of the proposed Project, major new roadway infrastructure will be constructed on Route 1A in the vicinity of the site, but these improvements will not be funded and, since they are not otherwise programmed, will not be built if the Project does not proceed, and therefore are not reflected in the 2017 No-Build conditions.

5.3.3 Use of Project Site

The proposed Project will retain the existing racetrack operations at Suffolk Downs. In the event that the Project does not proceed, however, it is anticipated that the racetrack function will not be sustainable in the long term, and that more realistically the entire Suffolk Downs site might be developed for some form of mixed-use development. This potential outcome is not anticipated in the near term, however, and therefore the potential traffic associated with such a build-out is not included in the 2022 No-Build traffic projections.

5.3.4 Peak Hour No-Build Traffic Volumes

The 2012 Existing condition traffic volumes were adjusted and projected to a ten-year 2022 No-Build condition based on the foregoing assumptions. The projected traffic turning movement volumes at all study intersections for the Friday evening and Saturday afternoon peak hours are presented Figures 5-13 (A, B & C) and 5-14 (A, B & C), respectively.

Traffic capacity and operational analysis for the 2022 No-Build conditions are presented in Section 5.7.

5.4 2022 Build Conditions

This section describes the projected travel demand for the Project by all modes and the development of the 2022 Build condition traffic volumes on study area roadways for analysis of potential traffic impacts. The latter were developed by distributing the Project-generated vehicular traffic volumes geographically, and assigning them to the study area roadways. Project-generated transit trips are presented in Section 5.7.

5.4.1 Project Travel Demand

The Institute of Transportation Engineers (ITE) Trip Generation manual does not contain guidance appropriate to the primary proposed Project land use. Therefore, the Project trip generation projections are based on research of data for other comparable projects, and information provided by the Proponent including proprietary data for existing gaming venues and projected data for its proposed operations at Suffolk Downs. A synthesis of information and data used in the development of the Project travel characteristics and trip generation is included in Attachment A.

5.4.2 Trip Generation Characteristics

The trip generation characteristics of the proposed Resort are unique to this type of proposed land use. In addition, the general travel demand characteristics must be adjusted to reflect the unique geographic location of the proposed Project and its supporting transportation infrastructure.

Project trip generation will vary by both day of week and time of day, and is based on the arrival and departure patterns at numerous existing Caesars resorts, as projected for this Project. As shown in Table 5-13, approximately 55% of the weekly gaming activity is expected to occur on Friday, Saturday, and Sunday.

Table 5-13 Project Activity by Day-of-Week

Day of Week	*% of Weekly Activity*
Monday	10%
Tuesday	10%
Wednesday	12%
Thursday	13%
Friday	18%
Saturday	20%
Sunday	17%

Source: Caesars Resort patron data

Since the proposed Project will operate 24 hours per day, there is significant variation in trip generation throughout the day. It is important to note that the hourly distribution for employees is different than for patrons. In addition, it should be noted that, although there will be employee shift changes, they will not create distinctly concentrated peaks in trip generation, as there will be a wide range of employee types with differing shift changes that will not necessarily coincide.

Table 5-14 presents the projected arrival and departure patterns for Project trips for an average weekday by percentage of the entire day. The distribution by time of day is based on an analysis of data for other gaming facilities owned or operated by Caesars. It should be noted that, because patrons constitute the majority of trips generated by the proposed Project, it is the pattern of patron trips that largely determines the distribution of total trips over the course of the 24-hour day.

Table 5-14 Average Weekday Hourly Trip Patterns

Time of Day[1]	*Percentage of Patron Trips*		*Percentage of Employee Trips*	
	Entering	*Exiting*	*Entering*	*Exiting*
12:00AM	2.2%	3.3%	3.4%	5.0%
1:00AM	1.6%	2.9%	2.4.%	5.6%
2:00AM	1.3%	2.4%	2.2%	5.0%
3:00AM	0.7%	1.8%	1.9%	4.3%
4:00AM	0.6%	1.3%	1.4%	3.2%
5:00AM	0.6%	1.1%	1.4%	3.2%
6:00AM	0.7%	0.8%	2.2%	2.2%
7:00AM	1.0%	1.0%	3.7%	2.4%
8:00AM	1.7%	1.4%	3.6%	1.5%
9:00AM	3.1%	2.2%	6.0%	2.5%
10:00AM	4.6%	3.0%	8.9%	3.5%
11:00AM	5.8%	4.0%	6.7%	6.6%
12:00PM	6.2%	5.0%	6.3%	3.9%
1:00PM	6.3%	5.8%	8.8%	5.0%
2:00PM	5.9%	5.9%	4.9%	3.2%

Table 5-14 Average Weekday Hourly Trip Patterns (Continued)

Time of Day[1]	*Percentage of Patron Trips*		*Percentage of Employee Trips*	
	Entering	*Exiting*	*Entering*	*Exiting*
3:00PM	5.7%	6.0%	4.0%	3.9%
4:00PM	6.0%	5.9%	6.6%	4.3%
5:00PM	6.7%	6.7%	5.1%	3.3%
6:00PM	7.6%	6.9%	5.1%	4.8%
7:00PM	8.4%	7.3%	3.7%	5.5%
8:00PM	7.3%	6.9%	2.9%	4.3%
9:00PM	6.5%	6.8%	3.8%	5.2%
10:00PM	5.3%	6.2%	2.8%	6.5%
11:00PM	4.1%	5.5%	2.1%	4.8%
TOTAL	100%	100%	100%	100%

Source: Caesars Resort employee and patron data

[1] Hour commencing

On an hourly basis, the proportion of trips is very limited during the morning commuter peak period, and increases over the morning to a relatively constant level throughout the afternoon. Most notably, the peak in Project trips does not occur during the evening peak commuter period, but peaks at a later time in the early evening around 7:00 PM. On Saturdays, the Project peak occurs slightly later than on a weekday, at around 8:00 PM. Accordingly, the Project will not create a combination of peak Project trips with peak commuter trips. Nonetheless, as noted previously, the critical analysis periods for traffic operations are the Friday evening commuter peak hour and the Saturday afternoon peak hour.

5.4.3 Trip Generation Methodology

An extensive review of other gaming resorts in the U.S. was performed to establish trip generation rates for Project patrons. The initial review included the following locations:

- Sugarhouse, Philadelphia, PA;
- Harrah's – Columbus, Philadelphia, PA;
- Harrah's – Station Square, Philadelphia, PA;
- Crossroads – Gettysburg, Adams, PA;
- Coulitz Indian, Clark County, WA;

- Par-a-dice Casino, East Peoria, IL;
- Twin River Casino, Lincoln, RI;
- Casino at Ocean Downs, Berlin, MD;
- Newport Grand Slots, Newport, RI;
- Aqueduct Racetrack, New York, NY; and
- Horseshoe, Cleveland, OH.

In addition, a research report prepared to guide the Gaming Commission in Philadelphia, Pennsylvania was reviewed, as were data and traffic generation estimates for various filings in Massachusetts prepared in connection with the ongoing permitting of other proposed resort casinos. Information gathered for these gaming facilities included location, land-use context, program, parking, transit service, mode share, vehicle occupancy, trip generation and directional information. The information gathered is included in Attachment A. The research yielded much information and data to inform the trip generation analysis for the proposed Project, but the vast majority of the data obtained is based on studies rather than actual data collection. Some actual data were available for the Twin River Casino, Casino at Ocean Downs, and Newport Grand Slots locations, but these locations appear to yield somewhat low trip generation rates and are not considered to be good comparable gaming facilities as they do not offer live table games. Further, with the exception of Aqueduct and Cleveland Horseshoe, none of the locations are well-served by transit, unlike the Project site which enjoys rapid transit service at the site itself.

Sugarhouse in Philadelphia, for which actual counts are available, is a reasonably comparable gaming location, and these counts yielded trip generation rates that are generally consistent with most of the study rates. While trip rates derived from the Sugarhouse counts provided a first benchmark for the analysis, it was considered that additional count data were necessary to validate the rates. Accordingly, the Proponent identified the following selected locations, two of which include racetracks, as candidate locations that might yield comparable data for locations close to major cities:

- Parx Philadelphia Casino and Race Track, Bensalem, PA;
- Horseshoe Hammond Casino, Hammond, IN; and
- Chester Harrah's Casino and Race Track, Chester, PA.

Traffic counts were conducted at all three locations during March and April 2013. Counts for Hammond and Chester, both operated by Caesars, comprised hourly counts over the course of an entire week, while at Parx, which is not operated by Caesars, manual traffic counts were performed at access points for the site during the Friday evening and Saturday afternoon peak periods. Data collection sheets are included in Attachment A.

Results of the counts are summarized in Table 5-15 along with the trip rates per gaming position derived for each location on the Friday and Saturday peak hours. The number of gaming positions is the most commonly-used variable upon which trip generation is derived. It should be noted that none of the three selected locations enjoys rapid transit access, and local bus service is relatively limited. Therefore, while the counts record actual numbers of vehicles, the vehicular trip rates effectively account for all patrons and employees entering and exiting those facilities and are more than what is expected at the Project site, which has the benefit of readily available transit access and good bus service.

Table 5-15 Comparable Vehicle Trip Generation Rates Summary

Location	*Number of Gaming Positions*		*Direction*	*Friday Evening Peak Hour* *Trips*	*Trip Rate*	*Saturday Afternoon Peak Hour* *Trips*	*Trip Rate*
Parx Philadelphia Casino & Race Track	Slots	3,535	In	922	0.19	932	0.19
	Tables	1,248	Out	859	0.18	1,243	0.26
	Total	**4,783**	**Total**	**1,781**	**0.37**	**2,175**	**0.45**
Horseshoe Hammond Casino	Slots	3,015	In	384	0.09	416	0.10
	Tables	1,035	Out	435	0.11	594	0.15
	Total	**4,050**	**Total**	**819**	**0.20**	**1,010**	**0.25**
Chester Harrah's Casino & Race Track	Slots	2,832	In	845	0.23	642	0.17
	Tables	849	Out	717	0.19	492	0.13
	Total	**3,681**	**Total**	**1,562**	**0.42**	**1,134**	**0.31**

Source: Counts performed by VHB, March/April 2013

Of the three locations, Horseshoe Hammond yields the lowest vehicle trip rates at 0.20 and 0.25 per gaming position for the Friday and Saturday peak hours, respectively. Parx yields rates of 0.37 and 0.45 vehicle trips per gaming position for Friday and Saturday peak hours, respectively, while Chester yields rates of 0.42 and 0.31 vehicle trips per gaming position for Friday and Saturday peak hours, respectively. Because the Hammond rates are so much lower, they were eliminated from the analysis, and the average peak hour trip rates of Parx and Chester were used for the DEIR/EPNF Friday evening peak hour analysis. For the Saturday afternoon peak hour, these rates were adjusted based on daily and hourly distribution of Project trips. Corresponding trip rates incorporated in the analysis are as follows:

- Friday: 0.21 In + 0.19 Out = 0.40 Total vehicle trips per gaming position.
- Saturday: 0.23 In + 0.18 Out = 0.41 Total vehicle trips per gaming position.

As noted previously, the vehicular trip rates established by counts for the comparable locations account for all patrons and employees entering and exiting those facilities, as all access for patrons and employees essentially relies on vehicular modes.

To determine trip generation by mode for the proposed Project, mode share and vehicle occupancy parameters were established for patrons and employees separately, as described in the following sections.

5.4.4 Projected Project Person Trips

The numbers of patrons and employees projected by the Caesars patron gravity model and employment projections for the Project are presented in Table 5-16. As shown, approximately 28,500 average daily person trips are projected for the Project, but, as noted previously, there is significant variation in daily trips, particularly between weekends, Fridays, and other weekdays. Approximately 55% of person trips each week are expected to be generated on Friday, Saturday, and Sunday combined, with the highest daily person trip generation, 39,320, occurring on Saturday. Approximately 4,400 and 4,500 person trips are projected for the Friday and Saturday peak hours, respectively.

Table 5-16 Project Person Trip Generation

Person Type	*Average Weekday*	*Average Daily*	*Friday*		*Saturday*	
			Daily	*Evening Peak*	*Daily*	*Afternoon Peak*
Patrons	23,674	26,773	32,992	4,200	37,148	4,152
Employees	1,645	1,743	2,222	187	2,171	314
Total	**25,319**	**28,516**	**35,214**	**4,387**	**39,319**	**4,466**

Note: Person trips are expressed as total entering and exiting

5.4.5 Mode Share and Vehicle Occupancy

As previously discussed, the Project will benefit from very good MBTA transit services. Indeed, it is unusual for a resort gaming facility to enjoy rail transit access with an immediately adjacent station (Suffolk Downs Station).

While a significant number of patrons are expected to use the MBTA or shuttle service provided by the Project, these modes will be more heavily used by employees, particularly as a result of the incentives in the TDM plan. Also, there will be a measurable component of walking and bicycle trips from the surrounding residential neighborhoods, especially with regards to employee trips.

The derivation of mode share and vehicle occupancy for patrons and employees is described separately in the following sections, and the resulting mode share and vehicle occupancy parameters for the Project are summarized in Table 5-17.

5.4.5.1 Patrons

Mode share for Project patrons is partially based on information from Caesars, where approximately 5% of patrons travel to the resorts by private coach or shuttle. For rapid transit access provided by the MBTA Blue Line, however, an analysis of the penetration of MBTA rapid transit service within the patron catchment area established by Caesars' gravity model for the Project was performed.

In brief, the transit penetration analysis identified the availability of MBTA stations within each zip-code, thereby establishing the number of patrons with access to transit for their journey to and from the Project. The number of patrons in each relevant zip-code was then adjusted as follows:

1. The geographic location of the station relative to the residential areas within the zip-code; and

2. Application of existing mode share for the location based on mode shares required for analysis in traffic studies prepared for BTD. This information is derived from the City of Boston Access 2000-2010 Citywide Transportation Plan.

The resulting projections of patrons from each zip-code expected to choose MBTA transit as their mode of travel to and from the Project were aggregated, resulting in a projected 11% patron transit mode share. While some patrons are expected to travel to the casino by bicycle or walking, this was not factored into the analysis to provide a conservative (i.e., worst case) traffic analysis.

Average vehicle occupancy for patron cars was established to be 2.0 patrons per car, based on characteristics at other Caesars locations, and an average vehicle occupancy of 30 patrons was used for private coaches and shuttles.

5.4.5.2 Employees

A 10% transit use factor by employees at the Horseshoe Casino in downtown Cleveland, which is located directly above a downtown subway station, was used as a basis to most closely approximate access to transit at any of the sites studied with that offered at the

Project site. However, the transit mode share was adjusted to reflect the significantly different intensity of transit use in Boston compared to Cleveland. This adjustment was determined based on an analysis of overall transit mode share in the Greater Cleveland area compared to the Boston region.

This analysis yielded a three-fold difference between Boston and Cleveland, resulting in a projected 30% transit share for Project employees. As noted above, a limited number (estimated at less than 50) of parking spaces will be available for key management and essential employees at the site. The remaining employees are expected to access the site via a ground shuttle sponsored by the Proponent, with the exception of employees with disabilities who will be able to use designated spaces on-site.

Average vehicle occupancy for employees was based on US 2000 Census Journey to Work data from local census tracts surrounding Suffolk Downs.

It should also be noted that, while the Proponent's policy of limiting employee parking at the Project site (in favor of a ground shuttle program) may have the effect of encouraging more employees to use transit, the Proponent does not expect that the number of additional employees opting for transit will be measurable (as a percentage of total transit trips) to change the assumptions presented in the analysis.

Table 5-17 Mode Shares and Vehicle Occupancy

	Patrons		*Employees*	
Mode	*Mode Share*	*AVO*	*Mode Share*	*AVO*
Auto/Taxi	84%	2.0	63%	1.2
Public Transit	11%	-	30%	-
Shuttle Bus/Coaches	5%	30.0	-	-
Walk/Bike	< 1%	-	7%	-
Total	**100%**	-	**100%**	-

5.4.6 Projected Project Trips

Based on the previously described trip rates, mode share, and vehicle occupancy established for the Project, the projected average daily Project patron and employees trips by mode are presented in Table 5-18.

Table 5-18 Average Daily Trips by Mode

Daily Trip Type by Mode	*Patrons*	*Employees*	*Total*
Visitations (Persons)	*26,773*	*1,743*	*28,516*
Person Trips (Enter + Exit)	**53,546**	**3,486**	**57,032**
Person Trips by Auto/Taxi (84% Patrons, 63% Employees)	44,716	2,196	46,912
Vehicle AVO	2.0	1.2	n/a
Auto/Taxi Trips	22,358	1,830	24,286
Person trips by Shuttle/Coach (5% Patrons)	2,940	-	2,940
Shuttle/Coach AVO	30.0	-	n/a
Shuttle/Coach Trips	98	-	98
Total Vehicle Trips	***22,456***	***1,830***	***24,286***
Public Transit Trips * (11% Patrons, 30% Employees)	5,890	1,046	6,936
Walk/Bike Trips (Negligible % Patrons, 7% Employees)	Limited	244	244
Total Non-Vehicle Trips	***5,890***	***1,290***	***7,180***

Note: Daily trip generation is expressed in "trips per day, enter + exit"
* Transit trips are based on daily demand. In practice, during the night-time period when MBTA service is not available, those transit trips will shift to earlier or later times, or be diverted to vehicular modes.

Resulting projections of total Project trips (patrons and employees combined) for the average day, Friday evening peak, and Saturday afternoon peak hours by each mode are presented in Table 5-19.

Table 5-19 Project Trip Generation by Mode

Trip Type	Enter/Exit	Average Daily				Friday Evening Peak Hour				Saturday Afternoon Peak Hour			
		Autos/ Taxis	Shuttles/ Coaches	Public Transit	Walk/ Bike	Autos/ Taxis	Shuttles/ Coaches	Public Transit	Walk/ Bike	Autos/ Taxis	Shuttles/ Coaches	Public Transit	Walk/ Bike
Patrons	Enter	11,179	49	2,945	-	917	4	240	-	949	4	249	-
	Exit	11,179	49	2,945	-	847	3	222	-	794	3	208	-
	Total	22,358	98	5,890	-	1,764	7	462	-	1,743	7	457	-
Employees	Enter	915	-	523	122	59	-	34	8	116	-	66	15
	Exit	915	-	523	122	39	-	22	5	50	-	28	7
	Total	1,830	-	1,046	244	98	-	56	13	166	-	94	22
TOTAL	**Enter**	**12,094**	**49**	**3,468**	**122**	**976**	**4**	**274**	**8**	**1,065**	**4**	**315**	**15**
	Exit	**12,094**	**49**	**3,468**	**122**	**886**	**3**	**244**	**5**	**844**	**3**	**236**	**7**
	Total	**24,188**	**98**	**6,936**	**244**	**1,862**	**7**	**518**	**13**	**1,909**	**7**	**551**	**22**

A portion of the Resort vehicle trips will comprise existing trips, including the following:

- trips passing the site or diverted from other parts of the local roadway network;
- trips associated with the existing retail plaza;
- trips passing through the site between Route 1A and Route 145; and
- trips associated with the existing racetrack, including employees and visitors, who will also use the new Resort facilities.

To present a conservative (worst case) analysis, no trip "credits" have been applied to these diverted existing trips, and the total Project trips presented in Table 5-19 are incorporated into the 2022 Build analysis. As shown, the Project would generate approximately 1,869 vehicle (auto, taxi, shuttle and coach combined) trips (total entering and exiting) in the critical Friday afternoon peak analysis hour including patrons and employees. Total Project vehicle trip generation during the Saturday afternoon peak hour would be slightly higher, at approximately 1,916 vehicle trips.

5.4.7 Vehicular Trip Distribution & Assignment

The geographic directional distribution of Project trips is a function of several variables including the relative locations and densities of population, competing land uses, existing travel patterns, and the efficiency of roadways leading to the Project site. The

geographic distribution of patron trips and employee trips will be different. The following section explains the methodology applied to the patron and employee vehicular trip distribution.

Patrons

- Trip distribution patterns were developed based on the gravity model prepared by Caesars that has been proven in other locations and yields the geographic distribution of patrons by community or zip-code. This gravity model accounts for gaming competition, the attractiveness of the facility, and the location of the facility relative to the patron's location.
- The distribution is adjusted as described in Section 5.4.5 to account for transit penetration.
- Patron vehicle trips were then assigned to the regional and local highway network based on existing travel patterns and route choices available to drivers.
- MassDOT expressed concern that the distribution of vehicle trips from the Caesars gravity model did not reflect the overall regional traffic distribution. Accordingly, the model distribution was adjusted to shift more trips to the I-93 Southeast Expressway, resulting in a five percentage point shift of Project vehicle trips from the Sumner/Callahan tunnels to the TWT.

Employees

- Trip distribution patterns were developed based on the 2000 U.S. Census Journey to Work data for Census tracts 511, 1707, and 1708 which encompass the Project site as well as abutting communities, adjusted to recognize commitments the Proponent has made with respect to local employment and the fact that, with the exception of employees with disabilities, key management, and essential personnel (estimated at less than 50), no employee parking will be located at the Project site.
- Employee vehicle trips were then assigned to the regional and local highway network based on existing travel patterns and route choices available to drivers.
- Availability of alternative modes of transportation is considered when establishing a vehicular trip distribution for the region. Reasonably convenient access to transit allows more person trips from the metro-Boston area to access the property via transit; accordingly, the vehicular trip distribution was adjusted to account for this penetration. Local bus route access was also a key component of the employee trip distribution as the Journey to Work data indicated a significant proportion of employees will reside within the local study area.

- Employee vehicle trips were then assigned to the regional and local highway network based on existing travel patterns and route choices available to drivers. Employees were considered to potentially be more inclined to take alternative "more informed" routes to work than patrons.

A further factor in the assignment of Project trips is the impact of tolls returning westbound through the Sumner Tunnel. It is expected that some trips arriving through the Callahan Tunnel will depart via Route 16 to access I-93 North to avoid paying a toll. Project trip distribution and assignment reflects an outbound trip diversion of 11% for patrons and 3% for employees to Route 16 to avoid paying the toll.

The overall regional distribution and assignment of Project vehicle trips is summarized in Table 5-20. Figures 5-15 (A & B) present patron and employee vehicular trip distribution, respectively.

Table 5-20 Project Vehicular Trip Distribution by Direction

	Patron Vehicle Trips[1]		*Employee Vehicle Trips*[2]	
Travel Route	*Inbound*	*Outbound*	*Inbound*	*Outbound*
Route 1A (to/from north)	2%	2%	9%	9%
Route 107	2%	2%	8%	8%
Route 1	18%	18%	6%	6%
I 90 (Mass Pike)/ Ted Williams Tunnel[3]	44%	44%	24%	24%
Route 1A/ Sumner-Callahan Tunnels[3]	25%	14%	5%	2%
Route 16	7%	18%	8%	11%
Local communities	2%	2%	40%	40%
Total	**100%**	**100%**	**100%**	**100%**

1 Regional data based on Caesars Gravity Model
2 2000 U.S. Census Journey to Work data for Census Tracts 511, 1707 and 1708
3 Includes shift of patron trips requested by MassDOT, as discussed above

The choice of routes by drivers to get to and from the Project site access points will be influenced by significant roadway infrastructure improvements. As noted previously, the Project includes major off-site roadway, traffic, and safety improvements, specifically construction of major new roadway infrastructure on Route 1A in the vicinity of the site. The proposed roadway changes are described in detail in Sections 5.5 and 5.6.

The assignment of trips to the roadway network reflects the foregoing considerations of choice of route by drivers and projected Project vehicle trips assigned to the study area roadway intersections. Resulting patron vehicular Project trips are presented for Friday

evening and Saturday afternoon peak hours in Figures 5-16 (A, B & C) and 5-17 (A, B & C), respectively. Employee vehicular Project trips are presented for Friday evening and Saturday afternoon peak hours in Figures 5-18 (A, B & C) and 5-19 (A, B & C), respectively.

5.4.8 Build Condition Traffic Volumes

Combining projected 2022 No-Build traffic volumes from Section 5.3 with projected Project patron and employee trips described above yields the 2022 Build condition traffic volumes. Build condition volumes are presented for Friday evening and Saturday afternoon peak hours in Figures 5-20 (A, B & C) and 5-21 (A, B & C), respectively.

It should be noted that, while employee trips have been assigned to the regional and local roadway network, with limited exception, employee parking will not be provided on site (see Section 5.10). Therefore, by including the employee trips in the Build network, the traffic operational analysis in Section 5.7 presents a conservative (worst case) examination of the Project impacts. As noted above, while the Proponent's policy of limiting employee parking at the Project site (in favor of a ground shuttle program) may have the effect of encouraging more employees to use transit, the Proponent does not expect the number of additional employees will be measurable to change the assumptions presented in the analysis.

A comparison of No-Build and Build traffic volumes at the ATR locations is presented in Table 5-21.

Table 5-21 Roadway Traffic Volume Comparison

Location	*Average Weekday Daily Volume[1,2]*			*Friday Evening Peak Hour Volume[3]*			*Saturday Afternoon Peak Hour Volume[3]*		
	Existing	*2022 No-Build[4]*	*2022 Build[5]*	*Existing*	*2022 No-Build*	*2022 Build*	*Existing*	*2022 No-Build*	*2022 Build*
Route 1A (South of Furlong Drive)									
Northbound	29,719	31,239	33,012	2,075	2,345	2,489	1,927	2,182	2,321
Southbound	29,638	31,154	33,062	1,779	2,095	2,257	1,708	1,998	2,179
Total	59,357	62,393	66,074	3,854	4,440	4,746	3,635	4,180	4,500
Route 1A (North of 145 Ramps)									
Northbound	22,851	24,020	25,829	1,621	1,796	1,942	1,480	1,662	1,801
Southbound	21,596	22,700	24,525	1,267	1,502	1,664	1,242	1,457	1,638
Total	44,447	46,720	50,354	2,888	3,298	3,606	2,722	3,118	3,438

Table 5-21 Roadway Traffic Volume Comparison (Continued)

Location	Average Weekday Daily Volume[1,2]			Friday Evening Peak Hour Volume[3]			Saturday Afternoon Peak Hour Volume[3]		
	Existing	2022 No-Build[4]	2022 Build[5]	Existing	2022 No-Build	2022 Build	Existing	2022 No-Build	2022 Build
Route 60 (North of Bell Circle)									
Northbound	18,320	19,257	20,915	1,241	1,403	1,543	1,276	1,433	1,566
Southbound	18,596*	19,547	21,331	1,002	1,150	1,304	1,109	1,264	1,433
Total	36,885	38,804	42,246	2,243	2,554	2,848	2,385	2,697	2,999
Route 16 (West of Route 145)									
Eastbound	20,610	21,664	23,006	1,605	1,775	1,891	1,572	1,724	1,851
Westbound	19,261	20,246	22,620	1,117	1,220	1,420	1,200	1,284	1,473
Total	39,871	41,910	45,626	2,722	2,995	3,311	2,772	3,009	3,325

Source: Automatic Traffic Recorder (ATR) counts conducted by VHB, Inc. in April 2013.
Note: Peak hours from the ATRs do not necessarily coincide with the peak hours of the TMCs. Evening peak hour is between 4:00PM and 6:00PM. Saturday peak hour is between 2:00PM and 5:00PM.

1. Average weekday represents average of Monday-Thursday.
2. Daily traffic expressed in vehicles per day (vpd)
3. Peak hour volumes expressed in vehicles per hour (vph)
4. 2022 No-Build daily volume based on background growth only, does not include No-Build project specific trips.
5. 2022 Build daily volume assumes peak hour analysis trip distribution patterns and mode shares represent daily.

* SB ATR tubes damaged mid-week. Counts estimated based on 2010 ATR at same location.

5.5 Route 1A and Site Access Alternatives Analysis

With almost 70% of Project vehicle trips projected to approach the site through the already congested and inefficient Boardman Street intersection, the inadequacy of the existing Tomasello Drive access to accommodate Project trips, and the community's attention to a viable grade-separated alternative at the location, development of an improvement program for this section of Route 1A is the primary focus of the off-site roadway infrastructure proposed in connection with the Project.

In response to community concerns about local access and potential impacts from Project-related traffic to the neighborhoods, an improvement concept to address these issues was developed and advocated for by the Proponent, comprising a Route 1A northbound flyover at Boardman Street, an additional Route 1A southbound lane, traffic signal control at Waldemar Avenue, and signalization of the Tomasello Drive intersection. The concept was advocated for and presented to the communities in East Boston and Revere, and was also included in the ENF for the Project. The transportation alternatives analysis presented in this DEIR/EPNF is anchored in this concept. Any such concept is subject to evaluation and approval by MassDOT and BTD.

In commenting on the ENF, MassDOT asked that the range of alternatives for the Route 1A corridor at Boardman Street be explored. This section of the DEIR/EPNF presents this analysis, which has been refined through on-going discussions with MassDOT. While the analysis is anchored on the flyover concept as presented publicly and advocated for by the Proponent publically, the overall study area traffic impact analysis for the Project remains the same under any of the Route 1A infrastructure improvement options considered, although clearly each option has distinct impacts (positive and negative) and attributes within this section of Route 1A itself. Those attributes are summarized in this section.

The commitment to the Route 1A improvements is recognized in the HCAs with the Cities of Boston and Revere. To provide some context on the needed roadway construction timing, the Resort is expected to be fully completed approximately 24 months after the start of construction, or 26 months after a gaming license is issued for the Project.

During the course of the preliminary evaluation of alternatives to the flyover solution, a range of options was identified, encompassing various combinations of flyover and at-grade solutions, some of which explored the feasibility of a southbound flyover at a later time if a northbound flyover is built as part of the Project. After initial discussions with MassDOT, the options were expanded to include additional alternatives designed to fully explore the range of possible improvements to roadway operations. Subsequent discussions with MassDOT resulted in the elimination of infeasible options, largely due to environmental and land impacts, and the potential need for modifications to accepted MassDOT design standards (design exceptions). This screening process reflected pre-existing constraints within the corridor north of Tomasello Drive resulting from wetlands adjacent to the roadway and impacts to nearby improved properties.

The following sections provide a summary description of the options that MassDOT and the BTD continue to consider for implementation. Three have been carried as at-grade alternatives (Options 1, 11, and 13) and three series involve an overpass (Options 4, 7, and 8). One other series includes a set of hybrid overpasses intended to eliminate left turns from the surface movements. Concept plans and information on roadway configuration, anticipated traffic operations, construction phasing (including traffic management during construction), schedule, estimated cost, and land impacts have been developed for each option. The LOS analysis for each option includes morning, evening and Saturday peak conditions for the 2022 DEIR/EPNF analysis timeline and 2032 design year assuming the Resort is in place. Project impacts to wetlands, air quality, and other significant land impacts are based on Alternative 4, on which all of the remaining alternatives are anchored.

In evaluating the traffic operations for each option, the existing conditions analysis for the Route 1A/Boardman Street intersection must be borne in mind. Under existing conditions (presented in Section 5.7), extensive queuing and delay are experienced on various approaches depending on time of day. One goal of the Project is to address this current need.

5.5.1 Option 1 – At-Grade Solution, Standard Design

This alternative, illustrated in Figure 5-22A, provides an at-grade surface solution to the existing condition capacity constraint with the addition of Resort-related traffic to 10- and 20-year design horizons. The Option adds travel lanes on three of the four intersection approaches and on two departures extending from south of Boardman Street to north of the existing Jughandle. Note that this plan also serves as the basis for development of Traffic Management plans allowing for various "flyover" options also under consideration as part of this analysis, where the Resort could be open and operating while construction activities in the Route 1A corridor might still be on-going or occurring in subsequent construction phases.

The basic operations maintains multiple phase signal operation, with overlapping left turn movement in the Route 1A corridor followed by through movements. Split side street signal phasing operation for the Boardman Street corridor is provided, a theme for the balance of the options, given the introduction of a double left turn configuration on Boardman Street westbound.

Four through/right turn lanes are provided on the northbound approach, extending over a 3,500- to 4,000-foot work area that transitions from the existing two lanes plus shoulder approaching Boardman Street and departing Tomasello Drive. Three lanes are provided southbound from Tomasello Drive, tapering to the two-lane with shoulder condition approximately 1300 feet south of Boardman Street. Widening has been maintained along the northbound side of the corridor, again for the most part consistent with other options developed for the area. Boardman Street westbound has been widened to a three-lane approach consistent with the commitment for corridor improvements as part of an approved development on the southeast corner of Route 1A and Boardman Street. No changes have been made to the Boardman Street corridor west of Route 1A.

Tables 5-22 (A, B & C) provide a summary of LOS (Synchro 7) for the Weekday morning, Friday evening, and Saturday afternoon peak hours respectively.

The construction schedule is estimated at 18 months. The basic construction process would provide for the widening along the easterly side of Route 1A, followed by median work that would establish the final southbound alignment.

Table 5- 22(A) Option 1 – At-Grade Solution, Standard Design, Weekday Morning Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
7. Route 1A at Boardman Street	Route 1A- NB Left	0.88	90.0	F	0.89	93.1	F	0.93	101.4	F
	Route 1A – NB Thru/Right	0.39	17.9	B	0.48	19.3	B	0.51	19.9	B
	Route 1A – SB Left	0.66	57.9	E	0.66	58.1	E	0.68	59.1	E
	Route 1A- SB Thru/Right	0.85	27.9	C	0.94	34.3	C	0.98	42.3	D
	Boardman- EB Left/Thru	0.60	66.9	E	0.61	67.9	E	0.66	72.4	E
	Boardman – EB Right	0.07	54.8	D	0.07	54.8	D	0.07	54.8	D
	Boardman – WB Left	0.92	85.0	F	0.93	88.9	F	0.99	103.4	F
	Boardman – WB Left/Thru/Right	0.96	95.8	F	0.95	93.6	F	1.04	119.1	F
	Boardman- WB Right	0.10	44.2	D	0.10	44.2	D	0.11	44.3	D
	Overall Intersection	**0.82**	**36.3**	**D**	**0.87**	**38.7**	**D**	**0.92**	**45.2**	**D**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement.

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

Table 5-22(B) Option 1 – At-Grade Solution, Standard Design, Friday Evening Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
7. Route 1A at Boardman Street	Route 1A- NB Left	0.79	92.2	F	0.84	101.6	F	0.72	75.5	E
	Route 1A – NB Thru/Right	0.60	18.6	B	0.93	32.0	C	0.97	36.5	D
	Route 1A – SB Left	0.78	68.1	E	0.92	89.9	F	0.97	100.9	F
	Route 1A- SB Thru/Right	0.57	13.9	B	0.85	22.1	C	0.91	26.0	C
	Boardman- EB Left/Thru	0.60	70.1	E	0.63	73.6	E	0.66	77.6	E
	Boardman – EB Right	0.03	55.6	E	0.04	55.6	E	0.04	55.7	E
	Boardman – WB Left	0.78	70.3	E	0.95	99.7	F	0.99	112.7	F
	Boardman – WB Left/Thru/Right	0.64	58.2	E	0.82	75.1	E	0.87	85.2	F
	Boardman- WB Right	0.09	47.6	D	0.12	46.9	D	0.14	47.1	D
	Overall Intersection	**0.65**	**24.5**	**C**	**0.92**	**34.8**	**C**	**0.95**	**39.2**	**D**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

Table 5-22(C) Option 1 – At-Grade Solution, Standard Design, Saturday Afternoon Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
7. Route 1A at Boardman Street	Route 1A- NB Left	0.59	73.7	E	0.63	78.3	E	0.65	81.3	F
	Route 1A – NB Thru/Right	0.54	18.0	B	0.87	28.4	C	0.91	31.3	C
	Route 1A – SB Left	0.71	62.9	E	0.87	81.9	F	0.91	88.3	F
	Route 1A- SB Thru/Right	0.52	12.9	B	0.78	19.1	B	0.81	20.0	C
	Boardman- EB Left/Thru	0.67	79.3	E	0.71	86.0	F	0.74	91.2	F
	Boardman – EB Right	0.02	55.5	E	0.02	55.5	E	0.03	55.5	E
	Boardman – WB Left	0.75	62.3	E	0.87	76.6	E	0.91	83.6	F
	Boardman – WB Left/Thru/Right	0.37	48.3	D	0.60	52.1	D	0.68	56.5	E
	Boardman- WB Right	0.11	45.7	D	0.23	45.7	D	0.28	46.3	D
	Overall Intersection	**0.60**	**22.9**	**C**	**0.86**	**30.3**	**C**	**0.90**	**32.7**	**C**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement.

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

5.5.2 Option 4 – Flyover Solution, East of Existing Route 1A Corridor

This alternative, illustrated in Figure 5-22B and which has been advocated for by the Proponent and presented in public meetings and the ENF, was developed to address longstanding community concerns while also accommodating Project-related traffic. It provides a northbound overpass as part of Project development, addressing the current source of congestion in the Route 1A corridor during peak hours and allowing additional demand associated with the Project to be effectively managed through the design year, which has been identified as 2032. The southbound movement, a morning congestion point which will see little additional demands associated with the Project during that critical period, has been addressed with the addition of a third southbound lane from Tomasello Drive through the Boardman Street intersection and then returning to the two-lane southbound section.

A widening of Boardman Street westbound has been proposed by others to address the existing morning peak issue experienced on that approach. This improvement will be completed as part of a mitigation program for an approved hotel development on the southeast corner of Route 1A and Boardman Street. Option 4 has been developed to be consistent with this work.

The overpass would be constructed east of the existing Route 1A corridor, allowing construction to proceed while mitigating impacts on the existing Route 1A traffic flow, which would be improved with the addition of a third northbound lane prior to the start of construction. Vehicles in the Route 1A northbound corridor, destined for Boardman Street or Route 1A southbound, would exit the corridor to the right approximately 1,050 feet south of Boardman Street.

At Boardman Street, the collector distributor function would shift to the west of the overpass and would use a portion of the existing at-grade northbound roadway. The entering movement to the northbound Route 1A corridor would be via a left side on-ramp, serving movements from Boardman Street east and west and from points south of Boardman Street.

Understanding the need to permit the indirect movements from Boardman Street to Waldemar Avenue and to the Project site, traffic signal control is proposed at the ramp junction at Waldemar Avenue. The initial concept also provided for a pedestrian crossing of the collector/distributor and mainline Route 1A lanes and a free flow opportunity from Waldemar Avenue. Based on discussions with MassDOT, the concept has been revised such that pedestrians would be relocated to the easterly side of the Route 1A northbound corridor, via a walk area under the overpass, and the movement from Waldemar Avenue would be placed under signal control in light of the lane arrangement between Waldemar Avenue and the Project driveway, Tomasello Drive. Modifications associated with these changes are illustrated in the layout plan for Option 4B, Figure 5-22C.

To minimize impacts to traffic during construction, the overpass would be constructed east of the existing Route 1A alignment and in fact east of the existing State Highway Layout. South of Boardman Street, the initial right of way line was identified at 96 feet east of the layout recognizing a 36-foot (+/-) structure width and a three-lane northbound ramp/collector corridor with a sidewalk. The down slope from the roadway to the existing property elevation would be addressed as either a slope or vertical wall.

North of Boardman Street, the overpass would be built into the existing embankment, which rises from a drainage swale 14 feet east of the back of sidewalk (22 feet east of the exiting curbline) on a 2:1 ratio. Some flattening and modification of this slope will be required along with construction of a back wall on the order of 10 feet in height at the point where the structure meets grade. The right of way line is approximately 62 feet east of the existing State Highway Layout and extends northerly across Waldemar Avenue to the Tomasello Drive intersection.

Option 4 has received a significant amount of public support in several public forums at which the Resort has been discussed and presented. The construction schedule to complete Option 4 is estimated at 18 months, and the milestone to complete the widening of Route 1A is expected to be achieved in 12 months.

5.5.3 Option 4B – Flyover Solution, East of Existing Route 1A Corridor

An Option 4B was developed to illustrate the ability to construct a southbound flyover at a point in the future. It was discarded and replaced with Option 4B, presented in Figure 5-22C, which provides the same basic feature of permitting a southbound flyover in the future while at the same time addressing MassDOT's request that a traditional right exit/right entrance ramp system be provided from Route 1A southbound instead of the left off/left on ramps in Option 4A. With Option 4B, southbound overpass construction traffic

management and construction area requirements dictate that modification of the original Option 4 alignment would be required. This modification will be recognized with a 15 to 20 foot easterly shift in the northbound alignment corridor alignment. The new right of way line for this option would be shifted to a point 112 feet or 79 feet east of the current State Highway Layouts south and north of Boardman Street, respectively.

Future construction of a southbound flyover in the Option 4B alignment would require property acquisition along the west side of the Route 1A corridor, primarily to facilitate construction of the southbound alignment and exit lanes.

Extending northerly, the Tomasello Drive/Route 1A intersection would consist of three northbound through lanes and a right turn only lane to the Project site. Southbound, the two-lane section at the existing Jughandle has been maintained with two left turn lanes developed at Tomasello Drive to allow for an entering movement to the Project site. Exiting the Project, the current roadway configuration shows three lanes exiting to the left and one to the right. The three lanes are being provided to allow maximization of green time for the Route 1A movements. No changes, other than the extension of the three lane northbound section (and tapers to the existing two-lane corridor to the north), and traffic control signal upgrades to allow system development, are proposed in the area of the Jughandle signal.

Option 4B would require approximately 33 months to complete.

Operation of the surface roadway traffic control signal is forecast at LOS D or better on an overall intersection basis through the 2032 design year, even without construction of the southbound overpass. Utilizing Synchro 7, Tables 5-23 (A, B & C) summarize LOS by approach for Weekday morning, Friday evening, and Saturday afternoon peak hours, respectively, during each of the three Design Years reviewed for the intersections associated with the Option 4 Series.

Table 5-23(A) Option 4 - Route 1A Flyover Solution/ 3 Lanes Southbound, Weekday Morning Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
7. Route 1A at Boardman Street	Route 1A- NB Left/Thru	0.79	71.2	E	0.80	73.5	E	0.83	77.6	E
	Route 1A- NB Thru	0.06	47.8	D	0.29	49.8	D	0.30	49.7	D
	Route 1A- NB Right/Thru	0.04	0.1	A	0.05	0.1	A	0.05	0.1	A
	Route 1A- SB Left/Thru	0.28	22.8	C	0.29	27.9	C	0.29	28.5	C
	Route 1A- SB Thru/Right	0.89	35.6	D	0.98	46.2	D	1.01	49.9	D
	Boardman- EB Left/Thru	0.54	61.2	E	0.56	62.5	E	0.67	74.8	E
	Boardman- EB Right	0.30	44.5	D	0.32	44.6	D	0.38	45.8	D
	Boardman- WB Left	0.79	61.2	E	0.80	61.6	E	0.86	70.1	E
	Boardman-WB Left/Thru	0.79	61.5	E	0.80	62.2	E	0.86	70.1	E
	Boardman- WB Right	0.10	41.9	D	0.11	41.7	D	0.11	42.2	D
	Overall Intersection	**0.83**	**40.6**	**D**	**0.89**	**47.9**	**D**	**0.94**	**51.9**	**D**
20. Route 1A at Waldemar Avenue	Route 1A- NB Thru/Right	0.29	2.2	A	0.35	2.7	A	0.37	2.9	A
	Waldemar- EB Left	0.06	65.4	E	0.34	39.8	D	0.41	44.2	D
	Waldemar- EB Left/Thru	0.10	62.6	E	0.33	39.6	D	0.40	43.8	D
	Waldemar- WB Right	0.03	0.0	A	0.03	0.0	A	0.04	0.0	A
	Overall Intersection	**0.27**	**11.4**	**B**	**0.34**	**7.5**	**A**	**0.37**	**8.2**	**A**
1. Route 1A at Tomasello Drive	Route 1A- NB Thru	0.43	15.8	B	0.44	14.9	B	0.46	15.1	B
	Route 1A- NB Right	0.05	14.6	B	0.20	22.7	C	0.21	20.9	C
	Route 1A-SB Left	0.01	43.0	D	0.22	44.6	D	0.23	43.8	D
	Route 1A- SB Thru	0.79	9.1	A	0.81	8.4	A	0.85	9.2	A
	Tomasello Drive- WB Left	0.05	46.2	D	0.50	49.6	D	0.53	50.0	D
	Tomasello Drive- WB Right	0.01	0.0	A	0.15	0.2	A	0.16	0.2	A
	Overall Intersection	**0.69**	**11.9**	**B**	**0.77**	**14.7**	**B**	**0.81**	**15.1**	**B**
12. Route 1A at Jughandle	Route 1A NB- Thru /Right	0.35	1.7	A	0.40	2.6	A	0.42	2.7	A
	Route 1A- SB Thru	0.85	13.6	B	0.92	18.3	B	0.96	24.6	C
	Jughandle- EB Left/Thru/Right	0.26	43.2	D	0.26	43.1	D	0.27	43.3	D
	Overall Intersection	**0.74**	**10.1**	**B**	**0.79**	**13.0**	**B**	**0.83**	**16.8**	**B**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement.

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

Table 5-23(B) Option 4 - Route 1A Flyover Solution/ 3 Lanes Southbound, Friday Evening Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
7. Route 1A at Boardman Street	Route 1A- NB Left/Thru	0.54	53.2	D	0.56	54.1	D	0.58	54.5	D
	Route 1A- NB Thru	0.08	47.3	D	0.08	47.2	D	0.08	47.0	D
	Route 1A- NB Right/Thru	0.02	0.0	A	0.06	0.1	A	0.06	0.1	A
	Route 1A- SB Left/Thru	0.23	21.9	C	0.31	24.1	C	0.33	24.6	C
	Route 1A- SB Thru/Right	0.63	17.2	B	0.97	36.0	D	1.02	47.5	D
	Boardman- EB Left/Thru	0.47	54.7	D	0.49	55.1	E	0.51	55.9	E
	Boardman- EB Right	0.03	42.0	D	0.14	42.7	D	0.18	42.9	D
	Boardman- WB Left	0.58	50.5	D	0.66	53.2	D	0.68	54.4	D
	Boardman-WB Left/Thru	0.57	50.3	D	0.66	53.2	D	0.69	54.5	D
	Boardman- WB Right	0.14	44.2	D	0.18	43.1	D	0.19	43.0	D
	Overall Intersection	**0.61**	**24.7**	**C**	**0.85**	**37.0**	**D**	**0.89**	**45.4**	**D**
20. Route 1A at Waldemar Avenue	Route 1A- NB Thru/Right	0.56	5.1	A	0.83	10.5	B	0.87	12.0	B
	Waldemar- EB Left	0.55	44.0	D	0.65	46.3	D	0.67	46.7	D
	Waldemar- EB Left/Thru	0.52	43.0	D	0.61	44.1	D	0.63	44.5	D
	Waldemar- WB Right	0.10	0.1	A	0.11	0.1	A	0.11	0.1	A
	Overall Intersection	**0.56**	**8.8**	**A**	0.80	**13.1**	**B**	**0.83**	**14.4**	**B**
1. Route 1A at Tomasello Drive	Route 1A- NB Thru	0.81	20.0	C	0.93	22.8	C	0.97	26.6	C
	Route 1A- NB Right	0.14	8.6	A	0.72	13.8	B	0.76	15.2	B
	Route 1A-SB Left	0.08	40.0	D	0.53	40.4	D	0.50	39.4	D
	Route 1A- SB Thru	0.77	11.2	B	0.92	13.8	B	0.96	16.8	B
	Tomasello Drive- WB Left	0.02	32.1	C	0.58	37.0	D	0.60	37.4	D
	Tomasello Drive- WB Right	0.01	0.0	A	0.10	0.1	A	0.10	0.1	A
	Overall Intersection	**0.61**	**15.8**	**B**	**0.84**	**19.8**	**B**	**0.88**	**22.4**	**C**
12. Route 1A at Jughandle	Route 1A NB- Thru /Right	0.58	2.9	A	0.70	6.0	A	0.73	7.2	A
	Route 1A- SB Thru	0.70	6.2	A	0.90	12.4	B	0.93	15.8	B
	Jughandle- EB Left/Thru/Right	0.51	43.1	D	0.53	43.7	D	0.62	46.5	D
	Overall Intersection	**0.68**	**5.6**	**A**	**0.85**	**10.0**	**A**	**0.89**	**12.3**	**B**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement.

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

Table 5-23(C) Option 4 - Route 1A Flyover Solution/ 3 Lanes Southbound, Saturday Afternoon Peak Hour

Location	Approach	2012 Existing Conditions			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
7. Route 1A at Boardman Street	Route 1A- NB Left/Thru	0.30	46.7	D	0.35	47.7	D	0.33	47.0	D
	Route 1A- NB Thru	0.10	44.9	D	0.11	45.4	D	0.10	44.9	D
	Route 1A- NB Right/Thru	0.16	0.2	A	0.22	0.3	A	0.23	0.3	A
	Route 1A- SB Left/Thru	0.18	9.3	A	0.26	18.6	B	0.26	16.8	B
	Route 1A- SB Thru/Right	0.57	7.0	A	0.89	23.5	C	0.89	20.2	C
	Boardman- EB Left/Thru	0.44	48.0	D	0.43	47.5	D	0.48	48.7	D
	Boardman- EB Right	0.07	39.1	D	0.12	39.5	D	0.19	40.0	D
	Boardman- WB Left	0.66	53.6	D	0.68	50.9	D	0.86	76.8	E
	Boardman-WB Left/Thru	0.66	53.0	D	0.68	51.4	D	0.86	78.1	E
	Boardman- WB Right	0.18	42.2	D	0.22	40.3	D	0.23	42.2	D
	Overall Intersection	**0.55**	**15.7**	**B**	**0.74**	25.4	**C**	**0.77**	**25.4**	**C**
20. Route 1A at Waldemar Avenue	Route 1A- NB Thru/Right	0.45	4.7	A	0.74	9.9	A	0.77	10.4	B
	Waldemar- EB Left	0.61	39.9	D	0.69	43.7	D	0.68	43.0	D
	Waldemar- EB Left/Thru	0.57	38.7	D	0.64	41.9	D	0.64	41.3	D
	Waldemar- WB Right	0.08	0.1	A	0.08	0.1	A	0.08	0.1	A
	Overall Intersection	**0.47**	**9.7**	**A**	**0.73**	**13.9**	**B**	**0.75**	**14.0**	**B**
1. Route 1A at Tomasello Drive	Route 1A- NB Thru	0.80	28.2	C	0.93	28.6	C	0.97	33.0	C
	Route 1A- NB Right	0.11	19.1	B	0.80	17.6	B	0.84	20.0	B
	Route 1A-SB Left	0.05	37.5	D	0.37	37.5	D	0.37	36.8	D
	Route 1A- SB Thru	0.71	9.1	A	0.84	13.3	B	0.89	14.7	B
	Tomasello Drive- WB Left	0.04	30.7	C	0.52	34.8	C	0.54	35.1	D
	Tomasello Drive- WB Right	0.04	0.0	A	0.13	0.2	A	0.13	0.2	A
	Overall Intersection	**0.58**	**19.0**	**B**	**0.83**	**21.8**	**C**	**0.87**	**24.1**	**C**
12. Route 1A at Jughandle	Route 1A NB- Thru /Right	0.52	0.4	A	0.64	1.6	A	0.67	2.2	A
	Route 1A- SB Thru	0.68	8.5	A	0.88	14.8	B	0.92	17.9	B
	Jughandle- EB Left/Thru/Right	0.23	35.5	D	0.25	35.6	D	0.28	35.9	D
	Overall Intersection	**0.59**	**4.9**	**A**	**0.76**	**8.5**	**A**	**0.79**	**10.3**	**B**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement.

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

5.5.4 Option 8 – Northbound Flyover Constructed within Existing NB Travel Way, C/D Fully to East (Southbound flyover later by others)

It should be noted that Option 7 is presented in the next section (5.5.5), after Option 8, because Option 7 actually builds upon Option 8. Also, this option as presented demonstrates the feasibility of constructing a southbound flyover at a later date.

Option 8 is similar to Option 4 except that the northbound flyover is constructed within the existing northbound corridor with the parallel movement from Boardman Street to Waldemar Avenue on the east side of the overpass (against the embankment). The northbound exit and entrance are to the right of the overpass, which eliminates the need for signal control at Waldemar Avenue and provides the first northbound control point at Tomasello Drive. Option 8, shown with both a northbound and southbound flyover at Boardman Street, is illustrated in Figure 5-22D.

While Option 8 illustrates both a northbound and southbound overpass, in light of findings associated with the operational analysis, only the northbound overpass would be constructed with surface improvements to Route 1A southbound in conjunction with the Project. When needed, the southbound overpass (which would require additional right of way on the west side of the corridor) and southbound surface roadway could be constructed in the future by parties other than the Proponent.

Structure profile and length are generally consistent with the Option 4 alignment. The easterly extent of work associated with the Option 8 alignment requires establishment of the State Highway Layout line at a point approximately 96.5 feet east of the current line between Boardman Street and Waldemar Avenue. (South of Boardman Street, the extent of relocation of the line is reduced when compared with Option 4 needs.) This is driven by the construction sequence and timing of completion for corridor improvements compared with the schedule of construction and opening opportunity for the Project. The initial construction activity in this Option would include development of the northbound surface corridor adjacent to the existing northbound Route 1A travel way. This would be followed by a second construction stage: construction of the northbound overpass.

Construction of the southbound overpass, when required, would begin with a shift of the southbound through movement to the northbound overpass (and provision of turning lanes at the Boardman Street intersection) while construction of the southbound overpass proceeds. Work during this stage would also include wall construction along the west side of Route 1A and the acquisition of property necessary to shift the southbound surface corridor westerly to allow for overpass construction. Once completed, the southbound collector distributor corridor would be completed as well as the final northbound collector distributor alignment.

While the proposal would be to construct only the northbound flyover and northbound collector/distributor system initially (estimated at 24 to 26 months duration), an overall 40-month construction schedule (or some greater period of time allowing for construction of southbound lanes when eventually needed) would be required to construct the entire Option 8. The overall construction sequence would require an at-grade signal-controlled operation of the northbound corridor after the Resort opens.

In previous submissions to MassDOT, assuming a surface-only operation at Boardman Street, the need for four northbound through lanes (plus a fifth lane for left turns) was identified based on managing existing demands and additional traffic associated with full Project occupancy. The southbound corridor would be widened to three lanes plus the left turn lane, and Boardman Street widened to three approach lanes. This four lane northbound surface road and sidewalk drives the location of a retaining wall to be built into the embankment between Boardman Street and Waldemar Avenue, which in turn drives the height of the wall required, now estimated at a minimum of 35 feet exposed. Additional coordination with the hotel development at the southeast corner of Route 1A and Boardman Street and, in particular, plans for Boardman Street at this location, would be necessary.

The northerly limit of work would also be extended to include additional property acquisition requirements in Revere. With the first control point at Tomasello Drive, the Route 1A northbound corridor separation between the overpass movement and frontage road would require extension to that control point, prohibiting movement from the overpass to the Project driveway at Tomasello Drive. All northbound traffic approaching the Project from the south would have to use the collector/distributor system.

In the final configuration, the northbound collector/distributor system could be reduced to four lanes approaching Boardman Street (one left, one right and two through), with two lanes continuing to Tomasello Drive where a right-only lane and a single through lane would be provided. The three northbound through lanes (two on the west and one to the east of the median) would run simultaneously and continue northerly, tapering through the Jughandle area. The extent of lane drops would extend north of the anticipated limit of Option 4, and the additional width associated with the median would extend the needed property acquisition further north than required under Option 4.

It is worth noting that, while three lanes are provided for the northbound movement, the two lanes left of the separating median would bear more than 90% of the projected demand during the evening peak. The rightmost lane would see only the right turn demand from Boardman Street and the right turn from Waldemar Avenue.

Estimated construction time for Option 8 (northbound flyover, northbound collector distributor, southbound and Boardman Street at-grade surface widening only, with southbound flyover constructed as a separate project) is estimated as 24 to 26 months. In the case that northbound and southbound flyovers where constructed as a single project, then the full construction period would be estimated to take 40 months.

Operation of this alternative, assuming only a northbound overpass and southbound surface road, is consistent with results reported for Option 4. The northbound C/D corridor shows a slight degradation in LOS with the addition of all Route 1A Resort-destined traffic to the signal controlled surface road, even with the addition of a second through lane. An LOS degradation is also experienced at the Route 1A/Tomasello Drive intersection, where the primary northbound overpass through movement is concentrated in two lanes.

Using Synchro 7, Tables 5-24 (A, B & C) summarize LOS by approach for Weekday morning, Friday evening, and Saturday afternoon peak hours, respectively, during each of the three Design Years reviewed for intersections associated with Option 8.

Table 5-24(A) Option 8 – Northbound Flyover Constructed within Existing Northbound Travel Way, Weekday Morning Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
12. Route 1A at Jughandle	Route 1A NB- Thru /Right	0.30	0.7	A	0.36	0.4	A	0.38	0.4	A
	Route 1A- SB Thru	0.79	6.8	A	0.90	11.6	B	0.95	16.6	B
	Jughandle- EB Left/Thru/Right	0.52	52.0	D	0.53	52.1	D	0.54	52.6	D
	Overall Intersection	**0.77**	**5.6**	**A**	**0.87**	**8.4**	**A**	**0.92**	**11.5**	**B**
1. Route 1A at Tomasello Drive	Route 1A- NB Left	0.35	3.7	A	0.47	6.0	A	0.49	6.2	A
	Route 1A-SB Left	0.12	49.0	D	0.32	51.7	D	0.32	51.0	D
	Route 1A- SB Right	0.71	2.3	A	0.85	4.8	A	0.90	5.6	A
	Tomasello Drive- WB Left	0.18	52.1	D	0.48	48.5	D	0.48	48.4	D
	Tomasello Drive- WB Right	0.01	44.1	D	0.03	35.8	D	0.03	35.8	D
	Access Road- NB Thru	0.16	2.6	A	0.19	5.5	A	0.20	5.6	A
	Access Road- NB Right	0.05	2.3	A	0.17	5.5	A	0.18	5.5	A
	Overall Intersection	**0.69**	**3.2**	**A**	**0.82**	**7.6**	**A**	**0.86**	**8.0**	**A**
7. Route 1A at Boardman Street	Route 1A- NB Left	0.79	66.8	E	0.80	67.9	E	0.84	74.4	E
	Route 1A- NB Thru	0.27	44.5	D	0.78	55.7	E	0.77	55.4	E
	Route 1A- NB Right	0.04	0.1	A	0.05	0.1	A	0.05	0.1	A
	Route 1A- SB Left	0.22	22.3	C	0.24	24.7	C	0.25	24.8	C
	Route 1A- SB Thru/Right	0.86	30.5	C	1.03	58.2	E	1.08	78.4	E
	Boardman- EB Left/Thru	0.53	56.0	E	0.58	59.5	E	0.60	61.1	E
	Boardman- EB Right	0.29	36.2	D	0.31	36.2	D	0.32	36.4	D
	Boardman- WB Left	0.91	79.7	E	0.93	85.2	F	0.96	90.5	F
	Boardman-WB Left/Thru	0.91	79.6	E	0.93	85.1	F	0.96	90.3	F
	Boardman- WB Right	0.10	41.1	D	0.10	40.9	D	0.11	40.7	D
	Overall Intersection	**0.84**	**39.4**	**D**	**0.95**	**58.2**	**E**	**0.99**	**71.8**	**E**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement.

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

Table 5-24(B) Option 8 – Northbound Flyover Constructed within Existing Northbound Travel Way, Friday Evening Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
12. Route 1A at Jughandle	Route 1A NB- Thru /Right	0.54	5.6	A	0.64	1.1	A	0.68	1.6	A
	Route 1A- SB Thru	0.66	5.8	A	0.84	10.0	A	0.88	12.2	B
	Jughandle- EB Left/Thru/Right	0.66	59.7	E	0.68	60.7	E	0.74	65.2	E
	Overall Intersection	**0.66**	**7.3**	**A**	**0.82**	**6.7**	**A**	**0.86**	**8.2**	**A**
1. Route 1A at Tomasello Drive	Route 1A- NB Left	0.61	7.0	A	0.95	42.7	D	1.00	53.0	D
	Route 1A-SB Left	0.27	50.8	D	0.64	55.6	E	0.64	54.7	D
	Route 1A- SB Right	0.57	2.2	A	0.82	10.2	B	0.86	11.4	B
	Tomasello Drive- WB Left	0.18	57.1	E	0.85	56.7	E	0.88	58.8	E
	Tomasello Drive- WB Right	0.05	47.8	D	0.30	29.7	C	0.30	29.4	C
	Access Road- NB Thru	0.24	3.2	A	0.39	14.9	B	0.42	15.4	B
	Access Road- NB Right	0.14	2.8	A	0.69	21.8	C	0.73	23.6	C
	Overall Intersection	**0.60**	**5.1**	**A**	**0.93**	**28.3**	**C**	**0.98**	**32.4**	**C**
7. Route 1A at Boardman Street	Route 1A- NB Left	0.27	44.0	D	0.20	35.7	D	0.21	35.8	D
	Route 1A- NB Thru	0.70	51.0	D	1.22	156.8	F	1.28	178.6	F
	Route 1A- NB Right	0.02	0.0	A	0.06	0.1	A	0.06	0.1	A
	Route 1A- SB Left	0.26	31.4	C	0.33	26.8	C	0.35	30.5	C
	Route 1A- SB Thru/Right	0.65	20.6	C	1.09	78.1	E	1.14	104.5	F
	Boardman- EB Left/Thru	0.40	57.3	E	0.59	69.6	E	0.62	72.9	E
	Boardman- EB Right	0.11	33.3	C	0.11	27.9	C	0.12	28.0	C
	Boardman- WB Left	0.64	60.7	E	0.90	99.4	F	0.90	96.9	F
	Boardman-WB Left/Thru	0.64	60.0	E	0.91	100.6	F	0.90	96.7	F
	Boardman- WB Right	0.14	50.2	D	0.17	51.2	D	0.18	50.9	D
	Overall Intersection	**0.64**	**32.0**	**C**	**1.09**	**90.8**	**F**	**1.13**	**110.3**	**F**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement.

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

Table 5-24(C) Option 8 – Northbound Flyover Constructed within Existing Northbound Travel Way, Saturday Afternoon Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
12. Route 1A at Jughandle	Route 1A NB- Thru /Right	0.44	5.5	A	0.54	1.0	A	0.57	1.2	A
	Route 1A- SB Thru	0.58	3.6	A	0.75	5.7	A	0.78	6.7	A
	Jughandle- EB Left/Thru/Right	0.51	57.2	E	0.54	58.2	E	0.57	58.6	E
	Overall Intersection	**0.57**	**5.6**	**A**	**0.73**	**4.2**	**A**	**0.76**	**4.8**	**A**
1. Route 1A at Tomasello Drive	Route 1A- NB Left	0.51	6.2	A	0.80	36.0	D	0.84	38.3	D
	Route 1A-SB Left	0.18	51.1	D	0.60	54.6	D	0.60	54.2	D
	Route 1A- SB Right	0.54	3.1	A	0.76	10.5	B	0.81	11.8	B
	Tomasello Drive- WB Left	0.19	53.1	D	0.79	50.7	D	0.80	51.0	D
	Tomasello Drive- WB Right	0.25	45.0	D	0.36	28.5	C	0.36	28.1	C
	Access Road- NB Thru	0.27	4.8	A	0.44	17.1	B	0.47	18.0	B
	Access Road- NB Right	0.11	3.9	A	0.71	24.6	C	0.75	26.6	C
	Overall Intersection	**0.52**	**6.1**	**A**	**0.81**	**26.2**	**C**	**0.85**	**27.6**	**C**
7. Route 1A at Boardman Street	Route 1A- NB Left	0.17	47.9	D	0.07	30.1	C	0.07	30.1	C
	Route 1A- NB Thru	0.61	52.9	D	1.02	75.3	E	1.06	86.4	F
	Route 1A- NB Right	0.17	0.2	A	0.23	0.4	A	0.24	0.4	A
	Route 1A- SB Left	0.22	33.3	C	0.33	34.2	C	0.35	33.9	C
	Route 1A- SB Thru/Right	0.59	18.1	B	1.14	110.0	F	1.18	127.9	F
	Boardman- EB Left/Thru	0.32	53.2	D	0.70	83.2	F	0.73	88.2	F
	Boardman- EB Right	0.08	35.2	D	0.07	23.6	C	0.07	23.6	C
	Boardman- WB Left	0.58	55.5	E	0.93	108.9	F	0.97	118.6	F
	Boardman-WB Left/Thru	0.57	55.4	E	0.94	110.2	F	0.98	122.5	F
	Boardman- WB Right	0.18	49.4	D	0.22	52.0	D	0.23	52.1	D
	Overall Intersection	**0.57**	**27.3**	**C**	**1.05**	**84.8**	**F**	**1.09**	**96.8**	**F**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement
1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

5.5.5 Option 7 – Multiple Flyover Alternative at Boardman and Tomasello/Jughandle (Southbound flyovers later by others)

This alternative builds on Option 8 with construction of additional northbound and southbound structures (later by others) for through movement over the proposed Project driveway and relocation of the Jughandle (or alternative turnaround movement) southerly to a point at or near Tomasello Drive. Given the addition of Resort-related traffic to the southbound C/D approaching Boardman Street, a two-lane through movement will be required in addition to the left turn lane to Boardman Street eastbound.

This option is presented to demonstrate the feasibility for constructing southbound flyovers at a later date. If constructed as part of the Project, structure work would include the northbound side only, with southbound surface modifications as needed. The basic

construction sequence would follow that described in Option 8, first constructing the northbound collector distributor, then the northbound flyover system, followed by the southbound and the completion of the northbound and southbound surface alignments.

Option 7 final conditions are depicted in Figure 5-22E. It should be noted that this plan illustrates the outer limits of land acquisitions that would be required to allow maintenance of traffic during construction, including a pedestrian walkway, although the temporary construction roadways are not shown.

The basic traffic maintenance plan would include three northbound through lanes north of Tomasello Drive, tapering to two lanes through the balance of the construction area and then returning to the existing two lane and shoulder section approaching the Route 145 overpass. These lanes would be separated from the general construction area by approximately 15 feet. This would impact the tank farm overhead piping systems adjacent to both sides of Route 1A, including one of the buildings associated with the system. The work also impacts multiple properties and additional wetland resources. The Jughandle movement would have to be relocated to the south early in the traffic maintenance plan process, impacting additional property on the westerly side of Route 1A. (The initial plan developed for this alternate maintained the existing Jughandle location with a work and impact limit extending an additional 300 to 400 feet north, with the same increase in length of structure.)

When needed, the southbound flyover system could be implemented following the procedure identified in Option 8: southbound through movement to the northbound lanes with the northbound movement returned to surface operation from south of Boardman Street through the northerly Project limit, allowing for construction in the southbound corridor. A single lane from the southbound movement would allow for movement to the Jughandle, Tomasello Drive, adjacent west side land uses, and Boardman Street.

Construction of the southbound flyovers would be achieved via a buffer area of at least 15 feet between this C/D movement and the westerly side of the southbound structure. On completion of the southbound structure, the C/D corridors both northbound and southbound would be completed.

While the proposal would be to construct only the northbound flyover at Boardman Street with the associated northbound collector distributor, southbound and Boardman Street at-grade surface widening (estimated at 24 to 26 months duration), an overall 58-month construction schedule (or some greater period of time allowing for construction of southbound lanes when eventually needed) would be required to construct the entire Option 7.

Tables 5-25 (A, B & C) summarize LOS by approach for Weekday morning, Friday evening, and Saturday afternoon peak hours, respectively, during each of the three Design Years reviewed for the intersections associated with Option 7.

Table 5-25(A) Option 7 - Multiple Flyover Alternative at Boardman Street and Tomasello Drive/ Jughandle, Weekday Morning Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
1. Route 1A at Tomasello Drive/Jughandle	Route 1A- NB Thru	0.09	4.9	A	0.11	7.5	A	0.11	7.7	A
	Route 1A-NB Right	0.05	6.2	A	0.17	5.9	A	0.17	5.6	A
	Route 1A- SB Thru	0.05	4.1	A	0.06	6.5	A	0.07	6.6	A
	Jughandle- EB Left/Thru/Right	0.33	40.6	D	0.40	38.8	D	0.41	38.7	D
	Tomasello Drive- WB Left	0.11	40.6	D	0.42	38.5	D	0.42	38.4	D
	Tomasello Drive- WB Right	0.01	40.1	D	0.03	36.2	D	0.03	36.1	D
	Overall Intersection	**0.11**	**12.1**	**B**	**0.24**	**17.2**	**B**	**0.24**	**17.1**	**B**
7. Route 1A at Boardman Street	Route 1A- NB Left	0.42	33.4	C	0.45	34.8	C	0.49	36.2	D
	Route 1A- NB Thru/Right	0.12	28.0	C	0.34	30.7	C	0.35	31.2	C
	Route 1A- SB Left	0.52	40.3	D	0.53	53.4	D	0.55	53.2	D
	Route 1A- SB Thru/Right	0.03	29.4	C	0.14	15.2	B	0.14	15.6	B
	Boardman- EB Left/Thru	0.55	48.4	D	0.60	51.4	D	0.62	53.2	D
	Boardman- EB Right	0.07	20.5	C	0.07	21.0	C	0.07	21.3	C
	Boardman- WB Left	0.75	45.1	D	0.76	45.3	D	0.78	47.3	D
	Boardman-WB Left/Thru	0.75	45.0	D	0.76	45.2	D	0.78	47.1	D
	Boardman- WB Right	0.10	31.4	C	0.10	31.0	C	0.11	30.8	C
	Overall Intersection	**0.43**	**36.8**	**D**	**0.48**	**35.8**	**D**	**0.50**	**36.8**	**D**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

Table 5-25(B) Option 7 - Multiple Flyover Alternative at Boardman Street and Tomasello Drive/ Jughandle, Friday Evening Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
1. Route 1A at Tomasello Drive/Jughandle	Route 1A- NB Thru	0.17	13.6	B	0.21	16.6	B	0.22	17.0	B
	Route 1A-NB Right	0.14	2.1	A	0.72	10.0	A	0.75	11.1	B
	Route 1A- SB Thru	0.08	12.8	B	0.10	15.5	B	0.11	15.7	B
	Jughandle- EB Left/Thru/Right	0.54	62.1	E	0.80	68.6	E	0.84	71.2	E
	Tomasello Drive- WB Left	0.03	41.3	D	0.74	55.6	E	0.77	57.0	E
	Tomasello Drive- WB Right	0.01	41.1	D	0.10	42.6	D	0.10	42.6	D
	Overall Intersection	**0.19**	**20.0**	**D**	**0.73**	**31.0**	**C**	**0.76**	**32.2**	**C**
7. Route 1A at Boardman Street	Route 1A- NB Left	0.14	0.14	C	0.17	27.4	C	0.18	28.0	C
	Route 1A- NB Thru/Right	0.27	0.27	C	0.80	37.9	D	0.85	40.8	D
	Route 1A- SB Left	0.61	0.61	D	0.60	40.6	D	0.61	40.2	D
	Route 1A- SB Thru/Right	0.02	0.02	C	0.50	28.3	C	0.51	28.1	C
	Boardman- EB Left/Thru	0.38	0.38	D	0.39	47.5	D	0.41	47.7	D
	Boardman- EB Right	0.04	0.04	B	0.04	18.3	B	0.04	18.7	B
	Boardman- WB Left	0.57	0.57	D	0.68	51.2	D	0.70	53.2	D
	Boardman-WB Left/Thru	0.57	0.57	D	0.68	51.5	D	0.71	53.2	D
	Boardman- WB Right	0.14	0.14	D	0.17	40.2	D	0.18	40.2	D
	Overall Intersection	**0.34**	**34.7**	**C**	**0.64**	**37.2**	**D**	**0.66**	**38.6**	**D**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

Table 5-25(C) Option 7 - Multiple Flyover Alternative at Boardman Street and Tomasello Drive/ Jughandle, Saturday Afternoon Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
1. Route 1A at Tomasello Drive/Jughandle	Route 1A- NB Thru	0.14	4.3	A	0.25	20.6	C	0.27	21.2	C
	Route 1A-NB Right	0.11	1.8	A	0.75	14.0	B	0.78	15.1	B
	Route 1A- SB Thru	0.06	4.4	A	0.11	14.2	B	0.12	14.5	B
	Jughandle- EB Left/Thru/Right	0.39	45.7	D	0.65	44.3	D	0.66	44.6	D
	Tomasello Drive- WB Left	0.18	44.1	D	0.71	38.3	D	0.73	38.6	D
	Tomasello Drive- WB Right	0.04	43.4	D	0.13	30.5	C	0.13	30.2	C
	Overall Intersection	**0.17**	**12.8**	**B**	**0.74**	**25.0**	**C**	**0.76**	**25.6**	**C**
7. Route 1A at Boardman Street	Route 1A- NB Left	0.06	21.8	C	0.07	23.1	C	0.07	23.4	C
	Route 1A- NB Thru/Right	0.22	23.2	C	0.86	37.6	D	0.90	40.7	D
	Route 1A- SB Left	0.62	47.2	D	0.78	73.8	E	0.77	72.8	E
	Route 1A- SB Thru/Right	0.06	33.6	C	0.63	27.9	C	0.66	29.4	C
	Boardman- EB Left/Thru	0.42	47.8	D	0.45	48.2	D	0.47	48.5	D
	Boardman- EB Right	0.02	14.7	B	0.03	15.7	B	0.03	15.9	B
	Boardman- WB Left	0.51	43.2	D	0.58	44.2	D	0.59	44.5	D
	Boardman-WB Left/Thru	0.50	43.2	D	0.58	44.2	D	0.60	44.8	D
	Boardman- WB Right	0.18	40.0	D	0.22	39.0	D	0.23	38.9	D
	Overall Intersection	**0.31**	**33.5**	**C**	**0.71**	**38.6**	**D**	**0.73**	**40.3**	**D**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement
1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

5.5.6 Option 11 – Modified At-Grade Alternative

This at-grade alternative is provided as the alternate to Option 1 that was developed early in the process of evaluating alternatives. Option 1 replaced the flyover solution in favor of a concept that maintained movements concentrated at the Route 1A/Boardman Street intersection with multi-phase traffic signal control (with one left and four through lanes northbound, one left and three through southbound, three lanes on the Boardman Street westbound approach and two lanes on the eastbound approach), and at a single concentrated intersection at Tomasello Drive. Option 11 builds on this concept and splits movements among various controlled points with two-phase signal control. This alternative design, while it fails to achieve grade separation at Boardman Street, a key feature of the flyover concept, recognizes the efficiency of two-phase signal operation (that is, addressing all traffic movements at the intersection in two signal phases) and the ability to provide fewer through lanes to handle greater demand.

The basic design, illustrated in Figure 5-22F, provides three lanes in each direction on Route 1A with the majority of improvements confined to within the existing State Highway Layout and most within the existing outside curb lines. At Boardman Street, three lanes would be provided both northbound and southbound. Direct left turns from Route 1A

southbound to Boardman Street would be prohibited and that traffic instead would proceed further south on Route 1A to a signal-controlled left exit into a jughandle to access the northbound lanes of Route 1A and Boardman Street.

Boardman Street westbound would be narrowed and realigned to the south, creating an approach angle consistent with needs for a smooth turning movement to Route 1A southbound. As with the previous option, this realignment would need to be evaluated for consistency with the hotel development at Boardman Street and Route 1A that has been approved. Left turns and right turns would be permitted from Boardman Street westbound. Eastbound Boardman Street would be retained in its current location but, with median installation on Route 1A, only right turns in and out would be permitted. Southbound left turn movement to Boardman Street would be displaced to the south and those motorists seeking to continue west of Boardman Street would instead travel south on Route 1A to a signal-controlled U-turn.

The plan is currently based on a median break and U-turn movement approximately 700 feet south of Boardman Street. At this point, U-turns would be signal controlled in both directions, requiring the introduction of a new full stop signal on Route 1A northbound to permit southbound traffic to execute the U-turn to access Route 1A north and, ultimately, Boardman Street. The U-turn would provide for all vehicles accessing Boardman Street eastbound off of Route 1A, those destined to Boardman Street or Route 1A northbound from the westerly leg of Boardman Street, and those accessing adjacent land uses on the easterly side of Route 1A between the turnaround and Boardman Street. Note that at this signal, only the northbound through movement and the southbound left turn would be controlled. The southbound through movement would be in a free flow condition.

At Boardman Street, two-phase operation would provide northbound and southbound Route 1A as Phase 1, and Boardman Street movement as Phase 2. The southbound Route 1A approach would be stopped north of the Boardman Street eastbound approach to allow vehicles to exit and store at the median break stop line. A pedestrian crossing would be provided on the northerly side of the primary intersection across the full width of Route 1A. The northerly control point would be in the vicinity of Tomasello Drive, with the Jughandle signal and turnaround point being maintained. At Tomasello Drive, the entering and exiting movements to the site will be treated in corridors separated by approximately 200 feet, versus the 60-foot separation in the current site access driveway configuration. The two-phase operation at this location would include Route 1A northbound and southbound during phase 1 and the Resort entrance and exit as phase 2. Internal to the site, a corridor would be established to allow U-turns from Route 1A northbound to southbound, providing for the replacement movement for the northbound left turn and U-turn currently permitted at Boardman Street, and for the movement from Waldemar Avenue. A pedestrian crossing could be incorporated on the northerly side of the exiting corridor intersection.

While the concept presents favorable traffic conditions in some areas, because it is based on maximizing the two-phase operation, this option presents a significant change in traffic patterns in several locations, including as follows:

- an additional signal is introduced onto Route 1A south of Boardman Street and the current signal for northbound traffic at Boardman Street is retained;
- motorists travelling south on Route 1A seeking to access Boardman Street eastbound are directed to the signal-controlled U-turn as described above; and
- Route 1A northbound traffic seeking to reverse direction (including traffic entering Route 1A northbound south of Boardman and from Waldemar) would exit Route 1A northbound at the Resort and use a Project-supplied U-turn at the entrance to the Resort.

Land acquisition is needed at the southerly turnaround for the realignment of Boardman Street westbound, and an expanded area from that parcel should the fourth northbound lane be provided, and potentially in the northeast quadrant of Waldemar Avenue and Route 1A northbound.

The construction schedule is estimated at approximately 16 months.

Using Synchro 7, Tables 5-26 (A, B & C) summarize LOS by approach for Weekday morning, Friday evening, and Saturday afternoon peak hours, respectively, during each of the three Design Years reviewed for the intersections associated with Option 11.

Table 5-26(A) Option 11 – Modified At-Grade Alternative, Weekday Morning Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
7A. Route 1A at Southern U-turn	Route 1A NB Thru	0.43	8.3	A	0.54	9.4	A	0.56	9.6	A
	Route 1A-SB U-Turn	0.40	24.0	C	0.42	21.7	C	0.44	21.4	C
	Route 1A- SB Thru	0.56	0.1	A	0.64	0.1	A	0.67	0.2	A
	Overall Intersection	**0.56**	**3.7**	**A**	**0.64**	**4.1**	**A**	**0.67**	**4.2**	**A**
7B. Route 1A at Boardman Street East	Route 1A- NB Thru	0.42	3.7	A	0.53	3.6	A	0.56	3.6	A
	Route 1A – NB Right	0.14	0.0	A	0.15	0.0	A	0.15	0.0	A
	Route 1A- SB Thru	0.78	2.8	A	0.89	4.1	A	0.93	5.0	A
	Boardman- WB Left	0.57	32.2	C	0.60	32.7	C	0.63	33.3	C
	Boardman- WB Right	0.43	30.9	C	0.55	32.8	C	0.59	34.0	C
	Overall Intersection	**0.72**	**6.7**	**A**	**0.82**	**7.1**	**A**	**0.86**	**7.7**	**A**
7C. Route 1A at Boardman Street West	Route- 1A NB Thru	0.31	0.0	A	0.38	0.0	A	0.40	0.0	A
	Route- 1A SB Thru/Right	0.76	5.1	A	0.89	9.0	A	0.93	10.7	B
	Boardman- SEB Right	0.40	30.7	C	0.44	31.0	C	0.46	31.3	C
	Overall Intersection	**0.67**	**4.1**	**A**	**0.74**	**6.3**	**A**	**0.77**	**7.3**	**A**
1A. Route 1A at Site Entrance	Route 1A- NB Thru	0.36	3.6	A	0.42	3.6	A	0.44	3.8	A
	Route 1A- NB Right	0.19	0.3	A	0.29	0.4	A	0.30	0.5	A
	Route 1A- SB Left	0.01	25.8	C	0.10	26.1	C	0.10	25.3	C
	Route 1A- SB Thru	0.50	0.1	A	0.58	0.1	A	0.61	0.1	A
	Overall Intersection	**0.50**	**1.2**	**A**	**0.58**	**1.5**	**A**	**0.61**	**1.6**	**A**
1B. Route 1A at Site Exit	Route 1A- NB Thru	0.39	8.1	A	0.45	8.6	A	0.48	8.7	A
	Route 1A- SB Thru	0.71	1.6	A	0.81	2.0	A	0.85	2.3	A
	Site Drive- NWB Left	0.29	37.9	D	0.41	33.0	C	0.43	33.2	C
	Site Drive- NWB Right	0.01	44.0	D	0.03	35.7	D	0.03	35.9	D
	Overall Intersection	**0.60**	**6.2**	**A**	**0.70**	**6.8**	**A**	**0.74**	**7.0**	**A**
12. Route 1A at Jughandle	Route 1A- NB Thru/Right	0.33	0.1	A	0.35	0.1	A	0.41	0.2	A
	Route 1A- SB Thru	0.71	11.2	B	0.81	13.5	B	0.85	14.9	B
	Jughandle- EB Left/Thru/Right	0.33	37.0	D	0.35	37.2	D	0.37	37.4	D
	Overall Intersection	**0.60**	**7.9**	**A**	**0.68**	**9.2**	**A**	**0.71**	**10.0**	**B**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

Table 5-26(B) Option 11 – Modified At-Grade Alternative, Friday Evening Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
7A. Route 1A at Southern U-turn	Route 1A NB Thru	0.63	8.0	A	0.92	16.2	B	0.95	19.4	B
	Route 1A-SB U-Turn	0.55	24.1	C	0.68	26.0	C	0.71	26.2	C
	Route 1A- SB Thru	0.41	0.0	A	0.59	0.1	A	0.61	0.1	A
	Overall Intersection	**0.61**	**5.2**	**A**	**0.83**	**9.3**	**A**	**0.86**	**10.9**	**B**
7B. Route 1A at Boardman Street East	Route 1A- NB Thru	0.69	5.7	A	0.99	13.4	B	1.02	22.1	C
	Route1A – NB Right	0.13	0.0	A	0.20	0.0	A	0.20	0.0	A
	Route 1A- SB Thru	0.61	8.4	A	0.89	3.6	A	0.92	4.4	A
	Boardman- WB Left	0.27	29.2	C	0.36	29.9	C	0.36	29.9	C
	Boardman- WB Right	0.67	36.9	D	0.85	51.0	D	0.85	51.0	D
	Overall Intersection	**0.68**	**6.4**	**A**	**0.95**	**10.9**	**B**	**0.98**	**15.1**	**B**
7C. Route 1A at Boardman Street West	Route- 1A NB Thru	0.49	0.1	A	0.69	0.1	A	0.71	0.0	A
	Route- 1A SB Thru/Right	0.59	2.0	A	0.86	7.4	A	0.89	8.1	A
	Boardman- SEB Right	0.21	28.8	C	0.27	29.3	C	0.28	29.5	C
	Overall Intersection	**0.56**	**1.5**	**A**	**0.81**	**3.8**	**A**	**0.84**	**4.1**	**A**
1A. Route 1A at Site Entrance	Route 1A- NB Thru	0.65	9.5	A	0.74	7.3	A	0.78	7.5	A
	Route 1A- NB Right	0.21	0.3	A	0.67	1.7	A	0.68	1.7	A
	Route 1A- SB Left	0.04	19.4	B	0.26	24.5	C	0.25	24.1	C
	Route 1A- SB Thru	0.39	0.0	A	0.57	0.1	A	0.59	0.1	A
	Overall Intersection	**0.57**	**4.8**	**A**	**0.68**	**3.8**	**A**	**0.75**	**3.9**	**A**
1B. Route 1A at Site Exit	Route 1A- NB Thru	0.77	15.4	B	0.88	17.2	B	0.92	18.5	B
	Route 1A- SB Thru	0.67	1.8	A	0.85	2.9	A	0.89	3.3	A
	Site Drive- NWB Left	0.11	24.0	C	0.60	26.2	C	0.61	26.3	C
	Site Drive- NWB Right	0.04	24.2	C	0.33	23.1	C	0.31	22.8	C
	Overall Intersection	**0.53**	**9.6**	**A**	**0.77**	**12.5**	**B**	**0.80**	**13.2**	**B**
12. Route 1A at Jughandle	Route 1A- NB Thru/Right	0.60	0.3	B	0.72	0.9	A	0.75	1.1	A
	Route 1A- SB Thru	0.67	0.3	A	0.85	19.5	B	0.88	21.1	C
	Jughandle- EB Left/Thru/Right	0.42	34.5	C	0.43	34.7	C	0.51	35.5	D
	Overall Intersection	**0.60**	**7.8**	**A**	**0.74**	**10.4**	**B**	**0.77**	**11.3**	**B**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

Table 5-26(C) Option 11 – Modified At-Grade Alternative, Saturday Afternoon Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
7A. Route 1A at Southern U-turn	Route 1A NB Thru	0.62	7.8	A	0.91	15.3	B	0.94	17.9	B
	Route 1A-SB U-Turn	0.45	14.9	B	0.59	18.2	B	0.61	19.0	B
	Route 1A- SB Thru	0.38	0.0	A	0.55	0.1	A	0.57	0.1	A
	Overall Intersection	**0.54**	**4.6**	**A**	**0.80**	**8.5**	**A**	**0.83**	**9.9**	**A**
7B. Route 1A at Boardman Street East	Route 1A- NB Thru	0.62	4.7	A	0.92	7.2	A	0.96	8.4	A
	Route 1A – NB Right	0.24	0.1	A	0.33	0.1	A	0.35	0.1	A
	Route 1A- SB Thru	0.61	2.1	A	0.88	3.8	A	0.92	4.5	A
	Boardman- WB Left	0.25	21.5	C	0.33	22.0	C	0.34	22.1	C
	Boardman- WB Right	0.75	32.6	C	0.96	62.6	E	1.00	73.6	E
	Overall Intersection	**0.66**	**5.8**	**A**	**0.93**	**8.8**	**A**	**0.97**	**10.3**	**B**
7C. Route 1A at Boardman Street West	Route- 1A NB Thru	0.43	0.0	A	0.62	0.1	A	0.64	0.1	A
	Route- 1A SB Thru/Right	0.58	3.2	A	0.85	7.9	A	0.88	8.9	A
	Boardman- SEB Right	0.17	21.1	C	0.22	21.5	C	0.23	21.6	C
	Overall Intersection	**0.53**	**1.9**	**A**	**0.77**	**3.9**	**A**	**0.80**	**4.4**	**A**
1A. Route 1A at Site Entrance	Route 1A- NB Thru	0.63	5.3	A	0.73	5.8	A	0.76	6.1	A
	Route 1A- NB Right	0.15	0.2	A	0.64	1.6	A	0.65	1.6	A
	Route 1A- SB Left	0.03	14.3	B	0.23	17.7	B	0.23	17.3	B
	Route 1A- SB Thru	0.36	0.0	A	0.52	0.1	A	0.54	0.1	A
	Overall Intersection	**0.53**	**2.6**	**A**	**0.66**	**2.9**	**A**	**0.68**	**3.1**	**A**
1B. Route 1A at Site Exit	Route 1A- NB Thru	0.63	6.3	A	0.73	5.7	A	0.76	6.1	A
	Route 1A- SB Thru	0.60	1.5	A	0.77	2.1	A	0.80	2.2	A
	Site Drive- NWB Left	0.11	19.0	B	0.65	23.3	C	0.66	23.6	C
	Site Drive- NWB Right	0.13	19.3	B	0.46	21.1	C	0.46	21.4	C
	Overall Intersection	**0.46**	**4.7**	**A**	**0.73**	**6.9**	**A**	**0.75**	**7.1**	**A**
12. Route 1A at Jughandle	Route 1A- NB Thru/Right	0.49	0.2	A	0.59	0.6	A	0.62	0.6	A
	Route 1A- SB Thru	0.59	10.1	B	0.77	12.7	B	0.80	13.4	B
	Jughandle- EB Left/Thru/Right	0.42	32.2	C	0.45	32.5	C	0.51	33.3	C
	Overall Intersection	**0.54**	**5.4**	**A**	**0.67**	**6.9**	**A**	**0.70**	**7.3**	**A**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

5.5.7 Option 12 – Left Turn Flyovers at Various Locations, all Through-Movements At-Grade

This series of alternatives could be implemented to remove left turns from the at-grade movement at various points along the Route 1A corridor. Given land use and space constraints west of the Route 1A corridor, only movements to and from the west are being considered for this Option.

Plans prepared at Boardman Street include the following:

- Elimination of left turn movement from Route 1A southbound to Boardman Street eastbound (see Figure 5-22G); and
- Removal of left turns from both Route 1A southbound to Boardman Street eastbound and from Boardman Street westbound to Route 1A southbound (see Figure 5-22H).

At Tomasello Drive, two alternatives have been developed, as follows:

- Elimination of the Route 1A southbound left to Tomasello Drive (see Figure 5-22I); and
- Elimination of the left turn from Tomasello Drive to Route 1A southbound (see Figure 5-22J).

Each alternative is described below. Implementation timeframes have not been identified for the alternatives identified for this option.

Alternate 12-1, Route 1A to Boardman Street

The provision of this movement in an overpass condition would directly benefit the northbound Route 1A corridor during the evening peak condition with the removal of 160 to 200 vehicles from signal control at the intersection (Friday afternoon peak condition) dependent on the design year. Three at-grade through lanes would be required in each direction on Route 1A (with a fourth northbound lane required for left turns). No significant benefit would be derived in the southbound direction during the morning peak other than that associated with the proposed third lane; the capacity of that approach is controlled by the northbound left and Boardman Street movement, and the same holds true for the movement from Boardman Street during the morning peak. The proposed Boardman Street widening would be included as the improvement for this location.

Construction of this overpass, illustrated in Figure 5-22G, would be in the center of the Route 1A corridor, replacing the existing left turn lane and median and shifting into both the northbound and southbound left turn lanes. The corridor has been set as 20 feet in width and, with walls/parapets, a base footprint of 26 feet has been identified. Alternates

(not drawn) would shift the turn lane to either the north or south, impacting only one side of the corridor with respect to land acquisition. Three through lanes in each direction would parallel the left turn overpass. To construct the overpass, an area approximately 42 to 44 feet wide would be required in addition to maintaining the existing three lane section southbound (two through and a left only) and two lanes northbound north of Boardman Street. With maintenance of sidewalks on both sides, 20 feet of additional right-of-way would be required through the construction period. Upon completion, the overall width of the needed layout would be consistent with this 120-foot layout.

With grades in the Boardman Street corridor sloping down from Route 1A, the touchdown point of the lane using grades on the order of 7% to 8% extends to 1,000 feet from the Route 1A corridor. Given the approach angle and associated sight line restrictions, an extended area of two-lane eastbound operation would be included. Land acquisition in this corridor would extend over 54 feet and appears to impact the proposed building siting and access identified for the proposed hotel.

Using Synchro 7, Tables 5-27 (A, B & C) provide a summary of LOS for the remaining signal-controlled movements by approach for Weekday morning, Friday evening, and Saturday afternoon peak hours, respectively, during each of the three Design Years reviewed for the intersections associated with Option 12-1.

Table 5-27(A) Option 12-1 – Left Turn Flyover at Route 1A Southbound to Boardman Street, Weekday Morning Peak Hour

		2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
Location	*Approach*	*V/C*[1]	*Delay*[2]	*LOS*[3]	*V/C*	*Delay*	*LOS*	*V/C*	*Delay*	*LOS*
7. Route 1A at Boardman Street	Route 1A- NB Left	0.94	106.5	F	0.98	119.9	F	1.03	134.8	F
	Route 1A- NB Thru/ Right	0.41	11.6	B	0.54	13.4	B	0.56	13.8	B
	Route 1A- SB Thru/Right	0.85	30.9	C	1.02	53.1	D	1.06	67.9	E
	Boardman-EB Left/Thru	0.59	66.0	E	0.64	70.0	E	0.66	72.4	E
	Boardman-EB Right	0.28	42.0	D	0.31	42.4	D	0.34	42.7	D
	Boardman-WB Left	0.93	79.9	E	0.96	86.0	F	1.01	99.0	F
	Boardman-WB Left/Thru/Right	0.83	63.3	E	0.86	66.9	E	0.91	76.0	E
	Overall Intersection	**0.87**	**34.4**	**C**	**0.98**	**45.3**	**D**	**1.02**	**54.7**	**D**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

Table 5-27(B) Option 12-1 – Left Turn Flyover at Route 1A Southbound to Boardman Street, Friday Evening Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
7. Route 1A at Boardman Street	Route 1A- NB Left	0.77	87.8	F	0.68	69.5	E	0.71	73.8	E
	Route 1A- NB Thru/ Right	0.66	12.1	B	1.01	37.6	D	1.04	49.7	D
	Route 1A- SB Thru/Right	0.55	16.4	B	0.87	27.7	C	0.91	30.2	C
	Boardman-EB Left/Thru	0.57	66.8	E	0.59	69.6	E	0.62	72.9	E
	Boardman-EB Right	0.04	44.5	D	0.09	43.8	D	0.11	44.0	D
	Boardman-WB Left	0.71	56.4	E	0.82	63.8	E	0.80	62.1	E
	Boardman-WB Left/Thru/Right	0.80	66.4	E	0.95	89.1	F	1.13	144.7	F
	Overall Intersection	**0.68**	**20.6**	**C**	**0.97**	**37.8**	**D**	**1.04**	**47.8**	**D**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement
1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

Table 5-27(C) Option 12-1 – Left Turn Flyover at Route 1A Southbound to Boardman Street, Saturday Afternoon Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
7. Route 1A at Boardman Street	Route 1A- NB Left	0.52	63.5	E	0.55	66.1	E	0.56	67.8	E
	Route 1A- NB Thru/ Right	0.67	15.0	B	1.02	46.1	D	1.06	59.2	E
	Route 1A- SB Thru/Right	0.54	17.8	B	0.83	26.3	C	0.86	28.0	C
	Boardman-EB Left/Thru	0.66	76.9	E	0.70	83.2	F	0.73	88.2	F
	Boardman-EB Right	0.02	46.5	D	0.03	46.5	D	0.03	46.5	D
	Boardman-WB Left	0.52	44.5	D	0.67	47.6	D	0.65	47.1	D
	Boardman-WB Left/Thru/Right	0.88	71.5	E	0.97	86.4	F	1.13	137.2	F
	Overall Intersection	**0.72**	**22.8**	**C**	**0.99**	**41.5**	**D**	**1.06**	**52.2**	**D**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement
1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

Alternate 12-2, Boardman Street Westbound to Route 1A Southbound Added

The addition of a flyover allowing either a reduction in, or elimination of, the left turn from Boardman Street westbound extends the overall operational improvement to the morning peak hour given the existing demand for the left turn movement (approximately 380 vehicles during the morning peak). A series of alignments for the addition of this movement have been considered and the alternative presented in Figure 5-22H maintains the centrally located southbound movement from Route 1. The on-movement to Route 1A southbound would continue westerly from the southbound-off, turning and fully crossing Route 1A

south and then merging with the Route 1A southbound flow via a right entering ramp. Alignment of the off-ramp will be established to discourage a through movement onto the northbound on-ramp from Boardman Street.

The need to maintain a left turn movement at either the intersection or improve/modify the geometry at the ramp/Boardman Street intersection is driven by needs of the Leyden Street corridor. This one-way westbound roadway intersects Boardman Street between Route 1A and the take-off point for Boardman Street access via the flyover. Given property impacts, it has been assumed that the left turn at Route 1A would be maintained, but that the demand would be reduced by 85% given use of the direct flyover ramp.

The two-way ramp would require a width of approximately 30 feet (two 11-foot lanes with four-foot shoulders on each side) and, with parapets added, the structure width would be 34 to 36 feet. At the intersection of the southbound off-ramp and the Boardman on-ramp, the southbound off-ramp would be stop sign controlled, requiring an expanded structure to provide adequate intersection sight distance unimpeded by parapet walls.

Route 1A north and south would be widened to three lanes in each direction with the northbound left turn lane maintained. The Boardman westbound approach would be maintained in its current two-lane configuration.

Using Synchro 7, Tables 5-28 (A, B & C) provide a summary of LOS for the remaining signal-controlled movements by approach for Weekday morning, Friday evening, and Saturday afternoon peak hours, respectively, during each of the three Design Years reviewed for the intersections associated with Option 12-2.

Table 5-28(A) Option 12-2 - Left Turn Flyover at Route 1A Southbound at Boardman Street Westbound^, Weekday Morning Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
7. Route 1A at Boardman Street	Route 1A- NB Left	0.66	51.5	D	0.70	58.2	E	0.71	58.3	E
	Route 1A- NB Thru/ Right	0.33	3.3	A	0.43	4.5	A	0.45	5.0	A
	Route 1A- SB Thru/Right	0.68	15.6	B	0.81	21.0	C	0.87	24.6	C
	Boardman-EB Left/Thru	0.35	46.1	D	0.34	48.7	D	0.32	47.6	D
	Boardman-EB Right	0.23	28.8	C	0.23	30.7	C	0.23	29.6	C
	Boardman-WB Left/Thru	0.53	48.6	D	0.47	50.2	D	0.45	48.9	D
	Boardman-WB Right	0.53	48.7	D	0.67	57.8	E	0.69	57.9	E
	Overall Intersection	**0.66**	**15.9**	**B**	**0.77**	**18.9**	**B**	**0.81**	**21.0**	**C**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement.

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

^ Analysis shows 50 WB left turns in each scenario to account for traffic from Leyden Street that will not be able to access the overpass

Table 5-28(B) Option 12-2 - Left Turn Flyover at Route 1A Southbound at Boardman Street Westbound ^,*, Friday Evening Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
7. Route 1A at Boardman Street	Route 1A- NB Left	0.61	53.8	D	0.63	55.2	E	0.67	58.0	E
	Route 1A- NB Thru/ Right	0.62	7.7	A	0.95	21.6	C	0.99	29.2	C
	Route 1A- SB Thru/Right	0.54	12.5	B	0.84	20.8	C	0.88	22.8	C
	Boardman-EB Left/Thru	0.17	35.4	D	0.15	33.1	C	0.16	32.8	C
	Boardman-EB Right	0.09	25.2	C	0.11	23.5	C	0.12	23.3	C
	Boardman-WB Left	0.27	36.3	D	0.24	33.9	C	0.24	33.5	C
	Boardman-WB Left/Thru/Right	0.72	50.1	D	0.85	57.1	E	0.87	60.5	E
	Overall Intersection	**0.65**	**13.4**	**B**	**0.93**	**23.5**	**C**	**0.97**	**28.4**	**C**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement
1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.
^ Analysis shows 50 WB left turns in each scenario to account for traffic from Leyden Street that will not be able to access the overpass

Table 5-28(C) Option 12-2 - Left Turn Flyover at Route 1A Southbound at Boardman Street Westbound ^,*, Saturday Afternoon Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
7. Route 1A at Boardman Street	Route 1A- NB Left	0.43	50.1	D	0.45	50.6	D	0.47	50.9	D
	Route 1A- NB Thru/ Right	0.61	8.9	A	0.96	24.9	C	1.00	33.1	C
	Route 1A- SB Thru/Right	0.50	12.2	B	0.79	19.7	B	0.83	21.1	C
	Boardman-EB Left/Thru	0.16	33.0	C	0.14	30.2	C	0.15	29.9	C
	Boardman-EB Right	0.04	24.7	C	0.07	22.6	C	0.08	22.4	C
	Boardman-WB Left	0.22	33.6	C	0.19	30.6	C	0.19	30.3	C
	Boardman-WB Left/Thru/Right	0.80	51.0	D	0.90	61.7	E	0.93	66.8	E
	Overall Intersection	**0.65**	**14.2**	**B**	**0.95**	**25.3**	**C**	**0.98**	**30.4**	**C**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement
1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.
^ Analysis shows 50 WB left turns in each scenario to account for traffic from Leyden Street that will not be able to access the overpass

Alternate 12-3, Southbound Route 1A to Tomasello Drive

The provision of this movement would eliminate the left turn phase for movement into the Project site. Projections for the movement are less than the left turn into Boardman, and as part of all of the at-grade options, a double left turn is provided to minimize disruption to northbound Route 1A traffic demands.

The corridor lane and structure would be as described in the Alternate 12-1 program for Boardman Street. The length of the structure, illustrated in Figure 5-22I, would be considerably longer however, given the need to be fully elevated at the current Jughandle location. Construction staging would also be as described in terms of lane needs, structure width buffers, and pedestrian facilities, except that there is no need for a surface left turn lane at Tomasello Drive.

The 110- to 115-foot cross section needed for construction would extend northerly to impact the overhead oil distribution facilities located north of the Jughandle.

The surface streets are proposed as three lanes southbound (all through) and four lanes northbound (three through and a right only) to the Project site. Tables 5-29 (A, B & C) provide a summary of LOS for the remaining signal-controlled movements by approach for Weekday morning, Friday evening, and Saturday afternoon peak hours, respectively, during each of the three Design Years reviewed for the intersections associated with Option 12-3.

Table 5-29(A) Option 12-3- Left Turn Flyover at Route 1A Southbound to Tomasello Drive, Weekday Morning Peak Hour

			2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
	Location	Approach	V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
1.	Route 1A at Tomasello Drive	Route 1A- NB Thru	0.30	1.3	A	0.36	3.0	A	0.38	3.5	A
		Route 1A- NB Right	0.05	0.9	A	0.17	2.6	A	0.17	2.9	A
		Route 1A- SB Thru	0.53	2.7	A	0.64	7.5	A	0.65	5.6	A
		Tomasello Drive- WB Left	0.24	49.0	D	0.46	43.6	D	0.53	43.2	D
		Tomasello Drive- WB Right	0.01	0.0	A	0.03	0.0	A	0.04	0.0	A
		Overall Intersection	**0.52**	**2.5**	**A**	**0.62**	**6.9**	**A**	**0.64**	**6.4**	**A**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement.

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

Table 5-29(B) Option 12-3 – Left Turn Flyover at Route 1A Southbound to Tomasello Drive, Friday Evening Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
1. Route 1A at Tomasello Drive	Route 1A- NB Thru	0.49	1.8	A	0.73	11.6	B	0.76	12.7	B
	Route 1A- NB Right	0.14	1.1	A	0.60	11.1	B	0.62	11.9	B
	Route 1A- SB Thru	0.43	0.3	A	0.66	7.2	A	0.70	7.6	A
	Tomasello Drive- WB Left	0.23	48.9	D	0.76	40.7	D	0.77	40.6	D
	Tomasello Drive- WB Right	0.01	0.0	A	0.10	0.1	A	0.10	0.1	A
	Overall Intersection	**0.48**	**1.3**	**A**	**0.73**	**12.3**	**B**	**0.76**	**13.0**	**B**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement.
1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

Table 5-29(C) Option 12-3 – Left Turn Flyover at Route 1A Southbound to Tomasello Drive, Saturday Afternoon Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
1. Route 1A at Tomasello Drive	Route 1A- NB Thru	0.42	1.9	A	0.62	9.7	A	0.65	10.4	B
	Route 1A- NB Right	0.11	1.3	A	0.60	11.2	B	0.62	11.9	B
	Route 1A- SB Thru	0.40	1.1	A	0.59	9.0	A	0.62	9.2	A
	Tomasello Drive- WB Left	0.30	47.4	D	0.75	40.7	D	0.77	40.7	D
	Tomasello Drive- WB Right	0.04	0.0	A	0.13	0.2	A	0.13	0.2	A
	Overall Intersection	**0.42**	**2.0**	**A**	**0.65**	**12.4**	**B**	**0.68**	**12.8**	**B**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement.
1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

Alternate 12-4, Tomasello Drive to Route 1A Southbound

This overpass construction would have more beneficial impact on Route 1A/Tomasello Drive traffic operations than the previous left turn entering movement alternative. Corridor and overall structure size would be consistent with the one-way, one-lane operation associated with other Option 12 alternates. Movement from the Resort, illustrated in Figure 5-22J, would be taken over Route 1A fully, partially turning and then entering the Route 1A southbound corridor as an added lane approaching Boardman Street. The location of the on-ramp would restrict access to the left turn movement to Boardman Street eastbound, and establish a difficult weaving section for movement from the southbound Route 1A corridor to Boardman Street west of the corridor.

Much of the overpass could be constructed off the existing Route 1A travel way and would require acquisition of properties along the west side or Route 1A. Given grades on the site and the desire to provide a U-turn movement for Waldemar Avenue traffic, considerable impact to on-site wetlands is anticipated.

Route 1A southbound would remain a two lane through movement corridor and would not be controlled by traffic signals at Tomasello Drive, unless there is a desire to provide a pedestrian crossing at the site, which could easily be provided on the south side of the existing Jughandle location. The double left turn movement from Route 1A southbound to the site would be signal-controlled. Route 1A northbound would be three lanes in width, providing for two through lanes and a right only lane into the Project.

Using Synchro 7, Tables 5-30 (A, B & C) provide a summary of LOS for the remaining signal-controlled movements by approach for Weekday morning, Friday evening, and Saturday afternoon peak hours, respectively, during each of the three Design Years reviewed for the intersections associated with Option 12-4.

Table 5-30(A) Option 12-4 – Left Turn Flyover at Tomasello Drive to Route 1A Southbound, Weekday Morning Peak Hour

		*2012 Existing Conditions**			*2022 Build Conditions*			*2032 Build Conditions*		
Location	*Approach*	*V/C*[1]	*Delay*[2]	*LOS*[3]	*V/C*	*Delay*	*LOS*	*V/C*	*Delay*	*LOS*
1. Route 1A at Tomasello Drive	Route 1A- NB Thru	0.67	18.0	B	0.76	20.4	C	0.78	21.0	C
	Route 1A- NB Right	0.05	10.5	B	0.17	11.6	B	0.17	11.6	B
	Route 1A- SB Left	0.01	26.5	C	0.05	26.8	C	0.05	21.5	C
	Route 1A- SB Thru	0.66	0.3	A	0.74	0.3	A	0.74	0.9	A
	Tomasello Drive- WB Left	0.01	0.0	A	0.03	0.0	A	0.04	0.0	A
	Overall Intersection	**0.66**	**6.8**	**A**	**0.74**	**8.1**	**A**	**0.74**	**8.7**	**A**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement.

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

Table 5-30(B) Option 12-4 – Left Turn Flyover at Tomasello Drive to Route 1A Southbound, Friday Evening Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
1. Route 1A at Tomasello Drive	Route 1A- NB Thru	0.92	18.5	B	0.94	19.0	B	0.98	25.4	C
	Route 1A- NB Right	0.14	4.9	A	0.76	11.8	B	0.78	12.8	B
	Route 1A- SB Left	0.05	24.3	C	0.42	43.1	D	0.40	43.3	D
	Route 1A- SB Thru	0.54	0.2	A	0.64	0.2	A	0.67	0.2	A
	Tomasello Drive- WB Left	0.01	0.0	A	0.10	0.1	A	0.10	0.1	A
	Overall Intersection	**0.82**	**9.9**	**A**	**0.88**	**11.3**	**B**	**0.92**	**14.0**	**B**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement.
1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

Table 5-30(C) Option 12-4 – Left Turn Flyover at Tomasello Drive to Route 1A Southbound, Saturday Afternoon Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
1. Route 1A at Tomasello Drive	Route 1A- NB Thru	0.74	11.2	B	0.86	15.4	B	0.89	17.6	B
	Route 1A- NB Right	0.11	5.0	A	0.79	15.8	B	0.82	17.2	B
	Route 1A- SB Left	0.04	31.7	C	0.33	36.7	D	0.33	37.5	D
	Route 1A- SB Thru	0.49	0.1	A	0.57	0.1	A	0.60	0.2	A
	Tomasello Drive- WB Left	0.04	0.0	A	0.13	0.2	A	0.13	0.2	A
	Overall Intersection	**0.67**	**5.9**	**A**	**0.78**	**10.2**	**B**	**0.82**	**11.2**	**B**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement.
1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

5.5.8 Option 13 – Boardman Street At-Grade, Reverse Jughandle and Relocation of Northbound Left Turns

With identification of a plan that will function with three vehicle phases, this at-grade alternative (shown in Figure 5-22K) looks to strike a balance between the four vehicle phase Option 1 and the two vehicle phase Option 11. Left turn movements have been prohibited directly at the intersection; instead, northbound vehicles would be permitted to turn left (and U-turn) approximately 300 feet south of Boardman Street and, for those with destinations on Boardman Street west of Route 1A, connect to a private access and utility easement area (that would become a public way) via a new 75- to 100-foot-long roadway. Southbound vehicles would continue southerly through the signal to this new connector roadway (a travel distance of approximately 400 feet from the existing left turn lane), turn

right and then complete the movement to eastbound Boardman Street or back to Route 1A northbound via the Boardman Street eastbound corridor, passing through the signal again as a through movement or left turn.

Basic findings associated with this design include the need to widen the westerly leg of Boardman Street to three approach lanes from the access/utility easement corridor to Route 1A in addition to the widening to three lanes on the easterly approach. The alignment eastbound will also require a widening on the departure side of Boardman Street eastbound to accommodate the two approach lanes. On Route 1A, four northbound through/right turn lanes are required in addition to the three southbound through/right turn lanes approaching Boardman Street. Note that a fourth southbound lane is developed just south of Boardman Street to remove the right turn movement to the new connector from the through travel lanes. Northbound and southbound Route 1A operate in one vehicle phase at Boardman Street, followed by split phase operation on the Boardman Street approaches.

The northbound left turn movement would also be signal-controlled, operating during the Boardman Street eastbound phase (after a southbound internal clearance phase). Note at this latter location, northbound through movement would be permitted at all times.

Widening of the Route 1A corridor has again been maintained only on the northbound side except for the development of the short right turn lane between Boardman Street and the connector. Land acquisition needs are reduced (when compared with Option 1) along the easterly side of Route 1A given the reduction in median width associated with the elimination of the left turn lane. However, the widening in the Boardman Street corridor west of Route 1A, construction of the connector, and inclusion of the Access/Utility easement area within the public right of way add the need for land acquisition in the southwest quadrant of the intersection.

Tables 5-31 (A, B & C) provide a summary of operations based on Synchro 7 analysis for the Weekday morning, Friday evening, and Saturday afternoon peak hours, respectively, based on the 2012 and Resort build 2022 and 2032 volume conditions.

The construction schedule is estimated at 18 months. Basic construction staging would first include widening of the northbound corridor and construction in the northbound median at the proposed left turn point together with the connector and upgrades to the Access/Utility easement corridor and Boardman Street. Traffic would be put in its final alignment and then the southbound side of Route 1A would be modified to the three lanes southbound.

Table 5-31(A) Option 13 – Boardman Street At-Grade, Reverse Jughandle and Relocation of NB Left Turns, Weekday Morning Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
7. Route 1A at Boardman Street	Route 1A- NB Thru/Right	0.39	17.6	B	0.47	18.1	B	0.49	18.4	B
	Route 1A- SB Thru/Right	0.92	32.2	C	0.99	43.0	D	1.04	57.3	E
	Boardman-EB Left/Thru	0.97	110.0	F	1.08	141.6	F	1.10	149.3	F
	Boardman-EB Right	0.31	51.4	D	0.34	50.8	D	0.40	52.5	D
	Boardman-WB Left	0.93	81.5	F	1.03	108.6	F	1.05	112.8	F
	Boardman-WB Left/Thru/Right	0.83	67.9	E	0.90	81.2	F	0.95	88.0	F
	Overall Intersection	**0.96**	**37.7**	**D**	**1.04**	**46.5**	**D**	**1.08**	**54.7**	**D**
7A. Route 1A at Connector	Route 1A- NB Left	0.90	97.2	F	0.09	101.3	F	0.97	115.1	F
	Route 1A – SB Thru	0.67	1.1	A	0.73	1.9	A	0.76	2.6	A
	Route 1A- SB Right	0.09	0.5	A	0.92	0.5	A	0.09	0.5	A
	Overall Intersection	**0.70**	**5.7**	**A**	**0.75**	**6.3**	**A**	**0.79**	**7.7**	**A**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement.

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

Table 5-31(B) Option 13 – Boardman Street At-Grade, Reverse Jughandle and Relocation of NB Left Turns, Friday Evening Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
7. Route 1A at Boardman Street	Route 1A- NB Thru/Right	0.72	26.7	C	0.92	29.6	C	0.96	33.6	C
	Route 1A- SB Thru/Right	0.74	27.4	C	0.94	32.1	C	0.98	38.1	D
	Boardman-EB Left/Thru	0.67	52.6	D	1.00	111.7	F	1.04	120.4	F
	Boardman-EB Right	0.06	42.2	D	0.11	46.8	D	0.13	46.2	D
	Boardman-WB Left	0.56	51.4	D	0.96	97.8	F	1.06	129.0	F
	Boardman-WB Left/Thru/Right	0.27	44.2	D	0.84	80.5	F	0.95	102.9	F
	Overall Intersection	**0.71**	**30.3**	**C**	**0.98**	**38.6**	**D**	**1.03**	**45.6**	**D**
7A. Route 1A at Connector	Route 1A- NB Left	0.42	52.7	D	0.44	53.0	D	0.44	53.0	D
	Route 1A – SB Thru	0.48	1.4	A	0.71	2.3	A	0.74	4.5	A
	Route 1A- SB Right	0.10	1.2	A	0.13	0.7	A	0.14	0.7	A
	Overall Intersection	**0.48**	**3.0**	**A**	**0.69**	**3.4**	**A**	**0.71**	**3.9**	**A**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement.

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service

Table 5-31(C) Option 13 – Boardman Street At-Grade, Reverse Jughandle and Relocation of NB Left Turns, Saturday Afternoon Peak Hour

Location	Approach	2012 Existing Conditions*			2022 Build Conditions			2032 Build Conditions		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS
7. Route 1A at Boardman Street	Route 1A- NB Thru/Right	0.66	24.7	C	0.90	28.2	C	0.94	32.3	C
	Route 1A- SB Thru/Right	0.74	26.8	C	0.96	35.5	D	1.00	43.7	D
	Boardman-EB Left/Thru	0.66	54.0	D	1.03	121.2	F	1.09	137.0	F
	Boardman-EB Right	0.03	43.6	D	0.08	46.6	D	0.09	46.7	D
	Boardman-WB Left	0.55	49.1	D	0.89	82.6	F	0.94	90.9	F
	Boardman-WB Left/Thru/Right	0.43	46.8	D	1.11	143.8	F	1.23	184.1	F
	Overall Intersection	**0.70**	**29.5**	**C**	**43.7**	**43.7**	**D**	**1.09**	**52.2**	**D**
7A. Route 1A at Connector	Route 1A- NB Left	0.18	49.8	D	0.19	49.9	D	0.19	49.9	D
	Route 1A – SB Thru	0.45	1.4	A	0.68	2.4	A	0.69	2.5	A
	Route 1A- SB Right	0.09	1.6	A	0.12	1.0	A	0.13	1.0	A
	Overall Intersection	**0.43**	**2.2**	**A**	**0.63**	**2.8**	**A**	**0.64**	**3.0**	**A**

* Existing Conditions represent existing traffic volumes utilizing associated alternative roadway improvement.

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service

5.5.9 Alternatives Analysis Evaluation Criteria

As part of the alternatives comparison, a series of criteria to be considered in the evaluation has been developed. Given the nature of the Project and the basic requirements that will be the responsibility of the Proponent, higher scores should be afforded to those options that best meet the criteria identified.

The three base overpass conditions (Options 4, 7, and 8) are all predicated on provision of the northbound overpass and southbound surface improvements in the Resort's implementation phase. The southbound land acquisition required is generally consistent amongst all three, and therefore the southbound side land requirements have not been built into the comparative review.

The following is a summary of proposed evaluation criteria.

- **Neighborhood/community preference**. Since the flyover solution (Option 4) has formed the basis of the Proponent's outreach, has been supported by the Proponent in multiple public forums, has been under consideration for many years and enjoys broad public support, grade separation would carry the higher scores.

- **Construction duration and overall constructability including traffic management during construction**. Full implementation of the improvement would be anticipated as a requirement of site occupancy and operation. Note that the on-site construction duration for the Project is estimated at 26 months. Options with a longer estimated construction duration, unless accompanied by detailed a traffic

maintenance plan that maintains LOS during construction, would be given a lower score. Options that could be completed within this timeframe would be given a higher score.

- **Interference with Route 1A through traffic.** Options which eliminate signal control, particularly at key intersections in favor of assisting with the free flow of traffic are favored. Overpasses increase the capacity of a roadway by allowing uninterrupted flow in all directions. Fewer signals are therefore required to direct traffic, eliminating the queues caused by signals. Options that assist in accomplishing these objectives would score higher than those that do not.

- **Land impacts**. Because required land acquisition for implementation of the improvement is viewed as the Proponent's responsibility, the area in square feet, the number of abutters from which land would need to be acquired, and the current land holder (public/private/institutional) will all be recognized. Constructability issues and needs during construction that exceed the final width of corridors needed will be accounted for in this item. The greater the land impact, the lower the score.

- **Accommodation of all traffic movements within the highway right of way**. One overall goal of highway design is to control all traffic movements within the established right of way. Options that accommodate all turning movements within the proposed state highway layout (or on a nearby City street) rather than relying on the use of the private Resort driveway for access would be favored over those that cannot accommodate this feature.

- **Equitable treatment of all users.** In any evaluation of alternatives, there is always the risk that some users' driving experience will improve dramatically while other users will experience significant impacts to their current use of the roadway. Alternatives must recognize that, while Route 1A is a key regional asset and a state highway, it is intersected by local roads under the control of the City of Boston and the City of Revere and relied on every day by those users. Options that take into consideration all driving experiences will score higher than those that do not.

- **Safety.** All highway projects have safety as a key factor in determining eligibility and priority. Grade separation projects increase roadway safety by reducing vehicle-vehicle and vehicle-pedestrian conflicts on the roadway. The American Association of State Highway and Transportation Officials (AASHTO) *Highway Safety Manual* reports that converting an at-grade, four-leg intersection to a grade-separated interchange reduces injury crashes by 57 percent. While results vary based on a host of factors, it has also been reported that converting a signalized intersection into a grade-separated interchange reduces injury crashes by 28 percent. Designs that accommodate these objectives would score higher than at-grade solutions.

- **Level of Service**. A qualitative assessment of LOS and overall delay associated with general operation recognizing morning, evening, and Saturday peaks and the ability of each of the options to mitigate the site's impact is considered. In some cases, such as the elimination of the delay entirely or removal of signal control, the impact can be entirely mitigated. Better operation provides a higher score.

- **Environmental impacts recognizing wetlands and Chapter 91 land issues, along with land damages (such as elimination of green space adjacent to the right of way.** The Proponent has limited ability to fill wetlands and, because Route 1A improvements are being carried out as part of the Project, overall site impact to wetlands must include the area impacted by the access plan. Fewer potential impacts result in a higher score.

5.6 Host Community Agreement Traffic and Safety Improvements

As part of discussions for the HCAs and Surrounding Community Agreements to be executed by the Proponent, the cities of Revere and Chelsea have asked that existing regional traffic and safety issues along the Route 60 and Route 1 corridors be addressed by providing improved all-movement connections between Route 1 and Route 16. In response, conceptual plans for new ramp connections at the Route 1/Route 16 interchange and improvements along the Revere Beach Parkway corridor are included in the City of Revere HCA. The Route 1/Route 16 ramp connections would be supported by additional improvements at the Route 16/Route 145 Revere Beach Parkway intersection at Harris Street.

These improvements, which are consistent with the Boston MPO's Lower North Shore Transportation Improvement Study (prepared by the Central Transportation Planning Staff for the Massachusetts Highway Department in October 2000), and the recommendations contained in CTPS's 2004 Congestion Management System Report, are expected to shift some regional traffic from the Route 60 corridor to Route 1/Route 16.

Such strategic new connections could address long-standing regional traffic issues in the Cities of Revere and Chelsea along the Route 60 corridor through Brown Circle and Bell (Mahoney) Circle, as well as along Route 16/Revere Beach Parkway between Webster Avenue and the split to Route 145. Also, many of the trips using the new ramp connections will be diverted from the Route 16/Webster Avenue/Garfield Avenue intersection which currently provides a tenuous, unsafe U-turn alternative to using the Route 60 corridor. As these improvements are intended to address a pre-existing regional traffic problem independent of the Project, some Project-related trips would be expected to be similarly shifted from the Route 60 corridor.

As part of the Boston HCA, the City of Boston also identified locations in Revere that would complement improvements in East Boston and reinforce the regional benefits associated with proposed improvements in the Revere Beach Parkway (Route 16/Route 145) corridor.

The following sections describe the roadway, traffic, safety, bicycle, and pedestrian improvements committed to in the both the Boston and Revere HCAs, other than the Route 1A infrastructure improvements discussed in Section 5.5. All of the improvements and costs identified are based on the assumption that the needed right of way to make the improvements can be made available and that the Proponent will not need to make any additional right of way acquisitions. For each location, the relevant state and/or city agency having control and jurisdiction is identified; the Proponent will continue to work with these agencies, where appropriate, to further develop concept plans and advance permitting and design of the improvements or studies.

Both the Boston and Revere HCAs assume that the flyover solution (Option 4) will be the preferred alternative. Under that alternative, the proposed on-grade widening of Route 1A from Boardman Street to the Jughandle will be completed prior to the opening of any element of the Project. The Route 1A flyover will be completed prior to completion of the full build-out of the Resort. The Route 1A feasibility study, Bennington Street/Saratoga Street, improvements at Boardman Street/Ashley Street, and Boardman Street/Saratoga Street improvements will be completed prior to the opening of any element of the Project. Improvements to Mahoney (Bell) Circle, Brown Circle, and Route 60/Revere Street will be funded but not constructed by the Proponent as described in the Revere HCA. Remaining improvements (i.e., Neptune Road/Chelsea Street to northbound ramp, and Curtis Avenue/Route 1A) will be completed post-Project completion. Improvements in Revere will be completed in accordance with the City of Revere HCA.

5.6.1 Revere Beach Parkway Corridor

5.6.1.1 Route 1 at Route 16

This improvement, which requires DCR, MassDOT, and Cities of Revere and Chelsea approval, is intended to provide missing movements to an important regional highway access point. Under existing conditions, access from Route 1 southbound to Route 16 eastbound and from Route 16 westbound to Route 1 northbound are not provided. While there is redundant ramp access from Route 16 westbound to Route 1 southbound provided less than 1,500 feet from the existing interchange, or approximately 600 feet west of Webster Avenue, MassDOT has requested that this ramp be retained to maximize traffic operations on Route 16, and not introduce additional traffic into an already constrained weaving area.

Two alternate concepts for the improvement are presented in Figures 5-23A and 5-23B, although operationally they are the same. The former concept uses a part of the existing roadway median to create a left-turn lane for westbound traffic accessing the ramp to Route 1 north. The latter concept limits the impact to a short break in the median by shifting the westbound travel lanes within the right of way through the use of the existing hard shoulder.

Under either concept, the current on/off ramp configuration to and from Route 1 southbound would become a four lane off ramp to Route 16 east and west with a median break on Route 16 and installation of a traffic signal. This ramp will provide the opportunity to significantly reduce left lane and left/U-turn congestion at the Route 16/Webster Avenue intersection. The on-ramp to Route 1 northbound from Route 16 westbound would be developed with a second Route 16 median break on the easterly side of Route 1 supported by a 300- to 400-foot left turn lane. The left turn movement to Route 1 northbound would be signal-controlled and would tie into the existing eastbound to northbound loop ramp through an open infield area.

Both signals would operate in two phases (Route 16 east and west and the Route 1 southbound off at the off-ramp location, and the eastbound through and westbound left to Route 1 northbound at the new on-ramp location). It should be noted that there would be no stopping of the westbound through movement at the proposed signal to the northbound on-ramp movement. The interchange work would also include an update of the Route 16/Webster Avenue/Garfield Avenue intersection, and pavement area reduction where acceleration lanes are no longer required. The plan would provide an important safety improvement by virtue of the significant reduction in the existing dangerous weave and U-turn movements at this location. All work would be confined to the current right of way limits.

Initial review of the model output with the ramp added suggested a high demand for the movements being added. Initial traffic diversions indicated by the model include the following:

- During the Friday evening peak period, the projected movement from Route 1 south to Route 16 east is 300 vehicles. (The base CTPS model demand suggests a volume as high as 900 for this movement but the basis of the model also shows wide disparities between existing roadway demands – counted versus projected.) The left turn movement from Route 16 west to Route 1 north has been projected at 600 vehicles (also projected as high as 900 vehicles). The primary contributors to this demand are two primary corridors: the Route 107 corridor through Revere, which will see a decrease in overall demand, and the Winthrop Avenue corridor, which will be served by a left turn from Route 145 westbound to Route 16 west. The later movement is viewed as a capacity-constrained movement given conditions within the Route 145/Route 16 intersection which is discussed in the following section as a location which will also be improved.

- During the morning peak hour, the use of the new off-ramp movement from southbound to eastbound is projected to be as high as 900, although the actual projection for use of the ramp is shown to be less than 500 vehicles, recognizing existing vehicle patterns at the Webster Street intersection. The Proponent is currently continuing its evaluation of ramp demands, understanding that benefits associated with its addition can be effectively managed within the Route 16 corridor

and that there are significant benefits achieved at the Route 16/Webster Avenue/Garfield Avenue intersection. The on-ramp demand is expected to be 400 to 500 vehicles per hour. The model projection is as high 700 vehicles per hour, but again, this value appears to be high given the comparison in the base conditions with the model and actual field operations and observations.

- Addition of the ramps appears to show traffic diversions in various corridors including Webster Avenue between Route 16 and Chelsea Street, and along the Route 1 corridor itself. The magnitude of the changes vary considerably by corridor and within those corridors and include both the Route 1A and Route 16 approaches to Mahoney (Bell) Circle, extending northerly through the Route 60 corridor to Copeland Circle where the evening peak period demand (3 hours) suggests a volume reduction of between 500 to 750 vehicles (total both directions). This would be equivalent to 200 to 250 vehicles per hour.

The review of these initial data and analysis will be continued in coordination with MassDOT and CTPS.

It should be noted that the volume decreases associated with construction of the ramps have not been applied outside the immediate area of the ramp construction area itself. For example, base volumes assumed within Mahoney (Bell) Circle have not been adjusted even though there appears to be merit in doing so and due to the fact that the addition of these ramps will most certainly assist with Route 1A and Route 60 traffic volumes.

5.6.1.2 Route 1/Route 16 Long Range Plan

In addition to the physical improvement described above, the Proponent will fund a study of potential additional future Route 1 and Route 16 interchange improvements, consistent with long-range plans for interchange developed in the North Shore Transportation Study by CTPS which identifies a direct ramp connection from Route 16 westbound to Route 1 northbound. The following elements will be included in this study, which will be performed in coordination with state and municipal agencies:

- a study of the Route 1/Route 16 interchange for the purpose of planning additional improvements unrelated to the Route 1/Route 16 Intermediate Improvements;

- identification of costs associated with acquisition of property for right of way purposes as may be necessary to construct a direct access ramp from Route 16 westbound to Route 1 northbound; and

- the conceptual design of such a direct access ramp, but not including a full review of the environmental planning process or final design plans.

5.6.1.3 Route 16, Route 145, Harris Street

A series of improvement alternatives have been developed for this location requiring DCR, City of Revere, and potentially MassDOT approval (see Figures 5-24A, 5-24B and 5-24C). The alternatives are distinguished by the following treatments for Harris Avenue:

- maintain Harris Street as a two-way corridor;
- change two-way Harris Street to one-way away from Winthrop Avenue or one-way to Winthrop Avenue; and
- full closure of Harris Street at the intersection coupled with construction of a left turn lane on the Mahoney (Bell) Circle to Route 16 Connector south-westbound.

Common elements of each concept include the following:

- an optimal traffic signal timing and phasing plan, including split phasing;
- two exclusive right turn lanes eastbound onto Revere Beach Parkway;
- an associated widening of Route 16 EB to maintain the two-lane through movement toward Mahoney (Bell) Circle;
- pedestrian phasing, not provided under existing conditions;
- pedestrian safety improvements to allow for safe pedestrian routes from Winthrop Avenue to Revere Beach Parkway in both eastbound and westbound directions, including associated sidewalk reconstruction, curb ramps, crosswalks and median improvements; and
- Installation of an emergency vehicle preemption system.

5.6.1.4 Winthrop Avenue/Revere Beach Parkway at North Shore Road and Tomasello Drive

This intersection, which will require DCR, City of Revere, and MassDOT approvals, is an important access to the Resort. Intersection improvements, shown in Figure 5-25, are limited by a series of environmental concerns west of the intersection and constrained geometry to the north. Improvements under consideration include updating signal operation with split phasing to accommodate increased traffic movements associated with the Project, concurrent pedestrian phasing, provision of a missing crosswalk on Winthrop Avenue east of Tomasello Drive, minor realignments within the right-of-way, and construction of an island in the southwest quadrant allowing for pedestrian protection. An emergency vehicle preemption system will also be installed.

5.6.2 Specific City of Revere Locations

5.6.2.1 Mahoney Circle (Bell Circle)

Specific geometric improvements to be funded by the Proponent and constructed by others in accordance with the Revere HCA, subject to MassDOT approval, are presented in Figure 5-26. The localized widening at the northbound through movement to Route 1A north will enable vehicles to access those lanes more easily, increasing the effective storage capacity and improving throughput at the traffic signal. Analysis of this improvement is presented in Section 5.7.3.

Other basic improvements to pedestrian accommodations and general traffic operations, again subject to approval of MassDOT, include the following:

- Design and implementation of a comprehensive upgrade of the signs and pavement markings approaching and within Mahoney Circle, consistent with MUTCD standards, to improve motorist and pedestrian guidance and safety;
- Installation of ADA accessible ramps and associated sidewalk and median improvements within and around Mahoney Circle;
- Add pedestrian crossings to provide a Route 60 crossing on the north side of the circle, recognizing a high desire for the movements especially during school entrance and release periods;
- Design and installation of channelization and signalization improvements within and around Mahoney Circle;
- Construction of upgrades to traffic islands within Mahoney Circle, including new curbing and landscaping; and
- Installation of an emergency vehicle preemption system.

5.6.2.2 Brown Circle

Improvements at the intersection of Routes 60 and 107, to be funded by the Proponent and constructed by others in accordance with the Revere HCA, include the following:

- Design and implementation of a comprehensive upgrade of signs and pavement markings approaching and within Brown Circle, consistent with MUTCD standards, to improve motorist and pedestrian guidance and safety;
- Installation of ADA accessible ramps and associated sidewalk and median improvements within and around Brown Circle;

- Design and implementation of channelization and signalization improvements, including new pavement and directional markings and channelization islands, at the Route 107 northbound approach to Brown Circle;

- Construction of geometric and channelization improvements by extending existing islands and installing new islands to facilitate safer traffic flow; and

- Installation of an emergency vehicle preemption system.

A concept plan is included in Attachment A. Approval will be required from MassDOT and the City of Revere.

5.6.2.3 Route 60 at Revere Street

Intersection improvements proposed for this location, to be funded by the Proponent and constructed by others in accordance with the Revere HCA, include the following:

- Design and implementation of an optimal traffic signal timing and phasing plan at the intersection, including split phasing;

- Construction of pedestrian safety improvements including new crosswalks and ADA accessible ramps with associated sidewalk reconstruction; and

- Installation of an emergency vehicle preemption system.

A concept plan is included in Attachment A. Approval will be required from MassDOT and the City of Revere. Approval by the MBTA may also be required.

5.6.2.4 Donnelly Square (Bennington Street at Winthrop Avenue), including Bennington Street at Crescent Avenue

This signal-controlled intersection is adjacent to the MBTA Beachmont Station. The base improvement assumed for this site includes a signal upgrade using concurrent pedestrian crossings, extension of the Bennington Street median to the south to better control the prohibited left turn movement to a retail parking lot, and realignment of the Crescent Street approach to better manage the Bennington Street approach to Winthrop Avenue. Specific components include the following:

- Design and implementation of an optimal traffic signal timing and phasing plan, including split phasing, for the weekday morning, weekday evening, and Saturday midday peak periods;

- Redesign of the intersection to channelize traffic flow on the intersection approaches;

- Construction of permanent pedestrian crosswalks with new ADA accessible ramps at all crosswalks within the Donnelly Square area;

- Construction of aesthetic improvements within the Donnelly Square area, including new pavement markings;

- Construction of landscaping improvements within the Donnelly Square area and along Winthrop Avenue leading to the Project entrance at Revere Beach Parkway and Tomasello Drive; and

- Installation of an emergency vehicle preemption system.

A concept plan is included in Attachment A. Approval will be required from MassDOT and the City of Revere, and recognition of the MBTA as a potential stakeholder will be required.

5.6.3 Specific City of Boston Locations

5.6.3.1 Bennington Street at Saratoga Street

The base design used for improvements at this location is to improve pedestrian conditions and to upgrade signal operations. At the intersection, installation of a traffic island in the southwest quadrant and redirection of crosswalks for both the Bennington and Saratoga crossings is proposed, providing a compliant curb ramp for the Bennington Street cross in the southeast quadrant, lane use changes on the northbound Bennington Street approach (one right only and one through left), and median removal and median removal/relocation on the northerly leg of Bennington Street to allow a three lane southbound approach (two through and one left), with one through lane northbound. Signal phasing modifications are also proposed with minor support relocations.

As part of this intersection work, improvements will be made to the Saratoga Street pedestrian crossing in the Barnes Avenue, Bayswater Street triangle area to provide a pedestrian warning beacon system and compliant crossing ramps.

A concept plan is included in Attachment A. Approvals will be required from BTD and the Public Improvement Commission (PIC), and additional neighborhood outreach is required.

5.6.3.2 Boardman Street at Saratoga Street

The basic concept of a traffic circle will be maintained within this intersection with the 11-year-old geometry upgraded to a more standard roundabout design. The circle diameter would be increased and splitter islands added where roadway widths permit. The curb line along the easterly side of Saratoga Street would be modified to significantly reduce the pavement area, and the reclaimed roadway would be used for parking adjacent to the Saratoga Street residences. Pedestrian crossings would be relocated and generally pass through the splitter islands where available.

A concept plan is included in Attachment A. Approvals will be required from BTD and the PIC, and additional neighborhood outreach is required.

5.6.3.3 Chelsea Street Corridor from Neptune Road to Frankfort Street

This corridor has been split in two areas for the proposed improvement plan. The westerly section extends from Chelsea Street to Bremen Street, and the easterly section extends from Bremen Street to Frankfort Street. Concept plans are included in the Transportation Attachment A.

Within the westerly section, the plan would create a one-way couplet with Saratoga Street providing a one-way southbound corridor from Bremen Street to Neptune Road and Bremen Street one way northbound from Neptune Road to Saratoga Street. The curb line on the southeast corner of Chelsea Street and Saratoga Street would be modified (pavement area reduced) and a median would be added on Neptune Road from Chelsea Street to Bremen Street where two lanes would be provided: one left turn, and one lane continuing to Bennington Street. Based on traffic count evaluation, the plan would provide stop control on Neptune Road only or multi-way stop control on all approaches. Given geometric concerns and heavy truck activity, traffic signal control is not a viable option. Approvals will be required from BTD and PIC, and additional neighborhood outreach is required.

The plan developed for the easterly section of the Neptune Road corridor looks to increase capacity at the intersection by splitting the function of the overall intersection with the elimination of the westbound Neptune movement between the Route 1A northbound ramps and Bennington Street. All traffic from the ramp (except the U-turn to Route 1A southbound) and from Frankfort Street would be directed to Vienna Road and then allowed to access Bennington Street northbound and southbound via a new traffic signal and median break.

Removal of the westbound movement from the Bennington Street intersection will allow increased tome for the Bennington Street southbound phase, accommodating both the existing demand and the redirected movement from the closed link. Approvals are required from BTD/PIC, MassDOT, and Massport, and the improvements will be subject to additional neighborhood outreach.

5.6.3.4 Route 1A SB at Curtis Street

A proposal to realign Route 1A southbound has been developed in response to the improvement request for this intersection. A concept plan is included in Attachment A.

The realignment, subject to the approval of MassDOT, is intended to create an "exit" from Route 1A southbound to the Bennington Street and Curtis Street areas rather than the wide pavement area that currently exists. The relocation would be into a grass and tree area within the Route 1A median and provide for two continuous lanes for the southbound

through movement. An island would be created within the current paved area of the exiting movement and through movement. Movement from the newly created ramp would intersect with the Curtis Street movement under single or multi-way stop control (to be evaluated), and the movement from the Curtis Street corridor onto Route 1A southbound would be in a free-flow condition to the third lane available south of the interchange area.

The base design concept assumes that all work will be completed within the State Highway Layout and that, like other improvements described in this section, no right of way acquisition is necessary to make these improvements. Approvals will be required from MassDOT and BTD/PIC, and additional neighborhood outreach is required.

5.6.3.5 Route 1A Planning Study

The City of Boston has a long-standing concern about, and interest in, improving traffic flow along Route 1A from the south. In connection with such concerns, the Proponent will perform a feasibility study of various options available to improve traffic flow along Route 1A from the south.

5.6.3.6 Bennington Street Corridor "Constitution Beach to Revere Beach" Bicycle Connection

The Proponent will provide on-street bicycle accommodations along the Bennington Street corridor from Saratoga Street in East Boston to Winthrop Parkway in Revere.

The bicycle route will start at the northerly end of Constitution Beach Park, proceed northerly along Barnes Avenue (shared lanes) to Saratoga Street, and follow Saratoga Street easterly to Bennington Street (also as a shared lane given width limitations on Saratoga Street) over the MBTA Blue Line. From Saratoga Street to the Boston/Revere municipal boundary, a minimum five-foot-wide bicycle lane will be provided with one lane established for through movement northbound.

Parking will generally be permitted along the curb line, except approaching the Bennington Street, Leyden Street/Walley Street extended intersection area where two travel lanes will be designated, one for left turns and one for through movement. Within an area from 250 feet south of Leyden Street through Palermo Street, parking will be restricted. Parking restrictions and/or painted median area or two-way left turn lane will be considered from Leverett Avenue to the Boston/Revere municipal boundary. Southbound from the Revere/Boston municipal boundary to the Suffolk Downs Station, parking will be restricted (matching northbound). Southerly from the MBTA station, one travel lane will be maintained with on-street parking and the bicycle lane to an area between Ashley and Antrim Streets, where lane sharing will be provided to Saratoga Street.

In Revere, a three-lane corridor (one through/right lane in each direction with a two-way center left turn lane) would be provided, with parking on both sides at the curb and five-foot minimum turn lanes, from the City Line to Crescent Street. From Crescent Street to

Winthrop Avenue, lanes would be shared in both directions. From Winthrop Avenue to Winthrop Parkway, one travel lane would be removed, maintaining one travel lane, parking, and the bicycle lane.

Approvals will be required from BTD, the City of Revere, MassDOT, and DCR.

5.7 Traffic Operations Analysis

Capacity analyses were conducted for the Existing (2012), 2022 No-Build, 2022 Build, and 2022 Build with HCA Improvements conditions to determine how well the roadway facilities serve existing and future traffic demands. These roadway operating conditions are classified by the primary service measure of control delay in seconds per vehicle (sec/veh) and quantified LOS. Data are provided for all 30 intersections requested by MassDOT and the cities of Boston and Revere in the expanded regional study area, although the 2022 Build with HCA Improvements analysis is limited to a set of critical locations, as discussed Section 5.7.4.

While this evaluation presents an alternatives analysis of the Route 1A infrastructure improvements, the traffic analysis presented in this DEIR/EPNF is anchored on the flyover concept (Option 4) proposed in response to community concerns and presented publicly. Beyond the area of the Route 1A infrastructure improvements themselves (and the various operations issues that are unique to each option), the overall regional traffic impact analysis for the Project remains the same under any of the Route 1A options.

LOS is a qualitative measure of control delay at an intersection, providing an index to the operational qualities of a roadway or intersection. LOS designations range from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions. The following sections present LOS analyses for the study area signalized intersections, unsignalized intersections, roundabouts, and interchange (merge/diverge sections).

5.7.1 Signalized and Unsignalized Intersections

LOS designation is reported differently for signalized and unsignalized locations. For signalized intersections, the analysis considers the operation of each lane or lane group entering the intersection and the LOS designation is for overall conditions at the intersection. For unsignalized intersections, however, the analysis assumes that traffic on the mainline is not affected by traffic on side streets. The LOS is only determined for left turns from the main street and all movements from the minor street. The LOS designation is for the most critical movement, which is most often the left turn out of the side street.

The evaluation criteria used for the LOS analysis are based on the *2000 Highway Capacity Manual* (HCM)[6]. Table 5-32 presents the LOS delay threshold criteria as defined in the HCM.

Synchro 7 software was used to model LOS operations at all signalized and unsignalized study area intersections. Overall intersection, as well as individual movement LOS and delay are provided for signalized intersections by Synchro. For unsignalized intersections, only the critical movement is reported.

Table 5-32 Level of Service Criteria for Signalized and Unsignalized Intersections

Level of Service	*Signalized Intersection Control Delay (sec/veh)*	*Unsignalized Intersection Control Delay (sec/veh)*
LOS A	≤ 10	0 - 10
LOS B	> 10-20	>10 - 15
LOS C	> 20-35	>15 - 25
LOS D	> 35-55	>25 - 35
LOS E	> 55-80	>35 - 50
LOS F	> 80	>50

Source: 2010 HCM

LOS results for signalized intersections for the Friday evening peak hour and the Saturday afternoon peak hour are presented in Tables 5-33 and 5-34, respectively, for all analysis scenarios. Synchro reports are included in Attachment A.

[6] 2000 Highway Capacity Manual, Transportation Research Board, Washington D.C. (2000).

Table 5-33 Signalized Intersection Capacity Analysis, Friday Evening Peak Hour

Location		Approach	2012 Existing Conditions					2022 Future Conditions									
								No-Build					Build				
			V/C[1]	Delay[2]	LOS[3]	50th[4]	95th[5]	V/C	Delay	LOS	50th	95th	V/C	Delay	LOS	50th	95th
1.	Route 1A at Suffolk Downs Driveway (Tomasello Drive)	Suffolk Downs – WB Left											0.58	37.0	D	5	7
		Suffolk Downs – WB Right											0.10	0.1	A	0	0
		Route 1A – NB Thru											0.93	22.8	C	17	#21
		Route 1A – NB Right	*Intersection is Unsignalized under Existing & No-Build conditions*										0.72	13.8	B	1	6
		Route 1A – SB Left											0.53	40.4	D	3	m3
		Route 1A – SB Thru											0.92	13.8	B	28	35
		Overall Intersection											**0.84**	**19.8**	**B**		
3.	Winthrop Avenue (Route 145) at Route 1A SB On-Ramp	Winthrop Ave – EB	0.51	8.9	A	8	9	0.56	9.5	A	9	10	0.60	10.0	B	10	11
		Winthrop Ave – WB Left	0.73	42.9	D	8	#12	0.87	56.4	E	9	#16	0.87	56.4	E	9	#16
		Winthrop Ave – WB Thru	0.31	0.0	A	0	0	0.33	0.0	A	0	0	0.37	0.0	A	0	0
		Overall Intersection	**0.57**	**7.9**	**A**			**0.64**	**9.8**	**A**			**0.67**	**9.5**	**A**		
4a.	Winthrop Avenue (Route 145) at North Shore Road	Winthrop Ave - EB Left	>1.0	>80.0	F	~22	#31	>1.0	>80.0	F	~28	#37	>1.0	>80.0	F	~28	#37
		Winthrop Ave – EB Thru	0.42	12.7	B	8	9	0.46	13.2	B	9	11	0.50	13.7	B	11	12
		Winthrop Ave – WB Thru/Right	0.65	38.0	D	15	16	0.70	39.7	D	17	18	0.83	37.9	D	18	20
		North Shore Road – SB Left	0.32	40.2	D	6	7	0.34	40.5	D	6	8	0.40	41.7	D	7	9
		North Shore Road – SB Right	0.24	0.9	A	0	0	0.27	0.9	A	0	0	0.27	0.9	A	0	0
		Overall Intersection	**0.70**	**50.0**	**D**			**0.78**	**66.5**	**E**			**0.86**	**62.8**	**E**		
4b.	Winthrop Avenue (Route 145) at Suffolk Downs Driveway (Tomasello Drive)	Winthrop Avenue - EB	0.67	24.8	C	13	13	0.73	27.7	C	14	16	0.81	32.5	C	17	18
		Winthrop Avenue – WB Left	0.59	55.0	D	6	9	0.62	56.2	E	7	9	0.65	57.5	E	7	10
		Winthrop Avenue – WB Thru	0.33	9.4	A	5	6	0.36	9.7	A	6	6	0.36	9.7	A	6	6
		Tomasello Drive – NB Left	0.43	47.4	D	5	7	0.45	47.6	D	6	8	0.80	58.1	E	11	13
		Tomasello Drive – NB Right	0.30	0.5	A	0	0	0.31	0.5	A	0	0	0.32	0.5	A	0	0
		Shaw's Drive – SB Right	0.00	0.0	A	0	0	0.00	0.0	A	0	0	0.00	0.0	A	0	0
		Overall Intersection	**0.60**	**20.4**	**C**			**0.64**	**21.8**	**C**			**0.78**	**27.0**	**C**		
5.	Bennington Street/State Road at Winthrop Avenue	Winthrop Ave – EB Left/Thru	0.71	23.4	C	4	#13	0.72	23.5	C	5	#14	0.72	23.7	C	5	#14
		Winthrop Ave – EB Right	0.33	16.9	B	1	5	0.35	16.8	B	1	5	0.35	16.8	B	1	5
		Bennington St – NB Left	>1.0	79.0	E	4	#17	>1.0	>80.0	F	~5	#19	>1.0	>80.0	F	~5	#19
		Bennington St – NB Thru/Right	0.75	19.4	B	5	#20	0.84	25.4	C	6	#23	0.84	25.7	C	6	#23
		State Rd – SB Left/Thru/Right	0.53	24.2	C	2	#6	0.72	30.6	C	3	#9	0.73	30.9	C	3	#9
		Overall Intersection	**0.88**	**33.8**	**C**			**0.96**	**49.8**	**D**			**0.97**	**50.6**	**D**		

Table 5-33 Signalized Intersection Capacity Analysis, Friday Evening Peak Hour (Continued)

Location		Approach	2012 Existing Conditions					2022 Future Conditions									
								No-Build					Build				
			V/C[1]	Delay[2]	LOS[3]	50th[4]	95th[5]	V/C	Delay	LOS	50th	95th	V/C	Delay	LOS	50th	95th
6.	Bennington Street at Saratoga Street	Bennington St – EB Left/Thru	>1.0	>80.0	F	~24	#40	>1.0	>80.0	F	~26	~43	>1.0	>80.0	F	~26	#43
		Bennington St – EB Right	0.85	46.2	D	14	#30	0.89	51.9	D	15	#33	0.89	51.9	D	15	#33
		Bennington St - WB (defacto left)	>1.0	>80.0	F	~5	#11	>1.0	>80.0	F	~6	#13	>1.0	>80.0	F	~6	#13
		Bennington St - WB Thru/Right	0.79	52.6	D	11	18	0.88	62.6	E	13	#21	0.88	62.6	E	13	#21
		Saratoga St – NB Left	0.99	>80.0	F	11	#22	>1.0	>80.0	F	12	#23	>1.0	>80.0	F	12	#23
		Saratoga St – NB Left/Thru	>1.0	>80.0	F	12	#23	>1.0	>80.0	F	~14	#26	>1.0	>80.0	F	~14	#26
		Saratoga St – NB Right	0.08	38.6	D	0	2	0.09	38.7	D	0	2	0.09	38.7	D	0	2
		Saratoga St – SB Left/Thru/Right	0.90	69.4	E	14	#28	0.97	>80.0	F	15	#31	0.98	>86.9	F	15	#32
		Overall Intersection	**>1.0**	**>80.0**	**F**			**>1.0**	**>80.0**	**F**			**>1.0**	**>80.0**	**F**		
7.	Route 1A at Boardman Street *(Northbound Through Flyover under Build Conditions)*	Boardman St – EB Left	0.77	>80.0	F	2	#5	>1.0	>80.0	F	~3	#6	*	*	*	*	*
		Boardman St – EB Thru/Right	0.07	51.4	D	1	2	0.07	53.1	D	1	2	*	*	*	*	*
		Boardman St – EB Thru/Left	*	*	*	*	*	*	*	*	*	*	0.49	55.1	E	2	3
		Boardman St – EB Right	*	*	*	*	*	*	*	*	*	*	0.14	42.7	D	1	2
		Boardman St – WB Left	*	*	*	*	*	*	*	*	*	*	0.66	53.2	D	4	7
		Boardman St – WB Left/Thru	>1.0	>80.0	F	~14	#18	>1.0	>80.0	F	~21	#26	0.66	53.2	D	4	7
		Boardman St – WB Right	0.64	43.8	D	9	10	0.73	47.5	D	11	13	0.18	43.1	D	0	3
		Route 1A – NB Left	0.63	75.1	E	3	5	0.57	69.9	E	3	5	0.56	54.1	D	2	4
		Route 1A – NB Thru	>1.0	>80.0	F	~49	#59	>1.0	>80.0	F	~61	#73	0.08	47.2	D	0	1
		Route 1A – NB Right	0.02	12.2	B	0	1	0.09	14.2	B	1	2	0.06	0.1	A	0	0
		Route 1A – SB Left	0.76	73.8	E	6	9	0.80	76.1	E	8	11	0.31	24.1	C	5	7
		Route 1A – SB Thru/Right	0.89	26.4	C	27	#37	>1.0	63.6	E	~44	#53	0.97	36.0	D	~30	#35
		Overall Intersection	**>1.0**	**>80.0**	**F**			**>1.0**	**>80.0**	**F**			**0.85**	**37.0**	**D**		
8.	Winthrop Avenue (Route 145) at Revere Beach Parkway (Route 16)/ Harris Street	Winthrop Ave – EB Left/Thru	0.71	>80.0	F	7	10	0.76	>80.0	F	9	11	0.76	>80.0	F	9	11
		Winthrop Ave – EB Right	0.01	79.9	E	0	1	0.01	>80.0	F	0	2	0.01	>80.0	F	0	2
		Winthrop Ave – WB Left	0.74	58.8	E	23	27	0.78	61.8	E	25	30	0.95	>80.0	F	34	#41
		Winthrop Ave – WB Thru/Right	0.92	>80.0	F	31	#42	0.97	>80.0	F	35	#48	0.98	>80.0	F	35	#48
		Route 16 – NB – Thru	0.51	55.8	E	14	18	0.61	62.7	E	17	21	0.61	62.8	E	17	21
		Route 16 – NB - Right	0.77	2.9	A	0	0	0.83	4.3	A	0	0	0.90	8.2	A	0	0
		Route 16 - SB	0.43	53.6	D	13	16	0.51	59.4	E	16	19	0.51	59.5	E	16	19
		Harris St – SEB	0.85	>80.0	F	10	12	0.90	>80.0	F	11	#13	0.90	>80.0	F	11	#13
		Overall Intersection	**0.83**	**48.5**	**D**			**0.88**	**53.9**	**D**			**0.93**	**58.7**	**E**		

Table 5-33 Signalized Intersection Capacity Analysis, Friday Evening Peak Hour (Continued)

Location		Approach	2012 Existing Conditions					2022 Future Conditions									
								No-Build					Build				
			V/C[1]	Delay[2]	LOS[3]	50th[4]	95th[5]	V/C	Delay	LOS	50th	95th	V/C	Delay	LOS	50th	95th
9a.	Route 60 (American Legion Highway) at Bell Circle *(North signal)*	Route 60 – NB Thru	0.69	0.6	A	0	m0	0.77	2.7	A	0	m0	0.86	6.7	A	3	m0
		Route 60 – SB Thru	0.75	40.7	D	14	15	0.85	46.1	D	17	17	>1.0	71.3	E	~23	21
		Route 60 – SB Right	0.42	33.7	C	5	7	0.55	36.7	D	8	10	0.55	36.7	D	8	10
		Bell Circle – NWB Left	0.62	24.5	C	14	18	0.77	24.9	C	20	24	0.77	25.0	C	20	24
		Bell Circle – NWB Right	0.37	19.2	B	6	8	0.43	16.7	B	6	8	0.43	16.9	B	6	9
		Overall Intersection	**0.67**	**21.8**	**C**			**0.79**	**24.1**	**C**			**0.86**	**32.0**	**C**		
9b.	Route 1A (VFW Parkway) at Bell Circle *(East signal)*	Beach St – WB Right	0.39	28.3	C	4	6	0.60	32.4	C	10	13	0.61	32.4	C	10	14
		Bell Circle – NEB Left	0.13	20.7	C	1	m1	0.16	21.7	C	1	m1	0.17	21.5	C	1	m1
		Bell Circle – NEB Right	0.50	0.1	A	0	m0	0.55	0.1	A	0	m0	0.55	0.1	A	0	m0
		Overall Intersection	**0.51**	**12.0**	**B**			**0.58**	**14.4**	**B**			**0.58**	**14.4**	**B**		
9c.	Route 16/ Route 1A/ Beach Street at Bell Circle *(South signal)*	Route 16 – NB Right	1.00	>80.0	F	15	#18	>1.0	>80.0	F	~19	#23	>1.0	>80.0	F	~19	#23
		Route 60 – SB Right	0.74	7.4	A	4	1	0.84	11.4	B	6	2	1.00	20.8	C	~7	5
		Bell Circle – SEB Left	0.42	17.4	B	5	6	0.49	17.8	B	6	7	0.49	17.8	B	6	7
		Bell Circle – SEB Right	0.41	11.0	F	2	3	0.56	14.6	B	4	6	0.58	15.5	B	5	7
		Route 1A – NEB Left	>1.0	>80.0	F	~29	#24	>1.0	>80.0	F	~35	#29	>1.0	>80.0	F	~42	#34
		Route 1A – NEB Thru	>1.0	>80.0	F	~45	#42	>1.0	>80.0	F	~45	#41	>1.0	>80.0	F	~45	#42
		Overall Intersection	**0.95**	**>80.0**	**F**			**>1.0**	**>80.0**	**F**			**>1.0**	**>80.0**	**F**		
9d.	Beach Street/ Route 60 at Bell Circle *(West signal)*	Beach St – EB Right	0.22	0.3	A	0	0	0.26	0.4	A	0	0	0.26	0.4	A	0	0
		Bell Circle – SB Left	0.28	3.6	A	0	0	0.34	1.0	A	0	0	0.35	1.0	A	0	0
		Bell Circle – SB Right	0.22	0.2	A	0	0	0.26	0.3	A	0	0	0.27	0.3	A	0	0
		Overall Intersection	**0.26**	**2.2**	**A**			**0.32**	**0.7**	**A**			**0.32**	**0.7**	**A**		
10.	Ocean Avenue at State Road/Revere Beach Parkway	Revere Beach Pkwy – WB Hard Left	0.52	23.2	C	2	4	0.46	22.5	C	2	5	0.46	22.5	C	2	5
		Revere Beach Pkwy – WB Left	0.32	20.9	C	1	3	0.28	20.9	C	2	3	0.29	20.9	C	2	3
		Revere Beach Pkwy – WB Right	0.03	19.7	B	0	1	0.04	19.8	B	0	1	0.04	19.8	B	0	1
		Revere Beach Pkwy – NB Thru	0.14	13.5	B	1	3	0.26	16.8	B	2	4	0.26	16.8	B	2	4
		Revere Beach Pkwy – NB Right	0.75	3.3	A	0	0	0.79	4.1	A	0	0	0.79	4.1	A	0	0
		Ocean Ave – SB Left	0.60	17.6	B	4	8	0.68	20.0	C	5	9	0.68	20.0	C	5	9
		Ocean Ave – SB Thru	0.11	2.6	A	1	2	0.13	3.2	A	1	2	0.14	3.2	A	1	2
		Ocean Ave – SB Right	0.16	2.8	A	0	1	0.21	3.5	A	0	1	0.21	3.5	A	0	1
		Overall Intersection	**0.75**	**8.1**	**A**			**0.79**	**9.4**	**A**			**0.79**	**9.4**	**A**		

Table 5-33 Signalized Intersection Capacity Analysis, Friday Evening Peak Hour (Continued)

Location	Approach	2012 Existing Conditions					2022 Future Conditions									
							No-Build					Build				
		V/C[1]	Delay[2]	LOS[3]	50th[4]	95th[5]	V/C	Delay	LOS	50th	95th	V/C	Delay	LOS	50th	95th
12. Route 1A at Jughandle	Jughandle – EB Left/Thru	0.53	30.3	C	3	4	0.54	30.3	C	3	5	0.53	43.7	D	3	6
	Route 1A – NB Thru/Right	0.94	20.6	B	15	#28	>1.0	54.9	D	~26	#34	0.70	6.0	A	5	7
	Route 1A – SB Thru	0.82	12.3	B	11	18	0.97	24.6	C	16	#29	0.90	12.4	B	20	25
	Overall Intersection	**0.87**	**17.2**	**B**			**0.97**	**40.2**	**D**			**0.85**	**10.0**	**A**		
13a. Bennington Street at Neptune Road	Bennington St – EB Left/Thru/Right	>1.0	>80.0	F	~20	#25	>1.0	>80.0	F	~21	#26	>1.0	>80.0	F	~21	#26
	Bennington St – WB (defacto left)	0.91	55.9	E	8	#20	>1.0	>80.0	F	~10	#21	>1.0	>80.0	F	~10	#21
	Bennington St – WB Thru/Right	0.74	33.0	C	12	#21	0.82	39.0	D	13	#23	0.82	39.0	D	13	#23
	Neptune Rd – NB Left/Thru/Right	0.58	9.7	A	1	10	0.60	9.6	A	1	m10	0.60	9.6	A	1	m10
	Neptune Rd – SB Left/Thru/Right	0.30	33.7	C	2	4	0.30	32.9	C	2	4	0.30	32.9	C	2	4
	Overall Intersection	**>1.0**	**>80.0**	**F**			**>1.0**	**>80.0**	**F**			**>1.0**	**>80.0**	**F**		
13b. Neptune Road at Route 1A NB off-ramp	Route 1A Off-ramp – EB Left	0.88	49.2	D	13	#19	0.90	51.5	D	14	#21	0.90	51.5	D	14	#21
	Route 1A Off-ramp – EB Thru/Right	0.76	38.1	D	11	16	0.79	39.8	D	12	17	0.79	39.8	D	12	17
	Neptune Rd – NB Thru/Right	0.54	44.9	D	3	5	0.55	44.8	D	3	5	0.55	44.8	D	3	5
	Neptune Rd – SB Left/Thru	0.05	6.2	A	1	m1	0.05	6.5	A	1	m1	0.05	6.5	A	1	m1
	Overall Intersection	**0.42**	**42.2**	**D**			**0.45**	**43.4**	**D**			**0.45**	**43.4**	**D**		
15. Revere Street at Route 60	Revere St – EB Left	0.13	40.4	D	1	2	0.38	43.7	D	2	3	0.35	42.7	D	2	3
	Revere St – EB Thru/Right	0.85	64.0	E	10	14	0.92	73.4	E	12	#19	0.90	69.9	E	13	#19
	Revere St – WB Left	0.80	>80.0	F	3	#6	>1.0	>80.0	F	~3	#7	0.97	>80.0	F	3	#7
	Revere St – WB Thru/Right	0.60	47.1	D	7	11	0.78	55.1	E	10	#15	0.75	53.0	D	10	#15
	Route 60 – NB Left	>1.0	>80.0	F	~10	#16	>1.0	>80.0	F	~12	#18	>1.0	>80.0	F	~12	#18
	Route 60 – NB Thru/Right	0.93	47.4	D	22	#29	>1.0	>80.0	F	~29	#35	>1.0	>80.0	F	~35	#40
	Route 60 – SB Left	>1.0	>80.0	F	~28	#37	>1.0	>80.0	F	~33	#41	>1.0	>80.0	F	~33	#41
	Route 60 – SB Thru/Right	0.79	36.9	D	17	22	0.93	49.0	D	22	#28	>1.0	79.3	E	~28	#34
	Overall Intersection	**>1.0**	**>80.0**	**F**			**>1.0**	**>80.0**	**F**			**>1.0**	**>80.0**	**F**		

Table 5-33 Signalized Intersection Capacity Analysis, Friday Evening Peak Hour (Continued)

Location	Approach	2012 Existing Conditions					2022 Future Conditions									
							No-Build					Build				
		V/C[1]	Delay[2]	LOS[3]	50th[4]	95th[5]	V/C	Delay	LOS	50th	95th	V/C	Delay	LOS	50th	95th
19. Route 16 at Garfield Avenue/Webster Avenue	Route 16 – EB Thru/Right	0.92	58.0	E	21	#24	0.99	69.3	E	23	#28	>1.0	>80.0	F	~26	#30
	Route 16 – WB Left	0.98	>80.0	F	15	#24	>1.0	>80.0	F	~17	#26	>1.0	>80.0	F	~25	#34
	Route 16 – WB Thru/Right	0.57	18.1	B	14	15	0.60	18.8	B	15	17	0.66	20.1	C	17	19
	Webster Ave – NB Left	>1.0	>80.0	F	10	#18	>1.0	>80.0	F	~12	#20	>1.0	>80.0	F	~12	#20
	Webster Ave – NB Thru	0.88	>80.0	F	13	#18	0.93	>80.0	F	13	#19	0.93	>80.0	F	13	#19
	Webster Ave – NB Right	0.54	59.7	E	6	9	0.57	60.8	E	7	9	0.59	61.5	E	7	10
	Garfield Ave – SB Left	>1.0	>80.0	F	~12	#8	>1.0	>80.0	F	~13	#19	>1.0	>80.0	F	~13	#19
	Garfield Ave – SB Thru	0.50	57.1	E	7	10	0.52	57.8	E	7	11	0.52	57.8	E	7	11
	Garfield Ave – SB Right	0.47	57.2	E	6	9	0.50	58.0	E	6	9	0.50	58.0	E	6	9
	Overall Intersection	**>1.0**	**78.2**	**E**			**>1.0**	**>80.0**	**F**			**>1.00**	**>80.0**	**F**		
20. Route 1A at Waldemar Avenue	Route 1A – NEB Left/Thru											0.65	46.3	D	4	7
	Waldemar Avenue – WB Right											0.11	0.1	A	0	0
	Route 1A – NB Thru/Right											0.83	10.5	B	16	24
	Overall Intersection											**0.80**	**13.1**	**B**		
25. Route 1A (North Shore Road) at Wonderland MBTA Station	Parking Lot – EB Left/Thru/Right	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Station- WB Left	0.78	66.7	F	4	#5	0.80	>80.0	F	4	#6	0.80	>80.0	F	4	#6
	Station – WB Left/Thru/Right	0.27	64.4	E	1	2	0.29	65.2	E	1	2	0.29	65.2	E	1	2
	Station- WB Right	0.17	49.4	D	0	1	0.18	49.4	D	0	1	0.18	49.4	D	0	1
	Route 1A – NB Thru	0.67	21.3	C	20	25	0.79	25.9	C	27	34	0.81	26.4	C	28	35
	Route 1A – NB Right	0.04	8.5	A	1	1	0.04	8.7	A	1	1	0.04	8.7	A	1	1
	Route 1A – SB Left	0.55	59.1	E	4	m5	0.56	65.3	E	4	m5	0.56	64.8	E	4	m4
	Route 1A – SB Thru	0.42	13.9	B	10	11	0.51	11.4	B	10	m14	0.52	11.9	B	10	m15
	Route 1A – SB Right	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Overall Intersection	**0.67**	**27.1**	**C**			**0.78**	**27.6**	**C**			**0.79**	**27.9**	**C**		

Intersection is Unsignalized under Existing & No-Build conditions

Table 5-33 Signalized Intersection Capacity Analysis, Friday Evening Peak Hour (Continued)

Location	Approach	2012 Existing Conditions					2022 Future Conditions									
							No-Build					Build				
		V/C[1]	Delay[2]	LOS[3]	50th[4]	95th[5]	V/C	Delay	LOS	50th	95th	V/C	Delay	LOS	50th	95th
26. Route 1A (North Shore Road) at Revere Street	Revere St – EB Left	>1.0	>80.0	F	~19	#23	>1.0	>80.0	F	~19	#23	>1.0	>80.0	F	~19	#23
	Revere St – EB Thru/Right	0.83	75.4	E	9	#14	>1.0	>80.0	F	~16	#20	>1.0	>80.0	F	~16	#20
	Revere St – WB Left	0.18	51.0	D	1	2	>1.0	>80.0	F	~6	#10	>1.0	>80.0	F	~6	#10
	Revere St – WB Thru/Right	>1.0	>80.0	F	~17	#21	>1.0	>80.0	F	~28	#32	>1.0	>80.0	F	~28	#32
	Route 60 – NB Left	>1.0	>80.0	F	~13	m#21	>1.0	>80.0	F	~16	m#24	>1.0	>80.0	F	~17	m#24
	Route 60 – NB Thru/Right	0.92	31.5	C	13	22	>1.0	48.2	D	~41	#47	>1.0	51.8	D	~42	#47
	Route 60 – SB Left	0.36	30.9	C	1	2	0.55	38.3	D	1	3	0.55	38.3	D	1	3
	Route 60 – SB Thru/Right	0.74	33.1	C	18	21	0.75	30.6	C	21	24	0.77	31.2	C	22	25
	Overall Intersection	**>1.0**	**>80.0**	**F**			**>1.0**	**>80.0**	**F**			**>1.0**	**>80.0**	**F**		
27. Route 60 (Squire Road) at Charger Street	Route 60 – EB Left	0.66	40.4	D	5	m7	0.69	38.4	D	6	m7	0.69	36.6	D	6	m6
	Route 60 – EB Thru	0.69	32.5	C	10	20	0.75	34.7	C	15	m#22	0.80	37.1	D	~21	m#22
	Route 60 – WB Thru	0.61	25.7	C	11	14	0.68	27.4	C	13	16	0.74	28.8	C	14	18
	Route 60 – WB Right	0.20	20.5	C	2	5	0.37	23.2	C	5	8	0.38	23.3	C	5	9
	Charger St – NB Left	0.10	30.4	C	2	3	0.11	31.2	C	2	3	0.11	31.2	C	2	3
	Charger St – NB Thru/Right	0.64	54.6	D	4	6	0.66	55.9	E	4	6	0.66	55.9	E	4	6
	Charger St – SB Left	0.90	64.4	E	7	#12	>1.0	>80.0	F	~14	#19	>1.0	>80.0	F	~14	#19
	Charger St – SB Right	0.09	0.0	A	0	0	0.10	0.0	A	0	0	0.10	0.0	A	0	0
	Overall Intersection	**0.71**	**31.8**	**C**			**0.92**	**46.8**	**D**			**0.95**	**47.3**	**D**		
28. Route 60 (Squire Road) at Sigourney Street/ Mall Driveway	Route 60 – EB Left	0.79	53.7	D	8	11	0.84	57.0	E	9	#14	0.84	57.0	E	9	#14
	Route 60 – EB Thru	0.88	31.0	C	13	#36	>1.0	59.0	E	17	#41	>1.0	>80.0	F	20	#45
	Route 60 – WB Thru	>1.0	71.0	E	~26	#34	>1.0	>80.0	F	~34	#39	>1.0	>80.0	F	~38	#43
	Route 60 – WB Right	0.11	2.9	A	1	m1	0.16	4.1	A	1	m1	0.17	3.6	A	1	m1
	Charger St – NB Left	0.24	36.1	D	3	4	0.22	33.4	C	3	4	0.22	33.4	C	3	4
	Charger St – NB Thru/Right	0.25	36.2	D	3	4	0.23	33.4	C	3	5	0.23	33.4	C	3	5
	Driveway – SB Left	0.77	52.5	D	6	#12	0.78	50.0	D	7	#15	0.78	50.0	D	7	#15
	Driveway – SB Right	0.10	0.6	A	0	1	0.12	0.6	A	0	1	0.12	0.6	A	0	1
	Overall Intersection	**>1.0**	**46.8**	**D**			**>1.0**	**>80.0**	**F**			**>1.0**	**>80.0**	**F**		

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.
4. 50th percentile queue length in vehicles.
5. 95th percentile queue length in vehicles.

* Movement does not existing in that condition.
\# 95th percentile volume exceeds capacity, queue may be longer.
m Volume for 95th percentile queue is metered by upstream signal.
~ Volume exceeds capacity, queue is theoretically infinite.

Table 5-34 Signalized Intersection Capacity Analysis, Saturday Afternoon Peak Hour

Location		Approach	2012 Existing Conditions					2022 Future Conditions									
								No-Build					Build				
			V/C[1]	Delay[2]	LOS[3]	50th[4]	95th[5]	V/C	Delay	LOS	50th	95th	V/C	Delay	LOS	50th	95th
1.	Route 1A at Suffolk Downs Driveway	Suffolk Downs – WB Left	*Intersection is Unsignalized under Existing & No-Build conditions*										0.52	34.8	C	5	6
		Suffolk Downs – WB Right											0.13	0.2	A	0	0
		Route 1A – NB Thru											0.93	28.6	C	19	#20
		Route 1A – NB Right											0.80	17.6	B	1	#6
		Route 1A – SB Left											0.37	37.5	D	3	m4
		Route 1A – SB Thru											0.84	13.3	B	13	16
		Overall Intersection											**0.83**	**21.8**	**C**		
3.	Winthrop Avenue (Route 145) at Route 1A On-Ramp	Winthrop Ave – EB	0.34	6.3	A	5	6	0.38	7.1	A	5	6	0.42	7.7	A	6	7
		Winthrop Ave – WB Left	0.57	37.3	D	5	8	0.66	40.2	D	7	10	0.65	39.5	D	7	10
		Winthrop Ave – WB Thru	0.23	0.0	A	0	0	0.25	0.0	A	0	0	0.29	0.0	A	0	0
		Overall Intersection	**0.39**	**6.0**	**A**			**0.45**	**7.0**	**A**			**0.48**	**6.7**	**A**		
4a.	Winthrop Avenue (Route 145) at North Shore Road	Winthrop Ave - EB Left	0.72	62.2	E	8	12	0.83	71.5	E	10	#16	0.83	71.5	E	10	#16
		Winthrop Ave – EB Thru	0.25	11.5	B	5	5	0.27	11.3	B	5	6	0.32	11.7	B	6	7
		Winthrop Ave – WB Thru/Right	0.53	27.5	C	9	11	0.57	28.7	C	10	12	0.68	29.6	C	12	m13
		North Shore Road – SB Left	0.24	38.0	D	4	7	0.26	39.0	D	5	7	0.33	40.2	D	6	9
		North Shore Road – SB Right	0.12	0.7	A	0	0	0.14	0.7	A	0	0	0.14	0.7	A	0	0
		Overall Intersection	**0.48**	**24.1**	**C**			**0.53**	**25.6**	**C**			**0.60**	**26.0**	**C**		
4b.	Winthrop Avenue (Route 145) at Tomasello Drive	Winthrop Avenue - EB	0.39	18.7	B	6	7	0.43	19.8	B	7	8	0.51	20.7	C	9	10
		Winthrop Avenue – WB Left	0.58	55.5	E	6	8	0.59	55.0	D	6	8	0.64	57.1	E	7	9
		Winthrop Avenue – WB Thru	0.23	8.6	A	4	4	0.25	8.8	A	4	4	0.25	8.8	A	4	4
		Tomasello Drive – NB Left	0.64	51.4	D	8	11	0.67	52.4	D	9	11	>1.0	>80.0	F	~14	#20
		Tomasello Drive – NB Right	0.28	0.5	A	0	0	0.30	0.5	A	0	0	0.30	0.5	A	0	0
		Shaw's Drive – SB Right	0.00	0.0	A	0	0	0.00	0.0	A	0	0	0.00	0.0	A	0	0
		Overall Intersection	**0.49**	**20.7**	**C**			**0.53**	**21.0**	**C**			**0.67**	**31.6**	**C**		

Table 5-34 Signalized Intersection Capacity Analysis, Saturday Afternoon Peak Hour (Continued)

Location		Approach	2012 Existing Conditions					2022 Future Conditions									
								No-Build					Build				
			V/C[1]	Delay[2]	LOS[3]	50th[4]	95th[5]	V/C	Delay	LOS	50th	95th	V/C	Delay	LOS	50th	95th
5a.	Bennington Street/State Road at Winthrop Avenue	Winthrop Ave – EB Left/Thru	0.72	23.5	C	5	#14	0.73	23.9	C	5	#15	0.74	23.9	C	5	#15
		Winthrop Ave – EB Right	0.41	17.4	B	2	6	0.43	17.3	B	2	6	0.43	17.3	B	2	6
		Bennington St – NB Left	0.82	29.8	C	3	#12	0.93	48.7	D	3	#14	0.94	49.9	D	4	#14
		Bennington St – NB Thru/Right	0.35	12.7	B	2	7	0.40	13.5	B	2	8	0.40	13.6	B	2	8
		State Rd – SB Left/Thru/Right	0.34	21.9	C	1	4	0.44	23.8	C	2	5	0.44	23.9	C	2	5
		Overall Intersection	**0.76**	**21.7**	**C**			**0.82**	**26.2**	**C**			**0.82**	**26.4**	**C**		
6.	Bennington Street at Saratoga Street	Bennington St – EB Left/Thru	>1.0	>80.0	F	~32	#51	>1.0	>80.0	F	~35	#49	>1.0	>80.0	F	~35	#49
		Bennington St – EB Right	0.25	21.3	C	3	7	0.27	21.5	C	3	7	0.27	21.5	C	3	7
		Bennington St - WB Thru/Right	0.56	37.3	D	5	8	0.62	39.1	D	5	9	0.62	39.1	D	5	9
		Saratoga St – NB Left	0.39	46.4	D	4	8	0.41	46.7	D	4	8	0.41	46.7	D	4	8
		Saratoga St – NB Left/Thru	0.88	74.5	E	9	#20	0.96	>80.0	F	10	#22	0.98	>80.0	F	10	#23
		Saratoga St – NB Right	0.05	34.8	C	0	1	0.05	34.8	C	0	2	0.05	34.8	C	0	2
		Saratoga St – SB Left/Thru/Right	>1.0	>80.0	F	~26	#45	>1.0	>80.0	F	~28	#48	>1.0	>80.0	F	~29	#49
		Overall Intersection	**>1.0**	**>80.0**	**F**			**>1.0**	**>80.0**	**F**			**>1.0**	**>80.0**	**F**		
7.	Route 1A at Boardman Street *(Northbound Through Flyover under Build Conditions)*	Boardman St – EB Left	0.57	59.5	E	2	3	>1.0	>80.0	F	~3	#5	*	*	*	*	*
		Boardman St – EB Thru/Right	0.08	47.9	D	1	2	0.09	51.4	D	1	2	*	*	*	*	*
		Boardman St – EB Thru/Left	*	*	*	*	*	*	*	*	*	*	0.43	47.5	D	2	3
		Boardman St – EB Right	*	*	*	*	*	*	*	*	*	*	0.12	39.5	D	1	1
		Boardman St – WB Left	*	*	*	*	*	*	*	*	*	*	0.68	50.9	D	4	#7
		Boardman St – WB Left/Thru	>1.0	>80.0	F	~11	#16	>1.0	>80.0	F	~17	#24	0.68	51.4	D	4	#7
		Boardman St – WB Right	0.65	43.1	D	10	13	0.75	48.0	D	13	16	0.22	40.3	D	0	4
		Route 1A – NB Left	0.43	66.8	E	2	3	0.37	68.0	E	2	3	0.35	47.7	D	1	2
		Route 1A – NB Thru	0.81	24.1	C	25	32	0.94	36.5	D	34	#49	0.11	45.4	D	1	1
		Route 1A – NB Right	0.17	12.1	B	0	2	0.23	14.3	B	0	2	0.22	0.3	A	0	0
		Route 1A – SB Left	0.68	66.5	E	5	8	0.74	69.4	E	7	11	0.26	18.6	B	4	m4
		Route 1A – SB Thru/Right	0.72	15.2	B	20	24	0.84	20.1	C	28	34	0.89	23.5	C	22	28
		Overall Intersection	**0.84**	**30.8**	**C**			**>1.0**	**51.3**	**D**			**0.74**	**25.4**	**C**		

Table 5-34 Signalized Intersection Capacity Analysis, Saturday Afternoon Peak Hour (Continued)

Location		Approach	2012 Existing Conditions					2022 Future Conditions									
								No-Build					Build				
			V/C[1]	Delay[2]	LOS[3]	50th[4]	95th[5]	V/C	Delay	LOS	50th	95th	V/C	Delay	LOS	50th	95th
8.	Winthrop Avenue (Route 145) at Revere Beach Parkway (Route 16)/ Harris Street	Winthrop Ave – EB Left/Thru	0.64	74.4	E	6	7	0.68	77.9	E	7	9	0.70	85.2	F	8	9
		Winthrop Ave – EB Right	0.01	65.6	E	0	1	0.01	67.3	E	0	1	0.01	72.9	E	0	1
		Winthrop Ave – WB Left	0.76	58.8	E	16	20	0.78	60.6	E	17	22	0.86	65.2	E	24	30
		Winthrop Ave – WB Thru/Right	0.79	64.0	E	17	24	0.80	66.1	E	18	26	0.70	58.8	E	19	26
		Route 16 – NB – Thru	0.39	36.2	D	9	15	0.46	41.1	D	12	18	0.50	48.9	D	14	19
		Route 16 – NB - Right	0.52	0.6	A	0	0	0.56	0.8	A	0	0	0.64	1.2	A	0	0
		Route 16 - SB	0.35	35.5	D	10	13	0.42	40.1	D	12	16	0.45	47.6	D	14	17
		Harris St – SEB	0.67	78.9	E	6	10	0.69	>80.0	F	7	11	0.72	92.6	F	7	11
		Overall Intersection	**0.63**	**39.4**	**D**			**0.67**	**41.9**	**D**			**0.71**	**45.2**	**D**		
9a.	Route 60 (American Legion Highway) at Bell Circle *(North signal)*	Route 60 – NB Thru	0.55	0.7	A	0	0	0.62	0.5	A	0	m0	0.72	0.9	A	0	m0
		Route 60 – SB Thru	0.63	37.0	D	12	14	0.72	39.7	D	15	17	0.87	47.4	D	19	21
		Route 60 – SB Right	0.97	70.7	E	20	16	>1.0	>80.0	F	~28	20	>1.0	>80.0	F	~28	20
		Bell Circle – NWB Left	0.68	22.4	C	16	18	0.80	22.4	C	18	19	0.81	22.8	C	18	19
		Bell Circle – NWB Right	0.58	20.0	B	9	6	0.68	19.2	B	10	6	0.69	20.3	C	11	7
		Overall Intersection	**0.77**	**28.7**	**C**			**0.90**	**36.6**	**D**			**0.91**	**37.7**	**D**		
9b.	Route 1A (VFW Parkway) at Bell Circle *(East signal)*	Beach St – WB Right	0.62	32.8	C	11	13	0.79	37.9	D	17	19	0.82	39.6	D	19	21
		Bell Circle – NEB Left	0.20	24.5	C	2	m2	0.18	23.5	C	2	m2	0.24	22.8	C	3	m3
		Bell Circle – NEB Right	0.47	0.3	A	0	m0	0.53	0.1	A	0	m0	0.57	0.2	A	0	m0
		Overall Intersection	**0.54**	**16.3**	**B**			**0.65**	**18.2**	**B**			**0.69**	**18.4**	**B**		
9c.	Route 16/ Route 1A/ Beach Street at Bell Circle *(South signal)*	Route 16 – NB Right	0.89	61.7	E	13	16	0.99	79.7	E	14	#20	0.99	79.7	E	14	#20
		Route 60 – SB Right	0.59	3.7	A	2	2	0.67	4.7	A	3	3	0.81	9.2	A	4	4
		Bell Circle – SEB Left	0.53	22.4	C	9	9	0.61	23.6	C	11	11	0.61	23.4	C	11	11
		Bell Circle – SEB Right	0.62	20.8	C	6	11	0.77	25.3	C	14	18	0.80	26.9	C	16	20
		Route 1A – NEB Left	0.86	46.4	D	17	16	0.97	59.8	E	21	18	>1.0	>80.0	F	~28	#22
		Route 1A – NEB Thru	>1.0	>80.0	F	~28	#37	>1.0	>80.0	F	~37	#47	>1.0	>80.0	F	~37	#47
		Overall Intersection	**0.87**	**51.3**	**D**			**>1.0**	**72.9**	**E**			**>1.0**	**>80.0**	**F**		

Table 5-34 Signalized Intersection Capacity Analysis, Saturday Afternoon Peak Hour (Continued)

Location	Approach	2012 Existing Conditions					2022 Future Conditions									
							No-Build					Build				
		V/C[1]	Delay[2]	LOS[3]	50th[4]	95th[5]	V/C	Delay	LOS	50th	95th	V/C	Delay	LOS	50th	95th
9d. Beach Street/ Route 60 at Bell Circle *(West signal)*	Beach St – EB Right	0.26	0.4	A	0	0	0.31	0.5	A	0	0	0.32	0.5	A	0	0
	Bell Circle – SB Left	0.37	0.4	A	0	m0	0.45	0.9	A	0	m0	0.45	0.9	A	0	m0
	Bell Circle – SB Right	0.25	0.2	A	0	m0	0.29	0.2	A	0	m0	0.30	0.2	A	0	m0
	Overall Intersection	**0.36**	**0.7**	**A**			**0.44**	**0.7**	**A**			**0.43**	**0.7**	**A**		
10. Ocean Avenue at State Road/Revere Beach Parkway	Revere Beach Pkwy – WB Hard Left	0.47	33.1	C	3	5	0.49	33.9	C	3	5	0.50	33.9	C	3	5
	Revere Beach Pkwy – WB Left	0.30	31.2	C	2	3	0.32	31.8	C	2	3	0.33	31.8	C	2	3
	Revere Beach Pkwy – WB Right	0.02	29.7	C	0	2	0.04	30.2	C	0	2	0.04	30.2	C	0	2
	Revere Beach Pkwy – NB Thru	0.06	9.0	A	1	2	0.09	9.8	A	1	2	0.09	9.8	A	1	2
	Revere Beach Pkwy – NB Right	0.42	0.8	A	0	0	0.45	0.9	A	0	0	0.45	0.9	A	0	0
	Ocean Ave – SB Left	0.79	41.6	D	5	#11	0.87	51.1	D	7	#13	0.87	51.1	D	7	#13
	Ocean Ave – SB Thru	0.06	2.2	A	1	1	0.07	2.2	A	1	1	0.07	2.3	A	1	1
	Ocean Ave – SB Right	0.12	2.4	A	0	1	0.15	2.4	A	0	1	0.15	2.5	A	0	1
	Overall Intersection	**0.50**	**13.1**	**B**			**0.54**	**15.0**	**B**			**0.54**	**15.1**	**B**		
12. Route 1A at Jughandle	Jughandle – EB Left/Thru	0.40	31.5	C	2	3	0.42	31.6	C	2	3	0.25	35.6	D	2	4
	Route 1A – NB Thru/Right	0.74	8.1	A	9	15	0.85	11.2	B	12	#25	0.64	1.6	A	1	m1
	Route 1A – SB Thru	0.68	7.1	A	8	12	0.81	9.8	A	11	18	0.88	14.8	B	20	25
	Overall Intersection	**0.70**	**8.1**	**A**			**0.80**	**10.9**	**B**			**0.76**	**8.5**	**A**		
13a. Bennington Street at Neptune Road	Bennington St – EB Left/Thru/Right	>1.00	>80.	F	~10	#14	>1.0	>80.0	F	~12	#15	>1.0	>80.0	F	~12	#15
	Bennington St – WB (defacto left)	0.77	0	C	5	15	0.76	28.9	C	6	#15	0.76	28.9	C	6	#15
	Bennington St – WB Thru/Right	0.44	28.9	B	5	10	0.48	18.1	B	6	11	0.48	18.1	B	6	11
	Neptune Rd – NB Left/Thru/Right	0.43	17.1	A	1	6	0.44	8.7	A	1	6	0.44	8.7	A	1	6
	Neptune Rd – SB Left/Thru/Right	0.40	8.7	C	2	#3	0.44	33.7	C	2	#3	0.41	33.7	C	2	#4
	Overall Intersection	**0.80**	34.2	**F**			**0.88**	**>80.0**	**F**			**0.69**	**>80.0**	**F**		
			>80.0													
13b. Neptune Road at Route 1A off-ramp	Route 1A Off-ramp – EB Left	0.75	38.7	D	7	9	0.76	38.5	D	7	10	0.76	38.5	D	7	10
	Route 1A Off-ramp – EB Thru/Right	0.45	29.3	C	4	6	0.46	28.9	C	4	6	0.46	28.9	C	4	6
	Neptune Rd – NB Thru/Right	0.32	36.0	D	2	3	0.34	36.1	D	2	3	0.34	36.1	D	2	3
	Neptune Rd – SB Left/Thru	0.04	4.3	A	1	m1	0.04	4.6	A	1	m1	0.04	4.4	A	1	m6
	Overall Intersection	**0.27**	**32.7**	**C**			**0.29**	**32.7**	**C**			**0.29**	**32.6**	**C**		

Table 5-34 Signalized Intersection Capacity Analysis, Saturday Afternoon Peak Hour (Continued)

Location	Approach	2012 Existing Conditions					2022 Future Conditions									
							No-Build					Build				
		V/C[1]	Delay[2]	LOS[3]	50th[4]	95th[5]	V/C	Delay	LOS	50th	95th	V/C	Delay	LOS	50th	95th
15. Revere Street at Route 60	Revere St – EB Left	0.12	39.7	D	1	2	0.30	41.6	D	2	3	0.30	41.6	D	2	3
	Revere St – EB Thru/Right	0.81	58.0	E	10	#15	0.88	65.7	E	12	#19	0.90	68.9	E	13	#20
	Revere St – WB Left	>1.0	>80.0	F	4	#8	>1.0	>80.0	F	~5	#9	>1.0	>80.0	F	~5	#9
	Revere St – WB Thru/Right	0.55	45.1	D	7	9	0.68	49.1	D	9	12	0.68	49.1	D	9	12
	Route 60 – NB Left	>1.0	>80.0	F	~8	#13	>1.0	>80.0	F	~10	#16	>1.0	>80.0	F	~10	#16
	Route 60 – NB Thru/Right	0.79	37.8	D	17	21	0.92	47.1	D	20	#26	>1.0	65.0	E	~24	#31
	Route 60 – SB Left	>1.0	>80.0	F	~29	#37	>1.0	>80.0	F	~34	#42	>1.0	>80.0	F	~34	#42
	Route 60 – SB Thru/Right	0.81	38.5	D	18	22	0.94	51.9	D	22	#28	>1.0	>80.0	F	~29	#35
	Overall Intersection	**>1.0**	**>80.0**	**F**			**>1.0**	**>80.0**	**F**			**>1.0**	**>80.0**	**F**		
19. Route 16 at Garfield Avenue/Webster Avenue	Route 16 – EB Thru/Right	0.79	52.0	D	16	20	0.85	54.8	D	17	22	0.90	58.6	E	19	#24
	Route 16 – WB Left	0.97	>80.0	F	14	#25	>1.0	>80.0	F	15	#27	>1.0	>80.0	F	~23	#35
	Route 16 – WB Thru/Right	0.50	19.4	B	10	14	0.53	19.9	B	11	15	0.58	21.0	C	13	18
	Webster Ave – NB Left	0.78	63.4	E	7	#12	0.83	70.5	E	8	#14	0.83	70.5	E	8	#14
	Webster Ave – NB Thru	0.50	46.0	D	9	13	0.53	46.7	D	9	14	0.53	46.7	D	9	14
	Webster Ave – NB Right	0.33	43.2	D	5	8	0.35	43.5	D	5	8	0.37	43.7	D	5	9
	Garfield Ave – SB Left	0.91	>80.0	F	7	#14	0.97	>80.0	F	8	#16	0.97	>80.0	F	8	#16
	Garfield Ave – SB Thru	0.53	58.5	E	7	11	0.55	59.2	E	7	11	0.55	59.2	E	7	11
	Garfield Ave – SB Right	0.40	56.4	E	4	7	0.41	56.7	E	4	8	0.41	56.7	E	4	8
	Overall Intersection	**0.87**	**47.8**	**D**			**0.93**	**51.4**	**D**			**>1.0**	**61.4**	**E**		
20. Route 1A at Waldemar Avenue	Route 1A – NEB Left/Thru											0.69	44.4	D	6	m9
	Waldemar Avenue – WB Right				*Intersection is Unsignalized*							0.08	0.1	A	0	0
	Route 1A – NB Thru/Right				*under Existing & No-Build conditions*							0.74	9.9	A	13	20
	Overall Intersection											**0.73**	**14.0**	**B**		

Table 5-34 Signalized Intersection Capacity Analysis, Saturday Afternoon Peak Hour (Continued)

Location	Approach	2012 Existing Conditions					2022 Future Conditions									
							No-Build					Build				
		V/C[1]	Delay[2]	LOS[3]	50th[4]	95th[5]	V/C	Delay	LOS	50th	95th	V/C	Delay	LOS	50th	95th
25. Route 1A (North Shore Road) at Wonderland MBTA Station	Parking Lot – EB Left/Thru/Right	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Station- WB Left	0.24	56.4	E	1	2	0.26	56.2	E	1	2	0.26	56.2	E	1	2
	Station – WB Left/Thru/Right	0.06	55.4	E	1	2	0.06	55.1	E	1	2	0.06	55.1	E	1	2
	Station- WB Right	0.03	39.4	D	0	1	0.03	38.9	D	0	1	0.03	38.9	D	0	1
	Route 1A – NB Thru	0.63	19.8	B	15	21	0.75	23.5	C	20	#30	0.76	23.9	C	21	#31
	Route 1A – NB Right	0.01	9.9	A	1	1	0.02	10.0	B	1	1	0.02	10.0	B	1	1
	Route 1A – SB Left	0.76	37.4	D	2	m2	0.79	44.6	D	2	m2	0.79	43.9	D	2	m2
	Route 1A – SB Thru	0.46	23.4	C	19	m17	0.55	24.3	C	22	m19	0.56	24.8	C	23	m19
	Route 1A – SB Right	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Overall Intersection	**0.62**	**22.7**	**C**			**0.73**	**24.9**	**C**			**0.74**	**25.3**	**C**		
26. Route 1A (North Shore Road) at Revere Street	Revere St – EB Left	>1.0	>80.0	F	~13	#17	>1.0	>80.0	F	~14	#18	>1.0	>80.0	F	~14	#18
	Revere St – EB Thru/Right	0.61	38.2	D	9	12	0.91	66.4	E	12	#17	0.91	66.4	E	12	#17
	Revere St – WB Left	0.11	32.6	C	1	2	0.68	41.9	D	3	#5	0.68	41.9	D	3	#5
	Revere St – WB Thru/Right	0.90	64.0	E	13	#19	>1.0	>80.0	F	~18	#25	>1.0	>80.0	F	~18	#25
	Route 1A – NB Left	0.72	62.0	E	4	#8	0.80	62.9	E	5	m#9	0.80	62.6	E	5	m#9
	Route 1A – NB Thru/Right	>1.0	>80.0	F	14	#26	>1.0	>80.0	F	~29	#34	>1.0	170.3	F	~30	#35
	Route 1A – SB Left	0.51	30.4	C	2	3	0.62	33.4	C	3	5	0.62	33.4	C	3	5
	Route 1A – SB Thru/Right	>1.0	>80.0	F	~27	32	>1.0	>80.0	F	~31	#36	>1.0	>80.0	F	~32	#38
	Overall Intersection	**>1.0**	**>80.0**	**F**			**>1.0**	**>80.0**	**F**			**>1.0**	**>80.0**	**F**		
27. Route 60 (Squire Road) at Charger Street	Route 60 – EB Left	0.69	47.2	D	6	M8	0.71	46.9	D	6	m8	0.71	45.5	D	6	m7
	Route 60 – EB Thru	0.54	28.7	C	9	20	0.59	28.9	C	10	22	0.64	30.2	C	11	23
	Route 60 – WB Thru	0.67	24.2	C	15	20	0.75	26.6	C	17	23	0.80	28.2	C	19	#27
	Route 60 – WB Right	0.25	18.0	B	3	6	0.40	20.9	C	6	11	0.40	21.0	C	6	11
	Charger St – NB Left	0.09	38.2	D	1	2	0.10	38.5	D	1	2	0.10	38.5	D	1	2
	Charger St – NB Thru/Right	0.52	55.0	D	3	5	0.53	55.3	E	3	5	0.53	55.3	E	3	5
	Charger St – SB Left	0.98	>80.0	F	~7	#13	>1.0	>80.0	F	~15	#22	>1.0	>80.0	F	~15	#22
	Charger St – SB Right	0.11	0.0	A	0	0	0.13	0.0	A	0	0	0.13	0.0	A	0	0
	Overall Intersection	**0.78**	**30.5**	**C**			**0.95**	**45.7**	**D**			**0.98**	**45.8**	**D**		

Table 5-34 Signalized Intersection Capacity Analysis, Saturday Afternoon Peak Hour (Continued)

Location	Approach	2012 Existing Conditions					2022 Future Conditions									
							No-Build					Build				
		V/C[1]	Delay[2]	LOS[3]	50th[4]	95th[5]	V/C	Delay	LOS	50th	95th	V/C	Delay	LOS	50th	95th
28. Route 60 (Squire Road) at	Route 60 – EB Left	0.82	61.1	E	9	13	0.89	67.2	E	10	#16	0.89	67.2	E	10	#16
Sigourney Street/ Mall	Route 60 – EB Thru	0.78	28.9	C	13	#31	0.86	32.3	C	15	#25	0.93	39.7	D	17	#40
Driveway	Route 60 – WB Thru	>1.0	>80.0	F	~38	#45	>1.0	>80.0	F	~46	#50	>1.0	>80.0	F	~52	#56
	Route 60 – WB Right	0.17	4.4	A	1	m1	0.23	4.7	A	2	m1	0.23	4.2	A	2	m1
	Charger St – NB Left	0.25	36.3	D	3	6	0.26	36.4	D	3	6	0.26	36.4	D	3	6
	Charger St – NB Thru/Right	0.17	35.4	D	2	4	0.18	35.6	D	2	4	0.18	35.6	D	2	4
	Driveway – SB Left	0.77	52.1	D	8	#15	0.89	68.4	E	9	#18	0.89	68.4	E	9	#18
	Driveway – SB Right	0.13	0.6	A	0	1	0.16	0.6	A	0	1	0.16	0.6	A	0	1
	Overall Intersection	**>1.0**	**>80.0**	**F**			**>1.0**	**>80.0**	**F**			**>1.0**	**>80.0**	**F**		

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.
4. 50th percentile queue length in vehicles.
5. 95th percentile queue length in vehicles.

* Movement does not existing in that condition.
\# 95th percentile volume exceeds capacity, queue may be longer.
m Volume for 95th percentile queue is metered by upstream signal.
~ Volume exceeds capacity, queue is theoretically infinite.

Table 5-35 presents a summary of the overall LOS comparing the 2012 Existing, 2022 No-Build, and 2022 Build conditions for both the Friday evening and Saturday afternoon peak hours by intersection.

Table 5-35 Signalized Intersection LOS Summary Comparison

Location		Friday Evening			Saturday Afternoon		
		Existing	No-Build	Build	Existing	No-Build	Build
1.	Route 1A at Suffolk Downs Driveway (Tomasello Drive)	–	–	B	–	–	C
3.	Winthrop Avenue (Route 145) at Route 1A SB On-Ramp	A	A	A	A	A	A
4a.	Winthrop Avenue (Route 145) at North Shore Road	D	E	E	C	C	C
4b.	Winthrop Avenue (Route 145) at Tomasello Drive	C	C	C	C	C	C
5.	Bennington Street/State Road at Winthrop Avenue	C	D	D	C	C	C
6.	Bennington Street at Saratoga Street	F	F	F	F	F	F
7.	Route 1A at Boardman Street *(Northbound Through Flyover under Build Conditions)*	F	F	D	C	D	C
8.	Winthrop Avenue (Route 145) at Revere Beach Parkway (Route 16)/ Harris Street	D	D	E	D	D	D
9a.	Route 60 (American Legion Highway) at Bell Circle *(North signal)*	C	C	C	C	D	D
9b.	Route 1A (VFW Parkway) at Bell Circle *(East signal)*	B	B	B	B	B	B
9c.	Route 16/ Route 1A/ Beach Street at Bell Circle *(South signal)*	F	F	F	D	E	F
9d.	Beach Street/ Route 60 at Bell Circle *(West signal)*	A	A	A	A	A	A
10.	Ocean Avenue at State Road/Revere Beach Parkway	A	A	A	B	B	B
12.	Route 1A at Jughandle	B	D	B	A	B	A
13a.	Bennington Street at Neptune Road	F	F	F	F	F	F
13b.	Neptune Road at Route 1A off-ramp	D	D	D	C	C	C
15.	Revere Street at Route 60	F	F	F	F	F	F
19.	Route 16 at Garfield Avenue/Webster Avenue	E	F	F	D	D	E
20.	Route 1A at Waldemar Avenue	–	–	B	–	–	B
25.	Route 1A (North Shore Road) at Wonderland Station	C	C	C	C	C	C
26.	Route 1A (North Shore Road) at Revere Street	F	F	F	F	F	F
27.	Route 60 (Squire Road) at Charger Street	C	D	D	C	D	D
28.	Route 60 (Squire Road) at Sigourney Street/ Mall Driveway	D	F	F	F	F	F

Intersections in urban areas are typically considered to be operating acceptably if the intersection is LOS D or better. While most intersections within the study area operate above this threshold, there are a few intersections operating at a LOS E or F during at least one analyzed scenario (unless indicated otherwise, the stated condition exists for all of the options considered). These include the following:

- Winthrop Avenue (Route 145) at North Shore Road during the Friday evening peak in the No-Build and Build conditions;
- Bennington Street at Saratoga Street during both the Friday evening and Saturday afternoon peaks in all conditions;
- Winthrop Avenue (Route 145) at Revere Beach Parkway (Route 16)/ Harris Street during the Friday evening peak in the Build condition;
- Route 16/Route 1A/Beach Street at Mahoney (Bell) Circle (South signal) during the Friday evening peak in all conditions and Saturday afternoon peak in the No-Build and Build conditions;
- Bennington Street at Neptune Road during both the Friday evening and Saturday afternoon peaks in all conditions;
- Revere Street at Route 60 during both the Friday evening and Saturday afternoon peaks in all conditions;
- Route 16 at Garfield Avenue/Webster Avenue during the Friday evening peak in all conditions and Saturday afternoon peak in the Build condition;
- Route 1A (North Shore Road) at Revere Street during both the Friday evening and Saturday afternoon peaks in all conditions; and
- Route 60 (Squire Road) at Sigourney Street/ Mall Driveway during the Friday evening peak in the No-Build and Build conditions and Saturday afternoon peak in all conditions.

The Project, with the Route 1A flyover solution (Option 4), is expected to have limited impact to the signalized study area intersections. The overall intersection LOS is expected to degrade during the Friday evening peak hour from the No-Build condition to the Build condition at Winthrop Avenue (Route 145) at Revere Beach Parkway (Route 16)/ Harris Street. Route 1A at Boardman Street and Route 1A at Jughandle are expected to have an LOS improvement in the Friday evening peak.

During the Saturday afternoon peak hour, the overall intersection LOS is expected to change at four signalized intersections (with Option 4): Route 1A at Boardman Street, Route 16/Route 1A/Beach Street at Bell Circle (South signal), Route 1A at Jughandle, and Route 16 at Garfield Avenue/Webster Avenue. Route 1A at Boardman Street and at the Jughandle, is expected to have an improvement in the overall intersection LOS.

LOS results for unsignalized intersections for the Friday evening peak hour and the Saturday afternoon peak hour are presented in Tables 5-36 and 5-37, respectively, for all analysis scenarios. Synchro reports are included in Attachment A.

During existing Friday evening and Saturday afternoon peak hour conditions, the currently illegal left-turn movement from Tomasello Drive onto Route 1A southbound, the right-turn movement from Furlong Drive onto Route 1A northbound, and the right-turn from Curtis Street onto Route 1A southbound are operating at a poor LOS (LOS E or F). With the Resort, the currently illegal left turn out of the Resort to Route 1A southbound will be signalized, resulting in a legal and safe left-turn movement experiencing increased capacity as shown previously in Table 5-36 and Table 5-37.

Currently, the right-turn movement from Furlong Drive onto Route 1A northbound is not exceeding capacity, but it is LOS E due to excessive delays for vehicles making that turn during the analyzed Friday and Saturday peak hours. Under Future No-Build and Build conditions, this movement will continue to experience these delays.

The right-turn movement from Curtis Street onto Route 1A southbound is currently experiencing long average vehicle delays. In future conditions, this movement will exceed its capacity and will continue to operate at LOS F. However, it should be noted that the Synchro methodology for unsignalized intersection does not account for gaps in traffic created by up-stream signals. Therefore, the analysis for all conditions over-estimates the delays experienced in practice.

Table 5-36 Unsignalized Intersection Capacity Analysis, Friday Evening Peak Hour

			2012 Existing Conditions					2022 Future Conditions									
								No-Build					Build				
	Location	Movement	V/C[1]	Demand[2]	Delay[3]	LOS[4]	95th[5]	V/C	Demand	Delay	LOS	95th	V/C	Demand	Delay	LOS	95th
1.	Route 1A at Suffolk Downs Driveway (Tomasello Drive)	WB - Left(illegal)	>1.0	21	>50	F	-	>1.0	22	>50	F	-	*Signalized under Build Condition*				
		WB – Right	0.08	15	25.7	D	1	0.10	16	31.7	D	1					
2.	Route 1A at Furlong Drive	WB - Right	0.71	137	>50	F	5	0.94	144	>50	F	7	>1.0	154	>50	F	9
20.	Route 1A at Waldemar Avenue	WB - Right	0.35	167	16.3	C	2	0.35	176	15.9	C	2	*Signalized under Build Condition*				
21.	Bennington Street at Crescent Avenue	WB – Left	0.34	76	29.0	D	2	0.41	80	35.4	E	2	0.41	80	35.4	E	2
		WB – Right	0.31	184	13.8	B	2	0.36	202	14.8	B	2	0.36	202	14.8	B	2
22.	Route 1A SB at Curtis Street	EB – Right	>1.00	446	>50.0	F	17	>1.0	468	>50	F	25	>1.0	468	>50	F	33
23.	Neptune Road at Saratoga Street	EB – L/T/R WB – L/T/R	*n/a - HCM cannot quantify*					*n/a - HCM cannot quantify*					*n/a - HCM cannot quantify*				
24.	Neptune Road at Bremen Street	WB – L/T/R	0.38	124	22.5	C	2	0.42	130	24.6	C	2	0.42	130	24.6	C	2

1. Volume-to-capacity ratio reported for critical movement.
2. Demand of critical movements from the minor street/left-turn movement from the major street, in vph.
3. Average delay of critical movements, expressed in seconds per vehicle.
4. Level of Service.
5. 95th percentile queue length in vehicles.

Table 5-37 Unsignalized Intersection Capacity Analysis, Saturday Afternoon Peak Hour

Location	Movement	2012 Existing Conditions					2022 Future Conditions									
							No-Build					Build				
		V/C[1]	Demand[2]	Delay[3]	LOS[4]	95th[5]	V/C	Demand	Delay	LOS	95th	V/C	Demand	Delay	LOS	95th
1. Route 1A at Suffolk Downs	WB - Left(illegal)	>1.0	51	>50	F	-	>1.0	55	>50	F	-	*Signalized under Build Condition*				
Driveway (Tomasello Drive)	WB – Right	0.30	74	25.5	D	2	0.38	78	33.4	D	2					
2. Route 1A at Furlong Drive	WB – Right	0.60	140	40.9	E	4	0.78	146	>50	F	6	0.94	156	>50	F	7
20. Route 1A at Waldemar Avenue	WB – Right	0.22	141	12.2	B	1	0.30	148	15.5	C	2	*Signalized under Build Condition*				
21. Bennington Street at Crescent	WB – Left	0.18	69	16.4	C	1	0.20	73	17.7	B	1	0.20	73	17.7	B	1
Avenue	WB – Right	0.26	199	11.3	B	2	0.29	218	11.7	C	2	0.29	218	11.7	C	2
22. Route 1A SB at Curtis Street	EB – Right	0.86	260	>50	F	8	>1.0	273	>50	F	12	>1.0	273	>50	F	17
23. Neptune Road at Saratoga Street	EB – L/T/R WB – L/T/R	*n/a - HCM cannot quantify*					*n/a - HCM cannot quantify*					*n/a - HCM cannot quantify*				
24. Neptune Road at Bremen Street	WB – L/T/R	0.29	127	16.4	C	2	0.32	135	17.2	C	2	0.32	135	17.2	C	2

1. Volume-to-capacity ratio reported for critical movement.
2. Demand of critical movements from the minor street/left-turn movement from the major street, in vph.
3. Average delay of critical movements, expressed in seconds per vehicle.
4. Level of Service.
5. 95th percentile queue length in vehicles.

5.7.2 Roundabout/Rotary Analysis

The Highway Capacity Manual defines the capacity of a facility as "the maximum hourly rate at which persons or vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under prevailing roadway, traffic, and control conditions." The general principal for the capacity of an approach to a roundabout considers the inverse relationship between capacity of the approach and conflicting internal flow. Conflicting flow is the circulating flow that passes directly in front of the individual approach. Sidra Intersection 5.1 software was used to model control delay and LOS operations at the three study area roundabouts.

Table 5-38 presents the LOS delay HCM threshold criteria for roundabouts/rotaries.

Table 5-38 Level of Service Criteria for Roundabouts/Rotaries

Level of Service	*Roundabout Control Delay (sec/veh)*
A	0 - 10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: 2010 HCM

Overall roundabout, as well as individual approach LOS and delay, are reported for Friday evening and Saturday afternoon peak hours in Table 5-39 and 5-40, respectively. Sidra reports are included in Attachment A.

Table 5-39 Roundabout/Rotary Operations Summary, Friday Evening Peak Hour

		2012 Existing Conditions				*2022 Future Conditions*							
						No-Build				*Build*			
Location	*Approach*	*Volume*[1]	*Delay*[2]	*LOS*[3]	*95th*[4]	*Volume*	*Delay*	*LOS*	*95th*	*Volume*	*Delay*	*LOS*	*95th*
11: Eliot Circle	Winthrop Parkway NB	573	48.1	E	10	606	>50	F	17	608	>50	F	18
	Route 145 NEB	1,597	12.5	B	5	1,735	14.5	B	6	1,737	14.6	B	6
	Overall	**2,170**	**21.9**	**C**		**2,340**	**28.2**	**D**		**2,345**	**28.5**	**D**	
14: Butler Circle	North Shore Road NB	448	>50	F	8	523	>50	F	44	546	>50	F	52
	Route 1A SB	1,105	9.6	A	4	1,345	13.1	B	6	1,372	13.5	B	6
	Route 1A NEB	1,157	17.8	C	7	1,441	34.2	D	15	1,441	38.9	E	16
	Overall	**2,711**	**20.7**	**C**		**3,308**	**48.5**	**E**		**3,359**	**>50**	**F**	

Table 5-39 Roundabout/Rotary Operations Summary, Friday Evening Peak Hour (Continued)

		2012 Existing Conditions				2022 Future Conditions							
						No-Build				Build			
Location	Approach	Volume[1]	Delay[2]	LOS[3]	95th[4]	Volume	Delay	LOS	95th	Volume	Delay	LOS	95th
16: Brown Circle	Route 107 NB	621	>50	F	90	710	>50	F	118	710	>50	F	120
	Route 60 WB	1,765	>50	F	92	2,016	>50	F	129	2,158	>50	F	148
	Route 107 SB	1,148	>50	F	148	1,241	>50	F	179	1,268	>50	F	189
	Route 60 EB	1,691	>50	F	45	1,932	>50	F	79	2,067	>50	F	99
	Overall	**5,226**	**>50**	**F**		**5,899**	**>50**	**F**		**6,203**	**>50**	**F**	

Based on 2010 *Highway Capacity Manual*.
1. Volume –Approach volume in vehicles per hour.
2. Delay – Average stopped delay in seconds per vehicle.
3. LOS – Level of Service rating.
4. 95th - 95th percentile queue length in vehicles.

Table 5-40 Roundabout/Rotary Operations Summary, Saturday Afternoon Peak Hour

		2012 Existing Conditions				2022 Future Conditions							
						No-Build				Build			
Location	Approach	Volume[1]	Delay[2]	LOS[3]	95th[4]	Volume	Delay	LOS	95th	Volume	Delay	LOS	95th
11: Eliot Circle	Winthrop Parkway NB	565	14.6	B	4	627	18.3	C	6	633	18.6	C	6
	Route 145 NEB	954	7.1	A	2	1,040	7.7	A	3	1,043	7.7	A	3
	Overall	**1,519**	**9.9**	**A**		**1,667**	**11.6**	**B**		**1,675**	**11.8**	**B**	
14: Butler Circle	North Shore Road NB	330	18.4	C	3	400	38.9	E	5	426	46.5	E	6
	Route 1A SB	1,185	10.5	B	4	1,413	15.2	C	7	1,448	15.9	C	7
	Route 1A NEB	963	12.0	B	4	1,210	17.5	C	7	1,210	19.4	C	7
	Overall	**2,478**	**12.2**	**B**		**3,022**	**19.2**	**C**		**3,083**	**21.5**	**C**	
16: Brown Circle	Route 107 NB	491	>50	F	44	569	>50	F	68	569	>50	F	70
	Route 60 WB	1,570	>50	F	76	1,785	>50	F	106	1,917	>50	F	121
	Route 107 SB	983	>50	F	95	1,069	>50	F	124	1,099	>50	F	135
	Route 60 EB	1,475	>50	F	19	1,712	>50	F	48	1,853	>50	F	68
	Overall	**4,519**	**>50**	**F**		**5,134**	**>50**	**F**		**5,438**	**>50**	**F**	

Based on 2010 *Highway Capacity Manual*.
1. Volume –Approach volume in vehicles per hour.
2. Delay – Average stopped delay in seconds per vehicle.
3. LOS – Level of Service rating.
4. 95th - 95th percentile queue length in vehicles.

Under all analyzed conditions, Eliot Circle performs at LOS D or better during Friday evening and Saturday afternoon peak hours. However, the northbound approach of Winthrop Parkway will operate at LOS F under Future conditions during the Friday evening peak. The northeast-bound Route 145 approach will operate at LOS B or better during both peak hour periods. The Project is anticipated to have negligible impacts at this location due to the minimal Project trips estimated to utilize this corridor.

During the existing Friday evening and Saturday afternoon peak hours, the recently redesigned Butler Circle operates at LOS C and LOS B, respectively. Under Future No-Build growth conditions (without the Project), the circle will be reduced to LOS E during the Friday evening peak hour and LOS C during the Saturday afternoon peak. Although only a small amount of Project trips are expect to use Butler Circle, the LOS will be further decreased to LOS F during the Friday evening peak period.

The LOS at Butler Circle is primarily controlled by the minor North Shore Road northbound approach. This approach operates at a LOS E or F during the Friday evening peak in all conditions and Saturday afternoon peak in the No-Build and Build conditions. This delay is due to the heavy internal volume within Butler Circle heading northbound on Route 1A which opposes the North Shore Road approach.

Currently all approaches to Brown Circle (Route 60/Route 107) operate at LOS F during the Friday evening and Saturday afternoon peak hours. Route 60 in particular is a heavily travelled roadway for commuters both locally and regionally as it connects Route 1 to the north at Copeland Circle. Under Future No-Build and Build conditions, Brown Circle will continue to operate with excessive delays for all approaches.

5.7.3 Merge/Weave Interchange Analysis

The analysis of weaving operations at exit ramps is based on procedures presented in the HCM. A weaving movement is defined as the interaction between the crossings of two or more traffic streams traveling in the same direction without the aid of traffic control devices. The measure of effectiveness to determine the LOS is based on many parameters, including density and the speed of both the weaving and non-weaving vehicles. The higher the speeds and lower the density, the better the operations of the weaving segment.

The analysis of merge operations at ramps is based on procedures presented in HCM Chapter 25, Ramps and Ramp Junctions. The procedure focuses on the interaction between freeway mainline through-traffic and traffic merging from or diverging to ramps. The analysis takes into account geometric and operational factors such as the length and taper of the acceleration/deceleration lanes, free-flow vehicle speed along the freeway and on the ramps themselves, and the number of vehicles in the right-most (or left-most for left exits) two lanes of the freeway. It should be noted that limitations in the HCM merge analysis methodology define the mainline as a freeway with a minimum input free flow speed of 55 miles/hour. This limitation affects the presented study area merge analyses as stated.

The focus of the analysis is at the ramp junction with the mainline where entering vehicles attempt to find gaps in the adjacent traffic stream. The action of this merging traffic creates vehicle turbulence along the mainline that can affect freeway operations. According to the HCM, the influence area for both of these movements is approximately 1,500 feet before

the diverge areas and beyond the merge areas (including acceleration and deceleration lanes). Table 5-41 summarizes the HCM criteria for LOS and densities for merge and diverge analyses.

Table 5-41 Level-of Service Criteria for Merge/Weave Segments

Level of Service	*Density Range(pc/mi/ln)[1]*
A	≤10
B	>10 - 20
C	>20 – 28
D	>28 – 35
E	>35
F	Demand exceeds capacity

Source: Highway Capacity Manual, Transportation Research Board, National Research Council, Washington, D.C., 2010.
1 Passenger cars per mile per lane.

Capacity analyses for Copeland Circle and the Route 1/Route 16 interchange were conducted utilizing Highway Capacity Software (HCS+) Version 6.3. As defined by the HCM, Copeland Circle operates as a series of three weave sections and three merge sections. Merge and Weave analysis HCS+ output is provided in Attachment A. Figures 5-27 and 5-28 show the location of each merge/weave section.

Friday evening and Saturday afternoon peak hour weave and merge capacity analyses for Copeland Circle are presented in Table 5-42 and Table 5-43, respectively.

Table 5-42 Operations Summary, Copeland Circle, Friday Evening Peak Hour

		2012 Existing Conditions			*2022 Future Conditions*					
					No-Build			*Build*		
Location 17		*Volume[1]*	*Density[2]*	*LOS[3]*	*Volume*	*Density*	*LOS*	*Volume*	*Density*	*LOS*
W1.	Route 1 SB w/ Route 60	2,090	51.9	E	2,293	59.5	E	2,420	N/A	F
W2.	Route 60 EB w/ Route 1	1,904	41.5	E	2,094	47.3	E	2,221	51.1	E
W3.	Route 1 NB w/ Route 60	2,078	48.7	E	2,283	55.9	E	2,410	60.7	E
M1.	Route 60 WB w/ Route 1	2,114	23.8	C	2,309	25.6	C	2,426	26.5	C
M6.	Copeland w/ Route 1 NB	1,234	33.4	D	1,349	35.3	E	1,466	36.6	E
M7.	Copeland w/ Route 1 SB	268	14.0	B	289	14.6	B	289	14.9	B

Based on 2010 *Highway Capacity Manual*,
1. Volume – Unadjusted weave segments demand or ramp volume in vehicles per hour.
2. Density – Expressed in passenger cars per mile per lane.
3. LOS – Level of Service rating.
N/A = Volume exceeds capacity, density could not be calculated
W = Weave Segment analysis; M = Ramp Merge analysis.

Table 5-43 Operations Summary, Copeland Circle, Saturday Afternoon Peak Hour

Location 17	2012 Existing Conditions			2022 Future Conditions					
				No-Build			Build		
	Volume[1]	Density[2]	LOS[3]	Volume	Density	LOS	Volume	Density	LOS
W1. Route 1 SB w/ Route 60	1,794	42.8	E	1,977	48.8	E	2,111	53.3	E
W2. Route 60 EB w/ Route 1	1,896	43.0	E	2,086	49.0	E	2,220	53.1	E
W3. Route 1 NB w/ Route 60	1,957	44.4	E	2,150	50.6	E	2,284	55.2	E
M1. Route 60 WB w/ Route 1	2,436	24.2	C	2,646	26.0	C	2,756	26.8	C
M6. Copeland w/ Route 1 NB	1,714	35.6	E	1,854	37.7	E	1,964	38.9	F
M7. Copeland w/ Route 1 SB	381	19.6	B	407	20.5	C	407	20.7	C

Based on 2010 *Highway Capacity Manual*,
1. Volume – Unadjusted weave segments demand or ramp volume in vehicles per hour.
2. Density – Expressed in passenger cars per mile per lane.
3. LOS – Level of Service rating.

N/A = Volume exceeds capacity, density could not be calculated
W = Weave Segment analysis; M = Ramp Merge analysis.

During existing and future Friday evening and Saturday afternoon peak hour conditions, almost all weaving segments within Copeland Circle are a LOS E. The HCM defines this state as "turbulence felt by virtually all drivers." The only exception to this is the Route 1 southbound weave with Route 60 in the Build condition during the Friday evening peak hour. This weave operates at LOS F due to the fact that the volume just exceeds the capacity at a v/c ratio of 1.02. The HCM defines LOS F as "ramp and freeway queues form".

The merge approach onto Route 1 northbound from Copeland Circle appears to function at LOS D during the Friday evening and LOS E during the Saturday afternoon peak hours. It should be noted, however, that due to limitations in the Sidra software, the program cannot accurately model the lane-drop along Route 1 that occurs directly south of this merge segment. Therefore, while this merge location is most likely failing during peak traffic hours, the output may not be representative of true conditions. While this merge segment is considered failing, the Project impact is anticipated to be an approximately one-second increase in delay during both peak hours.

The on-ramp to Route 1 southbound from Copeland Circle functions at an acceptable LOS B during Existing peak hour conditions. In the future this merge is expected to continue to operate at LOS B during the Friday evening peak hour and degrade slightly to a LOS C during the Saturday peak hour due to regional growth projections.

The merge approach (Route 60 westbound) functions at a reasonable LOS C during all analysis periods.

As defined by the HCM, the Route 1/Route 16 interchange operates as a series of three merge sections. It should be noted that the ramp connecting Route 1 southbound to Route 16 westbound is not defined as a merge segment by the HCM definition due to the control of a signal at its terminus (Webster Avenue). Friday evening and Saturday afternoon peak hour merge capacity analyses for the Route 1/16 Interchange are presented in Table 5-44 and Table 5-45, respectively.

Table 5-44 Operations Summary, Route 1/16 Interchange, Friday Evening Peak Hour

		2012 Existing Conditions			*2022 Future Conditions*					
					No-Build			*Build*		
Location 18		*Volume*[1]	*Density*[2]	*LOS*[3]	*Volume*	*Density*	*LOS*	*Volume*	*Density*	*LOS*
M3.	Route 1 NB On-ramp to Route 16 EB	1,017	20.3	C	1,087	21.5	C	1,087	22.2	C
M4.	Route 16 EB On-ramp to Route 1 NB	508	16.6	B	534	17.3	B	573	17.6	B
M5.	Route 16 WB On-ramp to Route 1 SB	158	12.2	B	171	12.7	B	171	12.7	B

Based on 2010 *Highway Capacity Manual*,
1. Volume – Unadjusted ramp volume in vehicles per hour.
2. Density – Expressed in passenger cars per mile per lane.
3. LOS – Level of Service rating.

M = Ramp Merge analysis.

Table 5-45 Operations Summary, Route 1/16 Interchange, Saturday Afternoon Peak Hour

		2012 Existing Conditions			*2022 Future Conditions*					
					No-Build			*Build*		
Location 18		*Volume*[1]	*Density*[2]	*LOS*[3]	*Volume*	*Density*	*LOS*	*Volume*	*Density*	*LOS*
M3.	Route 1 NB On-ramp to Route 16 EB	478	13.0	B	514	13.6	B	514	14.3	B
M4.	Route 16 EB On-ramp to Route 1 NB	597	15.5	B	627	16.2	B	664	16.4	B
M5.	Route 16 WB On-ramp to Route 1 SB	142	15.1	B	154	15.7	B	154	15.7	B

Based on 2010 *Highway Capacity Manual*
1. Volume – Unadjusted ramp volume in vehicles per hour.
2. Density – Expressed in passenger cars per mile per lane.
3. LOS – Level of Service rating.

M = Ramp Merge analysis.

During the existing and future Friday evening and Saturday afternoon peak hour conditions, all three merge segments within the Route 1/Route 16 interchange operate at acceptable densities and LOS according to the defined criteria, with or without the proposed Project. The merge segment with the poorest LOS connects Route 1 northbound to Route 16 eastbound and currently operates at a LOS C during the Friday evening peak hour. This segment is projected to continue to operate at the acceptable LOS C under Future conditions, with or without the Project.

5.7.4 Harbor Tunnel Operations

One of the MassDOT-requested scope items was evaluation of operations in the Ted Williams Tunnel eastbound. As noted previously, incomplete data are available to facilitate analysis. Given severe limitations on the existing system infrastructure, it has not been feasible to gain access to and count data for the critical multiple merge sections at the entry to the eastbound tunnel. The Proponent will work with MassDOT to seek solutions to obtain these data. However, following is a qualitative discussion of operations and a potential improvement concept for on-going discussion with MassDOT.

There are five primary feeds to the two lane eastbound tunnel, which during a Thursday or Friday afternoon peak carries approximately 3,000 vehicles:

1. The I-90 corridor itself, sometimes referred to as the extension tunnel (Seaport Access Highway) east of the I-93 corridor;

2. The ramp from I-93 northbound, which merges with the I-90 mainline east of the mainline exit to the Congress Street ramp in South Boston;

3. The South Boston local access and South Boston By-Pass Road/Massport Haul Road ramp;

4. The HOV lanes from I-93 northbound; and

5. The emergency on-ramp from the Traffic Operation Center and Police Barracks in South Boston.

It should be noted that #4 and #5 merge together and end at the tunnel portal where the corridor is actually three lanes wide, and following an acceleration lane and taper reduce to the two lane section within the tunnel.

General observation of demands and operations suggests that the tunnel operation is very much controlled by actual on-ramp merging demands and lane turbulence with much lane changing occurring in the immediate areas of the ramp, and that there is a general prioritization of movement into the tunnel based on the movement from ramps closer to the tunnel portal. The farther downstream a vehicle enters, the less delay associated with the entering movement given the tendency for vehicles to "alternate merge" under heavy flow condition. This is generally accompanied by vehicles upstream of the merge to move to the left lane, displacing "capacity" for vehicles already in the traffic stream. For example, there is very little delay (associated with the movement of an HOV or Traffic Operation Center or emergency vehicle using entrances #4 and #5 because they are entering east of where much of the vehicle merging and turbulence has been created. Each vehicle entering once inside the portal is only impacting the operation of the right lane and only for a limited period.

South Boston surface demand is competing for the two-lane capacity at its merge point with vehicles that have been in the system from both mainline I-90 and those that have entered from I-93 northbound. The demand to enter from South Boston is high, and the impact of the ramp operation shows queuing on the Bypass Road from the eastbound corridor itself and from the West Service Road Extension corridor that provides access from the Congress Street area and from the Massport Haul Road corridor approaching from the east including both the surface road and ramp from D Street components. The ramp enters the I-90 mainline as it is exiting from the extension tunnel into the boat section, and then merges to the two-lane section continuing to run parallel to the HOV lane.

I-93 demand merges well within the I-90 tunnel extension through a horizontal curve and functions generally well until downstream demand in the tunnel starts to cause the slow down which then leads to ramp turbulence and changes to the left lane.

With a goal of minimizing impact first to the I-90 corridor traffic from the east, a potential approach to manage operational issues is as follows:

1. Reduce the I-90 eastbound corridor to one lane east of the Congress Street off-ramp. This would involve a right lane closure with all vehicles moved to the left lane. It is anticipated that this single lane will have a carrying capacity of some 1,350 to 1,500 vph, which will be reviewed against the eastbound demand when available. From this point, the left lane is available only for vehicles that have entered the system from the I-90 eastbound corridor to several hundred feet within the Ted Williams Tunnel.

2. Allow I-93 northbound traffic to enter I-90 eastbound in its own lane (and start to allow use of both lanes in the eastbound extension tunnel at that point).

3. Merge the South Boston on-ramp movement into the right lane I-93 northbound traffic stream. Modify the length of the merge lane to its maximum available distance and then taper to a single lane closer to the merge of the HOV and Traffic Operation Center ramps.

These are suggestions only, made for the purpose of raising with MassDOT some possibilities for addressing the Ted Williams Tunnel demand and to recognize that the continual addition of surface traffic into the tunnel from the South Boston Seaport area that has been added since the tunnel opened in December 1995 is impacting daily tunnel performance. The concept of this approach, which may be expanded to include ramp metering in one or more corridors, can be validated when traffic volume data (morning, afternoon, and Saturday mid-day peaks) are available.

5.7.5 Critical Operational Analysis with HCA Improvements

A key objective of many of the roadway improvements under the HCAs is to provide operational, safety, bicycle, pedestrian, and ADA improvements, rather than necessarily improve intersection capacity. However, improvements proposed on Revere Beach Parkway are expected to have positive regional as well as local impacts that involve diverting traffic from the Route 60 corridor to the Route 1/Route 16 corridor. Therefore, it is important to evaluate the capacity of those intersection improvements to accommodate diverted traffic.

Forecasting trip diversions associated with new roadway connections requires the use of MassDOT's Regional Transportation Model (maintained by CTPS) and, when looking at local intersections, some interpretation of the model projections is necessary. Initial model projections indicate the general trends in trip redistribution on the roadway network, but more detailed analysis will be required in consultation with MassDOT.

A conservative approach has been adopted for the initial critical analyses under these HCA improvements. While relief to Route 60 is expected, reduction in traffic through the Route 60 corridor study intersections has not been assumed. However, based on the initial model results, analysis has been performed for the Revere Beach Parkway corridor study intersections to demonstrate their ability to accommodate the addition of traffic from the Route 60 corridor.

Results of this analysis are presented in Tables 5-46 and 5-47. The Proponent intends to pursue discussion of these improvements with MassDOT and DCR so that a full analysis can be performed in coordination with MassDOT and the CTPS using refined Regional Transportation Model results. It should be noted that, although the analysis of critical locations in isolation suggests some negative impacts with the HCA improvements, it does not reflect the positive impacts to be realized by the improvements. Rather, as previously noted, the analysis is presented to demonstrate that the critical intersections that will process the diverted regional traffic will perform adequately.

The traffic volume diversions for initial analysis purposes at the critical Revere Beach Parkway intersections are shown in Figures 5-29 and 5-30 for the Friday evening and Saturday afternoon peak hours, respectively. Review of these initial data and analysis will be continued in coordination with MassDOT and CTPS.

Table 5-46 Signalized Intersection Capacity Analysis, Friday Evening Peak Hour, 2022 Build without and with HCA Improvements

Location		Approach	2022 Build without HCA Improvements			2022 Build with HCA Improvements		
			V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS
4.	Winthrop Avenue (Route 145) at North Shore Road/ Suffolk Downs Driveway (Tomasello Drive)	Winthrop Ave – EB Left	*	*	*	>1.0	>80.0	F
		Winthrop Ave – EB Thru/Right	0.81	32.5	C	>1.0	>80.0	F
		Winthrop Ave – WB Left	0.65	57.5	E	>1.0	>80.0	F
		Winthrop Ave – WB Thru	0.36	9.7	A	*	*	*
	Run as one intersection with clearance intervals and concurrent pedestrian phasing	Winthrop Ave – WB Thru/Right	*	*	*	0.88	47.7	D
		Tomasello Drive – NB Left	0.80	58.1	E	0.94	>80.0	F
		Tomasello Drive – NB Left/Thru	*	*	*	0.92	78.2	E
		Tomasello Drive – NB Right	0.32	0.5	A	0.92	59.1	E
		North Shore Road – SB Left/Thru	*	*	*	>1.0	>80.0	F
		North Shore Road – SB Right	0.00	0.0	A	0.25	0.3	A
		Overall Intersection	**0.78**	**27.0**	**C**	**>1.0**	**77.4**	**E**
8.	Winthrop Avenue (Route 145) at Revere Beach Parkway (Route 16)	Winthrop Ave – EB Left/Thru	0.76	>80.0	F	0.64	51.0	D
		Winthrop Ave – EB Right	0.01	>80.0	E	0.01	43.7	D
		Winthrop Ave – WB Left	0.95	>80.0	F	1.00	59.0	E
	Harris Street closure/ Southbound Left-turns permitted and concurrent pedestrian phasing	Winthrop Ave – WB Thru/Right	0.98	>80.0	F	*	*	*
		Winthrop Ave – WB Thru	*	*	*	0.68	31.2	C
		Winthrop Ave – WB Right	*	*	*	0.04	0.1	A
		Route 16 – NB Thru	0.61	62.8	E	>1.0	>80.0	F
		Route 16 – NB Right	0.90	8.2	A	0.90	25.5	C
		Route 16 – SB Left	*	*	*	0.85	>80.0	F
		Route 16 – SB Thru/Right	0.51	59.5	E	0.83	55.9	E
		Harris St – SEB	0.90	>80.0	F	*	*	*
		Overall Intersection	**0.93**	**58.7**	**E**	**0.95**	**54.8**	**D**
9c.	Route 16/ Route 1A/ Beach Street at Bell Circle *(South signal)*	Route 16 – NB Right	>1.0	>80.0	F	>1.0	127.6	F
		Route 60 – SB Right	1.0	20.8	C	1.0	31.7	C
		Bell Circle – SEB Left	0.49	17.8	B	0.49	17.4	B
		Bell Circle – SEB Right	0.58	15.5	B	0.58	15.0	B
	Formalized Route 1A NB approach 2nd through lane	Route 1A – NEB Left	>1.0	>80.0	F	>1.0	>80.0	F
		Route 1A – NEB Thru	>1.0	>80.0	F	0.94	64.4	E
		Overall Intersection	**1.08**	**146.0**	**F**	**1.00**	**100.7**	**F**
18a.	Route 16 (Revere Beach Parkway) at Route 1 SB Off-ramp	Route 16 – EB Thru	*	*	*	0.60	5.2	A
		Route 16 – WB Thru	*	*	*	0.38	8.2	A
		Route 16 – WB Right	*	*	*	0.12	0.1	A
	Proposed signalized ramp connection	Route 1 Off-ramp - SB Left	*	*	*	0.41	39.7	D
		Route 1 Off-ramp - SB Right	*	*	*	0.78	49.3	D
		Overall Intersection	*****	*****	*****	**0.64**	**14.1**	**B**
18b.	Route 16 (Revere Beach Parkway) at Route 1 NB On-ramp	Route 16 – EB Thru	*	*	*	0.75	23.8	C
		Route 16 – WB Left	*	*	*	0.94	55.0	D
	Proposed signalized ramp connection	Route 16 – WB Thru	*	*	*	0.43	0.4	A
		Overall Intersection	*****	*****	*****	**0.83**	**20.2**	**C**

Table 5-46 Signalized Intersection Capacity Analysis, Friday Evening Peak Hour, 2022 Build without and with HCA Improvements (Continued)

Location	Approach	2022 Build without HCA Improvements			2022 Build with HCA Improvements		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS
19. Route 16 at Garfield Avenue/Webster Avenue *Coordinated signal with proposed signals at Route 16/Route 1 Interchange ramps and concurrent pedestrian phasing*	Route 16 – EB Thru/Right	>1.0	>80.0	F	>1.0	76.8	E
	Route 16 – WB Left	>1.0	>80.0	F	>1.0	>80.0	F
	Route 16 – WB Thru/Right	0.66	20.1	C	0.83	23.2	C
	Webster Ave – NB Left	>1.0	>80.0	F	0.99	>80.0	F
	Webster Ave – NB Thru	0.93	>80.0	F	0.97	>80.0	F
	Webster Ave – NB Right	0.59	61.5	E	0.58	46.0	D
	Garfield Ave – SB Left	>1.0	>80.0	F	0.55	50.3	D
	Garfield Ave – SB Thru	0.52	57.8	E	0.56	50.2	D
	Garfield Ave – SB Right	0.50	58.0	E	0.54	50.5	D
	Overall Intersection	**1.59**	**104.7**	**F**	**0.97**	**64.6**	**E**

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

Table 5-47 Signalized Intersection Capacity Analysis, Saturday Afternoon Peak Hour, 2022 Build without and with HCA Improvements

Location	Approach	2022 Build without HCA Improvements			2022 Build with HCA Improvements		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS
4. Winthrop Avenue (Route 145) at North Shore Road/ Suffolk Downs Driveway (Tomasello Drive) *Run as one intersection with clearance intervals and concurrent pedestrian phasing*	Winthrop Ave - EB Left	*	*	*	0.94	>80.0	F
	Winthrop Ave – EB Thru/Right	0.51	20.7	C	0.86	43.2	D
	Winthrop Ave – WB Left	0.64	57.1	E	0.88	>80.0	F
	Winthrop Ave – WB Thru	0.25	8.8	A	*	*	*
	Winthrop Ave – WB Thru/Right	*	*	*	0.57	35.5	D
	Tomasello Drive – NB Left	>1.0	>80.0	F	0.92	70.9	E
	Tomasello Drive – NB Left/Thru	*	*	*	0.89	65.0	E
	Tomasello Drive – NB Right	0.30	0.5	A	0.71	32.4	C
	North Shore Road – SB Left/Thru	*	*	*	0.93	>80.0	F
	North Shore Road – SB Right	0.00	0.0	A	0.18	0.2	A
	Overall Intersection	**0.67**	**31.6**	**C**	**0.89**	**48.7**	**E**
8. Winthrop Avenue (Route 145) at Revere Beach Parkway (Route 16) *Harris Street closure/ Southbound Left-turns permitted and concurrent pedestrian phasing*	Winthrop Ave – EB Left/Thru	0.70	>80.0	F	0.58	49.9	D
	Winthrop Ave – EB Right	0.01	0.01	E	0.01	44.4	D
	Winthrop Ave – WB Left	0.86	0.86	E	0.95	45.6	D
	Winthrop Ave – WB Thru/Right	0.70	0.70	E	*	*	*
	Winthrop Ave – WB Thru	*	*	*	0.38	23.5	C
	Winthrop Ave – WB Right	*	*	*	0.05	0.1	A
	Route 16 – NB Thru	0.50	0.50	D	>1.0	>80.0	F
	Route 16 – NB Right	0.64	0.64	A	0.64	13.3	B
	Route 16 – SB Left	*	*	*	0.72	66.5	E
	Route 16 – SB Thru/Right	0.45	0.45	D	0.70	47.8	D
	Harris St - SEB	0.72	0.72	F	*	*	*
	Overall Intersection	**0.71**	**45.2**	**D**	**0.89**	**42.8**	**D**

Table 5-47 Signalized Intersection Capacity Analysis, Saturday Afternoon Peak Hour, 2022 Build without and with HCA Improvements (Continued)

Location	Approach	2022 Build without HCA Improvements			2022 Build with HCA Improvements		
		V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS
9c. Route 16/ Route 1A/ Beach Street at Bell Circle	Route 16 – NB Right	0.99	79.7	E	0.99	79.9	E
	Route 60 – SB Right	0.81	9.2	A	0.81	10.2	B
(South signal)	Bell Circle – SEB Left	0.61	23.4	C	0.61	21.9	C
	Bell Circle – SEB Right	0.80	26.9	C	0.80	24.6	C
Formalized Route 1A NB approach	Route 1A – NEB Left	>1.0	>80.0	F	>1.0	>80.0	F
2nd through lane	Route 1A – NEB Thru	>1.0	>80.0	F	0.82	53.5	D
	Overall Intersection	**1.06**	**82.4**	**F**	**0.96**	**49.9**	**D**
18a. Route 16 (Revere Beach Parkway) at Route 1 SB Off-ramp	Route 16 – EB Thru	*	*	*	0.68	8.1	A
	Route 16 – WB Thru	*	*	*	0.49	18.6	B
	Route 16 – WB Right	*	*	*	0.12	14.5	B
Proposed signalized ramp	Route 1 Off-ramp - SB Left	*	*	*	0.24	24.9	C
connection	Route 1 Off-ramp - SB Right	*	*	*	0.89	44.0	D
	Overall Intersection	*	*	*	**0.77**	**20.3**	**C**
18b. Route 16 (Revere Beach Parkway) at Route 1 NB On-ramp	Route 16 – EB Thru	*	*	*	0.67	23.9	C
	Route 16 – WB Left	*	*	*	0.85	37.1	D
Proposed signalized ramp	Route 16 – WB Thru	*	*	*	0.42	0.4	A
connection	**Overall Intersection**	*	*	*	**0.76**	**17.0**	**B**
19. Route 16 at Garfield Avenue/Webster Avenue	Route 16 – EB Thru/Right	0.90	58.6	E	0.86	43.4	D
	Route 16 – WB Left	>1.0	>80.0	F	0.89	61.0	E
	Route 16 – WB Thru/Right	0.58	21.0	C	0.62	12.1	B
Coordinated signal with proposed	Webster Ave – NB Left	0.83	70.5	E	0.80	61.3	E
signals at Route 16/Route 1	Webster Ave – NB Thru	0.53	46.7	D	0.90	74.5	E
Interchange ramps and concurrent	Webster Ave – NB Right	0.37	43.7	D	0.61	48.4	D
pedestrian phasing	Garfield Ave – SB Left	0.97	>80.0	F	0.73	64.9	E
	Garfield Ave – SB Thru	0.55	59.2	E	0.68	61.3	E
	Garfield Ave – SB Right	0.41	56.7	E	0.51	54.4	D
	Overall Intersection	**1.01**	**61.4**	**E**	**0.85**	**38.1**	**D**

1. Volume-to-capacity ratio.
2. Average delay of movement, expressed in seconds per vehicle.
3. Level of Service.

5.8 Alternative Modes of Transportation

While auto travel is a dominant mode of travel for the proposed Project, the Proponent is committed to improvements and strategies to encourage and maximize multi-modal access for the Project and take advantage of the unique adjacency of a rapid transit line.

5.8.1 Transit

As discussed in Section 5.2.1, the Project site is well served by public transportation, with several available options including the Blue Line rapid-transit Suffolk Downs Station abutting the site and bus routes within one-quarter mile of the site, all provided by the MBTA. To further encourage use of public transit, the Proponent intends to collaborate

with the MBTA on ways Suffolk Downs Station can be upgraded and improved. In addition, stronger pedestrian, bicycle, and shuttle bus connections will be made on-site to promote use of the station.

As described in detail in Section 5.9, the TDM Plan for the Project will include a range of incentives to encourage public transit as an access mode, particularly for employees.

5.8.1.1 MBTA Blue Line Ridership Build Analysis

Because it is a longer walk from the Resort, and in light of the fact that the MBTA does not support the idea of running shuttle service from the Resort to Beachmont Station, use of Beachmont Station by Resort patrons and employees is not expected to be significant. Further, the vast majority of trips on the Blue Line will be from the eastbound (i.e., outbound) direction, and will therefore reach Suffolk Downs Station first, where shuttle service to the Resort entrances will be available.

Accordingly, all Blue Line Project trips are assigned to Suffolk Downs Station for purposes of analysis. Analysis of the patron catchment served by the Blue Line between Suffolk Downs Station and Wonderland Station indicates that only about 5% of patrons are expected to arrive from that direction. Therefore, 95% of patron Blue Line trips are assigned to arrive from and depart toward the downtown Boston direction.

Tables 5-48 and 5-49 and Figure 5-31 present the projected Build boardings and alightings for Suffolk Downs Station. While a significant increase in use of Suffolk Downs Station is projected, the level of use is well within the physical capacity of the station. It is also worth noting that, while Resort patrons and employees are expected to board and alight at other Blue Line stations, analysis of the patron and employee catchments indicates that the number of Project trips using other Blue Line stations within East Boston and Revere will be relatively limited in absolute numbers.

Table 5-48 Suffolk Downs Blue Line Station Future Weekday Platform Activity

	Inbound Platform			*Outbound Platform*		
Time Period	*Projected 2022 Volume*	*Patrons*	*Employees*	*Projected 2022 Volume*	*Patrons*	*Employees*
5:00 AM - 6:00 AM	10	28	19	4	21	12
6:00 AM - 7:00 AM	65	25	15	13	28	15
7:00 AM - 8:00 AM	112	31	20	8	37	20
8:00 AM - 9:00 AM	139	52	14	17	58	20
9:00 AM - 10:00 AM	65	75	26	21	103	31
10:00 AM - 11:00 AM	64	98	35	26	132	48
11:00 AM – Noon	34	137	45	48	167	43
Noon - 1:00 PM	33	165	31	86	174	36
1:00 PM - 2:00 PM	54	173	41	57	189	51
2:00 PM - 3:00 PM	48	195	24	80	171	31
3:00 PM - 4:00 PM	53	195	24	120	173	28
4:00 PM - 5:00 PM	59	190	33	107	195	40
5:00 PM - 6:00 PM	57	233	26	113	229	30
6:00 PM - 7:00 PM	37	228	34	55	292	32
7:00 PM - 8:00 PM	28	259	32	33	307	30
8:00 PM - 9:00 PM	36	290	26	54	307	22
9:00 PM - 10:00 PM	3	294	32	31	293	28
10:00 PM - 11:00 PM	7	257	36	30	292	27
11:00 PM – Midnight	13	240	25	21	202	21
Midnight - 1:00 AM	2	211	35	4	173	30
Total	920	3,376	573	928	3,543	595

Source: MBTA, Caesars Resort employee and patron data

Table 5-49 Suffolk Downs Blue Line Station Future Saturday Platform Activity

	Inbound Platform			*Outbound Platform*		
Time Period	*Projected 2022 Volume*	*Patrons*	*Employees*	*Projected 2022 Volume*	*Patrons*	*Employees*
5:00 AM - 6:00 AM	3	45	19	7	44	8
6:00 AM - 7:00 AM	8	36	15	4	36	12
7:00 AM - 8:00 AM	8	40	20	7	48	17
8:00 AM - 9:00 AM	33	58	14	2	67	15
9:00 AM - 10:00 AM	19	87	26	30	96	33
10:00 AM - 11:00 AM	23	108	35	70	138	48
11:00 AM – Noon	24	127	45	124	177	50
Noon - 1:00 PM	51	158	31	134	179	30
1:00 PM - 2:00 PM	59	171	41	124	189	51
2:00 PM - 3:00 PM	66	204	24	53	200	53
3:00 PM - 4:00 PM	69	204	24	40	208	56
4:00 PM - 5:00 PM	102	183	33	30	264	73
5:00 PM - 6:00 PM	117	186	26	23	276	41
6:00 PM - 7:00 PM	40	254	34	24	321	33
7:00 PM - 8:00 PM	29	272	32	22	290	36
8:00 PM - 9:00 PM	11	276	26	20	314	22
9:00 PM - 10:00 PM	17	279	32	29	297	29
10:00 PM - 11:00 PM	7	259	36	15	277	33
11:00 PM – Midnight	4	230	25	13	230	41
Midnight - 1:00 AM	11	210	35	6	79	32
Total	699	3,387	797	777	3,730	712

Source: MBTA, Caesars Resort employee and patron data

5.8.1.2 MBTA Blue Line Capacity Analysis – Build Conditions

Based on the MBTA's FY 2014 budget, the MBTA projects an annual ridership growth rate of 1% per year. As such, it was assumed that ridership would grow 10% over the 10-year period between the available 2012 passenger count data and the year 2022 Build condition analysis with the Project.

To analyze the Blue Line capacity for the Build condition, the highest existing ridership volumes between Aquarium and Maverick Stations were studied consistent with the Existing conditions analysis in Section 5.2.1.2. This Build condition analysis also includes the MBTA's projected ridership growth and projected 2022 ridership for Project patrons and employees. Since Fridays and Saturdays are anticipated to be the busiest in terms of ridership for the Resort, the analysis considers weekday and Saturday inbound and outbound ridership, again consistent with the Existing conditions analysis in Section 5.2.1.2.

The capacity analyzed is not the absolute maximum capacity; rather, it is a conservative interpretation based on the MBTA's Service Delivery Policy. The absolute maximum capacity of riders (also referred to by the MBTA as "crush capacity") for each Blue Line Number 5 car is 145 people.

Projected 2022 Build hourly ridership by direction between Maverick Station and Aquarium Station is presented for a weekday and Saturday in Figure 5-32. The charts also include line capacity as it varies during the course of the day.

As shown in Figure 5-32, under the projected 2022 No-Build and Build conditions, inbound Blue Line ridership almost meets or exceeds available capacity between the hours of 8:00 AM and 11:00 AM. The impact of additional riders for the Resort is expected to be very limited over and above the projected MBTA 2022 ridership growth during these morning periods. While capacity is met or exceeded during these times, they are well within the maximum crush capacity of 145 riders per car as outlined in the Blue Book.[7] To mitigate the existing ridership between 9:00 AM and 10:00 AM, the MBTA could choose to operate additional trains to reduce the nine-minute headways.

The projected 2022 Blue Line ridership for the weekday eastbound (outbound) direction would exceed capacity several times a day, due to projected MBTA ridership growth or Project trips. In the 3:00 PM to 4:00 PM and 10:00 PM to midnight hours, the capacity would be exceeded simply due to the projected MBTA 2022 ridership growth regardless of any increased volume due to the Resort. On other occasions where ridership is projected to meet or slightly exceed capacity (i.e., between 7:00 PM and 10:00 PM), it is largely due

[7] *MBTA Subway Operations Fleet Roster* as of February 2010, 2010 MBTA Blue Book Chapter 2, Page 7.

to increase in Project ridership. This is expected to result in some crowding during these periods on a Friday night, but impacts are relatively limited as the Project ridership will be much lower on other weekdays. Projected MBTA ridership growth could be mitigated by operating additional trains to reduce headways or changing the MBTA Service Delivery Policy vehicle load standards.

The projected 2022 Build Saturday inbound and outbound ridership is well within available capacity with Project trips. With the projected additional Project, the line volume never approaches the peak load capacity based on the current service plan.

5.8.1.3 MBTA Bus Ridership, Build conditions

Since MBTA Bus Routes 119 and Route 120 primarily serve the local neighborhoods, ridership increases due to the proposed Project on either route are anticipated to be very small on an hourly basis. Based on analysis of the patron and employee catchment areas, it is anticipated that a relatively low number of riders will choose to ride either route to access the proposed Project, and such trips per bus will be minimal. Projected new Project trips on each route during the Friday evening and Saturday afternoon peak hours are presented in Table 5-50. Most of the projected new trips comprise employees coming to and from the site, and insignificant impact to bus capacity is expected.

Table 5-50 Project Generated Bus Ridership

	Friday Evening Peak Hour	*Saturday Afternoon Peak Hour*
Route 119		
Inbound	4 trips	8 trips
Outbound	3 trips	4 trips
Route 120		
Inbound	0 trips	0 trips
Outbound	1 trip	1 trip

Table 5-51 shows the estimated changes in MBTA bus travel time from the Existing to No-Build Conditions and from the No-Build to Build Conditions for the Friday evening and Saturday afternoon peak hours, respectively. Changes in travel time are based on the HCM approach delay in the No-Build and Build Conditions as presented on Section 5.7, Traffic Operations Analysis. Bus travel time will only be minimally effected by the additional Resort traffic due to local routing of both of these routes. Therefore, bus operations and schedules are not expected to be significantly impacted by the Project.

Table 5-51 Bus Travel Time Delay

	Friday Evening Peak Hour		*Saturday Afternoon Peak Hour*	
	Existing to No-Build	*No-Build to Build*	*Existing to No-Build*	*No-Build to Build*
Route 119				
Inbound	12 seconds	10 seconds	5 seconds	3 seconds
Outbound	41 seconds	48 seconds	7 seconds	-1 second
Route 120				
Inbound	16 seconds	No Change	3 seconds	No Change
Outbound	388 seconds	50 seconds	385 seconds	32 seconds

5.8.2 Pedestrian Access

Due to the close proximity of residential areas to the Project site, walking is, and will continue to be, attractive to some employees and patrons. For this reason, the Project site layout has been designed to encourage pedestrian activity to and from the site by making appropriate connections to the existing off-site pedestrian network in the area.

The Project recognizes the existing connection between the Orient Heights neighborhood and retail stores located north of the Project site. Currently, residents of Orient Heights access these stores through the Suffolk Downs site. The Project site plan will enhance and strengthen the safety and quality of this pedestrian link.

On-site pedestrian circulation is described in detail in Sections 1.1.1.5 and 4.0. Pedestrian accommodations and safety will be afforded priority in the design development of off-site infrastructure.

Many of the off-site improvements to be provided under the HCAs include improvements in pedestrian accommodations and safety. Key improvements include the following:

- Provision of a crosswalk on Winthrop Avenue east of Tomasello Drive;
- Protected signal accommodations for pedestrians at the intersection of Route 16 with Route 145 (Winthrop Avenue) and Harris Street;
- Streetscape and safety improvements in and around Donnelly Square;
- Streetscape and pedestrian improvements on Winthrop Avenue between Beachmont Station and Tomasello Drive;
- Enhanced and more direct pedestrian connection between Suffolk Downs Station and the Project site;

- Improved pedestrian accommodations at Bell Circle and Brown Circle; and
- Introduction of concurrent pedestrian phasing at signalized intersections where feasible.

5.8.3 Bicycle Access

The Project seeks to continue the ongoing north-eastward expansion of the bicycle network from the East Boston piers. This expansion provides an excellent opportunity for the Project to significantly add to the bicycle infrastructure of the area, which will not only benefit Project patrons and employees but also the communities of East Boston, Revere, and other nearby municipalities.

The Proponent proposes to provide on-street bicycle accommodations along the Bennington Street corridor extending between Saratoga Street to the south and Revere Beach Boulevard to the north. With the current on-street bicycle accommodations on Bennington Street south of Saratoga Street, the proposed extension will provide the communities of East Boston and Revere with a "beach-to-beach" connection between Constitution Beach to the south and Revere Beach to the north. In addition to these proposed accommodations on Bennington Street, the Proponent proposes to provide bicycle connections that extend into the Project site at Suffolk Downs Station and along Winthrop Avenue to Tomasello Drive. Figure 5-5 in Section 5.2.3 present the proposed bicycle accommodations connecting to the Project site in the context of existing and planned bicycle facilities.

5.8.3.1 Bennington Street Corridor connection to Revere Beach

The Project's proposed expansion of the existing bicycle network will extend bicycle accommodations from Saratoga Street along Bennington Street to Eliot Circle at Revere Beach. This connection will provide the area with an almost continuous connection between the East Boston waterfront, Constitution Beach, and the front entrance to DCR's Belle Isle Marsh and Revere Beach, connecting several residential neighborhoods with retail, recreation, and transportation opportunities. It is anticipated that the changes to the corridor will be within the existing curb-to-curb width, thus minimizing the impact to adjacent communities. A bicycle route connecting several recreational opportunities may bring additional visitors to the area and has the potential to increase neighborhood livability and economic activity without significantly increasing automobile traffic and impacts.

The Proponent also plans to provide a spur connection from the Bennington Street corridor to the site to supply Project employees and patrons with bicycle access to the site. It is expected that many Project employees will live within adjacent neighborhoods, and providing bicycle access from Bennington Street will encourage them to bicycle to work.

In addition, bicycle access from Bennington Street and accommodations internal to the site will provide bicycle access to the retail store north of the Project site for residents living near and adjacent to the Bennington Street corridor.

5.8.3.2 Site Accommodations

As described in Section 4.0, bicycle paths and connections are integrated into Project site design. These paths will connect the Project's main bicycle access points from the wider area bicycle network with desired destinations within the Project site. Secure bicycle parking will be provided at the employee entrances and at locations convenient for patrons. The number of bicycle parking spaces required was determined in accordance with the BTD "Bicycle Parking Guidelines" (the Guidelines). Clearly, the Guidelines do not include requirements for a gaming resort land use, and BTD asked that the Guidelines be applied by considering the Project as a campus.

The BTD guidelines for a campus call for one secure/covered parking space per staff for 15% of the planned part- and full-time campus-wide occupancy. Based on the highest projected number of Project employees on-site at any given time (i.e., approximately 1,200 employees), this yields a requirement for 60 bicycle parking spaces. In addition, BTD guidelines for a campus call for one outdoor/covered or outdoor/open parking space for patrons and visitors for 5% of estimated daily building users. Based on the highest projected patron occupancy on-site at any given time (i.e., approximately 2,000 patrons), this yields a requirement for 100 bicycle parking spaces. Accordingly, the Project will provide a total of 160 covered bicycle parking spaces, along with some additional visitor "short-term" bicycle parking spaces close to the building entrance. At the entrance to Casino Area II, valet bicycle service will be available in addition to a bicycle rack. The Proponent has also committed to funding two bike-share Hubway stations on the Project site, one near the resort and one near Suffolk Downs Station, when the City expands the program to East Boston.

5.8.4 High Occupancy Vehicle Shuttle Plan

An effective way to accomplish the objectives of the TDM plan (described in Section 5.9) to reduce travel by private autos, particularly SOV trips, is the use of HOVs. While HOV trips will be encouraged for patron and employee travel, and many patrons will visit the Project in private buses or coaches, the Proponent will substantially expand the use of alternative modes of transportation through implementation of an off-site HOV Shuttle Plan operated by a suitably qualified contractor with extensive experience in the Boston region. These shuttle operations will be in addition to the on-site shuttle service connecting Suffolk Downs Station with the Resort building entrances.

The off-site shuttle plan will be tailored to the distinct needs of employees and patrons, and will accommodate employee commuting needs as described in Section 5.10.1. The shuttle plan for patrons will encompass a diverse range of services to provide alternative

transportation for patrons to and from multiple locations, including the East Boston business districts, nearby tourist, cultural, and entertainment venues, and area hotels. The purpose of the shuttle services goes beyond catering for the needs of patrons and minimizing vehicle trips; it is also intended to stimulate business and tourism in the region by enabling convenient transportation connections to the Resort for tourists, visitors, and business entities.

A major advantage of an off-site shuttle service is the flexibility with which it can be planned and operated. In essence, it is in the Proponent's interest to provide shuttle service wherever there is demand, and the routing and scheduling of shuttles can be tailored to satisfy such demand. Further, the shuttle plan implemented will be dynamic and responsive to demand changes as they occur.

Accordingly, it is not possible or necessary to identify specific service locations or routes at this stage of planning. The plan will be framed around an extensive variety of expected areas of demand, which can be continuously modified and optimized with experience over time and in coordination with state, municipal, business, and non-profit entities. The Proponent will also partner with Boston-area hotels, restaurants, entertainment venues, and tourism organizations to emphasize linkages with existing local attractions and services. It is anticipated, however, that HOV shuttle service will be provided to at least the following locations:

- MBTA transit hubs such as South Station and North Station;
- Logan Airport;
- Downtown hotels;
- Planned water transportation ferry/taxi dock on the East Boston waterfront;
- East Boston business districts;
- BCEC and Hynes Convention Center;
- Citi Performing Arts Center in Boston's Theater District; and
- Massport Black Falcon Cruise Terminal.

5.9 Transportation Demand Management

The Proponent is committed to implementing a robust TDM program, the primary objective of which is to reduce SOV travel, thereby reducing parking demand, congestion, and associated environmental impacts from the Resort. Complementary to the reduction in vehicular impacts, the TDM plan also enhances mobility by alternative modes of travel by

promoting walking, bicycling, ridesharing, and transit. The TDM Plan is an integral component of the overall Project mitigation package, and it overlaps with other key plan elements such as parking demand management and infrastructure improvements.

While goals for TDM programs targeted at employees and patrons are the same (e.g., to reduce drive-alone travel, reduce travel during commuter peak hours, and reduce reliance on personal automobile), the actual execution and implementation of these programs varies because of differences in travel behavior and characteristics of employees and patrons. As such, TDM programs need to be tailored to each group and account for unique needs. The Proponent proposes to develop and implement TDM actions and strategies appropriate for each user group.

The Proponent will prepare the TDM plan in close coordination with other stakeholders such as Massport, MBTA, and the City of Boston, and will commit to the plan by executing a TAPA with BTD. The plan will be comprehensive and include policy/management, infrastructure, and programmatic components. The remainder of this section discusses the proposed TDM plan in more detail.

5.9.1 Regulatory Context

Existing state and local regulations create TDM requirements that influence the way in which the Project can proceed. The Proponent intends to comply with both the letter and the spirit of these regulations.

State Regulation 310 CMR 7.16 (i.e., the Rideshare Regulation), is part of the Massachusetts SIP and requires employers of more than 250 employees to establish an SOV reduction target goal and implement a variety of TDM measures for employees to reach that goal.

In addition, the City of Boston will require the Proponent to execute a TAPA, which will establish a variety of TDM programs to be implemented by the Proponent and monitored by the BTD. It is the Proponent's expectation that a coordinated set of TDM measures will be developed for the Project regardless of jurisdiction.

In combination, the regulatory framework creates an environment in which TDM can be successful by aggressively managing parking, requiring employers to implement TDM programs, and working with developers to mitigate transportation impacts through the TAPA agreements. They also provide means for the city and state to monitor TDM measures identified in the plan.

5.9.2 Developmental Framework

To ensure a balanced and multi-modal transportation network that reduces auto dependency, the Proponent has defined a framework for implementing programs to reduce SOV trips. Under this framework, the Proponent has primary responsibility for developing and updating the TDM plan. The Proponent will ensure implementation of, and long-term compliance with, the plan through four independent but overlapping strategies:

1. Designating a Transportation Coordinator

   The Proponent bears responsibility for ensuring implementation of Plan by subsidiaries, tenants, and operators of individual components of the Project (e.g., multi-purpose meeting/entertainment space, hotels, retail, and restaurants). To the extent that ownership/management of individual components changes over time, requirements of the TDM plan will be formally "carried forward" to new management by incorporating specific requirements into binding legal agreements.

   Oversight of Plan implementation will be assigned to a Transportation Coordinator, whose duties will include, but not be limited, to the following:

   - Developing and implementing TDM measures identified in the Plan;
   - Acting as Project liaison to the TMA and MassRIDES, the statewide travel options program;
   - Coordinating with the various tenants and management companies within the development regarding the Plan;
   - Monitoring implemented programs for compliance with the TAPA and working with the City of Boston to update the Plan as necessary;
   - Maintaining and disseminating information on transit service, transit passes, ridesharing, and other alternative modes;
   - Advocating with transportation agencies at local and state levels to improve transportation infrastructure and services;
   - Developing marketing materials and hosting transportation-related events to promote the use of commuting alternatives; and
   - Answering questions from employees and visitors, and assisting them with their commuting/travel decisions.

2. Joining the Logan Transportation Management Association (Logan TMA)

   Implementation of the Plan will be facilitated by collaboration with the Logan TMA. The Proponent will join the TMA and encourage tenants to join as well. Through the TMA, all users on-site will have access to commuter services.

3. Forming Strategic Partnerships

   The Proponent will explore opportunities and play a leadership role in developing partnerships with other strategic stakeholders in the immediate area and region including, but not limited to, Massport, the Cities of Boston of Revere, A Better City, private transportation operators, the Massachusetts Convention Center Authority, and various tourism organizations.

4. Binding TAPA Commitments

   Elements of the Plan will be incorporated into the City of Boston's TAPA, enabling the City to be directly involved in implementation, monitoring, and enforcement of the TAPA under Article 80 of Boston zoning. The TAPA will establish a mechanism for updating the TDM Plan over time as conditions change and new technologies and approaches become available.

5.9.3 TDM Measures – By Land Use

TDM measures are most often directed at commuter travel, and are therefore implemented at the work-site. However, due to the nature of the Project and the desire to create an inviting environment and travel convenience with a choice of transportation options for all user groups, the Plan includes trip reduction measures for gaming, retail, and hotel patrons as well as employees. Some operational characteristics of the Project, such as 24-hour operations, lend themselves to spreading site-generated traffic over the course of the day, reducing the potential for vehicular trips during peak commuter hours.

The Proponent will work with individual Project tenants to join the TMA and implement TDM strategies for their employees that are equivalent to the TDM for the Proponent's own employees. Because not every TDM program may be suitable for all Project tenants that have employees, the Transportation Coordinator will offer technical assistance to develop and implement individual Tenant TDM programs.

5.9.4 Supporting Site Design and Program Elements

The Project site design itself is a critical supporting component of the TDM plan. As described in detail in other sections, the site layout, circulation, and accommodations are designed to foster a multi-modal Project. The physical layout of the Resort will provide wide sidewalks, interior walkways, and well-connected gaming and retail spaces, which will promote a pleasant walking environment attractive to visitors. Key site design and programmatic elements include the following:

- Pedestrian-scale streetscape design will include paving, street tree planting, signage, street furniture, and pedestrian-oriented street lighting;

- Sidewalks and walkways on the site will form a continuous network and make key internal and external pedestrian connections to the public realm both internal and external to the site;

- A bicycle-friendly environment, supported by necessary bicycle accommodations on the site, and coupled with conveniently located indoor and outdoor bicycle parking, is integrated throughout the site design to foster connections to public off-site bicycle accommodations;

- The Proponent will actively seek to attract a variety of retail tenants to the development which will provide services/products that meet the needs of visitors and employees;

- On-site amenities will provide services that reduce the need for employees to have their own vehicle available to run errands such as dining services, ATM, convenience retail and emergency nurse/medical facilities;

- The site design includes convenient curbside locations accommodating of HOV vehicles and shuttles for drop off and pick up of rideshare patrons and employees; and

- An extensive and comprehensive HOV shuttle plan, as described in Section 5.8.4, will support the entire Project program.

5.9.5 Summary of TDM Elements

This section provides a summary of proposed TDM plan measures, policies, and strategies to support the Project. These commitments will be formalized in a TAPA to be executed with the BTD.

TMA Membership

1. Outreach to area businesses or TMA, including, but not limited to, the following:

    - Massport;

    - Massachusetts Convention Center Authority;

    - A Better City;

    - Greater Boston Chamber of Commerce; and

    - Revere Chamber of Commerce.

2. Become a member of the Logan TMA.

3. Require Resort tenants to join a TMA.

Transportation Coordinator

1. Designate an on-site Transportation Coordinator to be responsible for all transportation programs and primary contact with BTD, Revere, MassDOT, MBTA, and Massport.

2. Designate a deliveries/loading dock manager.

3. Schedule deliveries outside of peak traffic and night-time periods.

4. Designate a parking manager.

Transit Pass Programs and Promotion of Transit

1. Subsidize MBTA Transit passes (Charlie Cards) for all full- and part-time employees.

2. Offer on-site transit pass sales.

3. Participate in MBTA Corporate T-pass Program (employees/employer receive a pre-tax deduction) sales.

4. Provide transit incentives to patrons.

5. Provide enhanced shuttle service between Suffolk Downs Station and the patron and employee entrances at Resort buildings.

6. Provide enhanced pedestrian connections to Suffolk Downs Station and local bus stops.

7. Provide MBTA bus stop on site if MBTA wishes to modify bus routes through site.

8. Provide shuttle service to planned water transportation at Pier 1 in East Boston.

Ridesharing/Carpooling, Auto-Trip Reduction and Parking Management

1. Facilitate rideshare matching for employees through staff data base/software.

2. Participate in MassRIDES (Massachusetts Car Sharing Program) through TMA.

3. Designate preferential parking for carpool/vanpools.

4. Designate preferential patron parking for fuel efficient/alternative fuel vehicles.

5. Provide electric car charging stations in parking areas.

6. Enforce five-minute vehicle idling in conformance with State law.

7. Restrict employee parking on-site to senior management and critical staff only.

8. Provide employee parking remote from Resort site supported by 24-hour shuttle service.

9. Work with BTD and City of Revere to develop and implement effective on-street parking plans to protect neighborhoods from Resort-related parking.

10. Implement local hiring to the extent possible and allowable under law to reduce auto commuting.

11. Provide on-site facilities including ATM, dining and convenience services.

12. Provide on-site medical/nurse facilities.

13. Provide direct-deposit pay for employees.

14. Provide incentives for non-auto commuters.

15. Work with visitor and tourist entities to provide coach and/or shuttle connecting resort with the following:

    - MBTA transit hubs such as South Station, North Station, Lynn commuter rail station, and Wonderland Station parking garage;
    - Logan Airport;
    - Downtown, Back Bay, Theater District, and Seaport (Innovation District) hotels;
    - Planned water transportation ferry/taxi dock on the East Boston waterfront;
    - East Boston business districts;
    - BCEC and Hynes Convention Center;
    - Massport Black Falcon Cruise Terminal; and
    - Boston region major tourist locations.

16. Provide parking spaces for a car-sharing entity (such as Zipcar), subject to demand.

17. Work with MassDOT to implement directional signage program to direct drivers to regional rather than local roadways.

18. If feasible, work with GPS network providers to direct drivers to regional rather than local roadways.

Guaranteed Ride Home Program

1. Offer a "Guaranteed Ride Home" to all employees in the event of an emergency.

Information Disseminations and Promotion of Travel Alternatives

1. Provide employees and patrons with MBTA system maps.
2. Provide information on travel alternatives for employees and patrons via the internet/Resort web-site.
3. Provide information on travel alternatives to new employees.
4. Incorporate information on travel alternatives in all marketing materials and instructions to vendors, special event organizers, etc.
5. Provide "transportation kiosks" to display transit service and schedules in prominent locations in Resort and employee areas.
6. Promote bicycles as an alternative to SOV travel by providing materials to employees on bicycle commuting and bicycle safety.
7. Provide quarterly employee transportation newsletter or bulletin summarizing transit, ridesharing, bicycling, alternative work schedules, and other programs.
8. Sponsor an annual "Transportation Day" at which employees may obtain info on travel alternatives and register for ridesharing.
9. Modify work shifts for employees to minimize commuting during peak traffic periods and/or offer alternative work schedules.
10. Modify shifts to the extent possible to avoid nighttime periods when the MBTA is not operating and transit is not a feasible commuting mode.
11. Provide flex time and telecommuting options when feasible.
12. Provide sheltered, secure bicycle parking for employees and patrons.
13. Provide convenient short-term outside bicycle parking for visitors. At the entrance to Casino Area II, valet bicycle service will be available in addition to a bicycle rack.
14. Provide locker rooms, showers, and changing facilities for employees commuting by bicycle.
15. Provide two Hubway stations on-site when the City expands the program to East Boston.

16. Provide enhanced bicycle access to and within Resort site.

17. Negotiate employee discounts for purchase of bicycle equipment at local retailers.

Transportation Monitoring and Annual Report

1. Monitor employee and patron travel by mode.

2. Provide Annual Reports to BTD on transportation and TDM performance measures.

3. Execute annual ridesharing surveys for submission to MassDEP.

4. Discuss with MassDOT and implement monitoring of assumptions and effectiveness of TDM strategies.

5.10 Parking

5.10.1 Project Parking Supply

Today, large sections of the Suffolk Downs site are dominated by impervious parking areas, providing a current total of approximately 6,000 parking spaces, of which approximately 209 are located in the Barn Area/Horsemen's Lot. This parking supply far exceeds the demand associated with the proposed Project, and the total number of parking spaces will be reduced to a supply of approximately 4,891 spaces, excluding the Barn Area/Horsemen's Lot. The layout and location of on-site parking and on-site circulation is discussed in Sections 1.0 and 4.4. Allocation of parking spaces is summarized in Table 5-52.

Table 5-52 Project parking

Area	*Spaces*
Parking garage	2,550
North Lot	1,468
South Lot	413
Valet	460
Barn Area/Horsemen's Lot	209
Total	*5,100*

For the purposes of analysis, the 209 parking spaces in the Barn Area are not included in the total supply as they are not anticipated to always be available to patrons on a day-to-day basis. The net Project parking supply for analysis purposes is therefore 4,891 spaces.

While there is a total supply of almost 4,900 parking spaces, when designing to accommodate operational needs it is necessary to determine a practical operational capacity that reflects the fact that there will be a portion of cars circulating at any given time, and that a reasonable LOS must be achieved for patrons to find a space reasonably easily without undue circulation. Accordingly, the operational capacity is considered to be 85% of the total supply, equivalent to approximately 4,157 spaces.

5.10.2 Project Patron Parking Demand

To estimate parking demand associated with the Resort, hourly patron arrivals were forecast based on empirical data from other Caesars resorts and by applying an average stay of three hours per patron. Using the auto trip generation presented in Section 5.4 and vehicular arrival patterns presented in Table 5-14, a parking accumulation analysis was performed.

In addition to the new trips associated with the Resort, the existing racing activity at Suffolk Downs will continue. A conservative 50 vehicles was assumed on a typical Friday, while races are simulcast at the racetrack. For the Saturday parking analysis, counts were performed on a live race day in June 2013 to determine parking occupancy on-site associated with the racetrack.

Resort patron and racetrack demand were combined to derive hour-by-hour total parking accumulation for a Friday and Saturday. Results of the parking demand analysis for the Project peak days (i.e., Friday and Saturday) are presented in Figure 5-33.

As shown in Figure 5-33, the maximum parking demand on a typical Friday and Saturday is estimated at approximately 3,850 vehicles. The peak parking demand on Friday is estimated to occur at 9:00 PM, while the Saturday peak is expected to occur around 4:00 PM with the live racing activity overlapping with Resort patron activity. This peak parking demand represents a 79% utilization of the proposed patron parking supply on a typical Friday and Saturday.

Accordingly, the parking supply proposed for the Project is expected to more than adequately accommodate Project demand, and will provide a high LOS for users on a typical day-to-day basis. There will be adequate capacity, however, to accommodate variation in demand that may be associated with special events, holidays, or seasonal variations.

5.10.3 Employee Parking

Consistent with objectives of the TDM plan described in Section 5.9 to discourage employees from commuting in private cars and to encourage use of alternative modes such as transit, no employee parking will be provided on the Project site, with the exception of a limited number of spaces for senior management, essential staff, and disabled employees.

The parking plan for staff is based on the use of multiple geographically-dispersed parking locations remote from the Project site, with employee shuttle service to and from the Resort. This will result in maximum dispersion of employee auto trips, and will minimize employee VMT as employees will choose to park at locations that are most convenient for their commute. Further, it will minimize employee vehicle trips in the vicinity of the Project site, as the majority of employee trips will be intercepted on the roadway network before they reach the Project site area, and therefore will not use the roadway network local to the Project site.

While the Proponent's policy of limiting employee parking at the Project site (in favor of a ground shuttle program) may have the effect of encouraging more employees to choose transit for commuting, it is not expected that the numbers of additional employees will be sufficient to change the assumptions presented in the analysis.

It should be noted, however, that to present a conservative (i.e., worse case) Build traffic impact analysis, it was assumed that employees would park on-site. Therefore, the employee auto trips are included in the Build condition traffic assignment to the local roadway network, even though in reality they will not be added to the local network.

The Proponent proposes to engage a contractor to manage and operate the employee shuttle system, which will run continuously 24-hours per day, seven days a week, to serve the continuous turnover of multiple employee shift changes throughout the day. As discussed in Section 5.4, this will also provide a way for employees whose shifts start or end during the period when the MBTA is not operating (roughly 12:30 AM to 5:30 AM) to commute to work.

The shuttle contractor will be responsible for identifying available parking locations and developing the shuttle plan, but it is anticipated that locations could include strategic regional parking facilities such as the Logan Express park-and-ride lots or other existing public commuter parking facilities, or available private parking facilities. Also, as discussed previously, the Proponent and employee shuttle contractor will work with MassDOT, MassRIDES, MBTA, and Massport to collaborate on optimizing the use of existing parking facilities throughout the Boston area and region.

Section 6.0

Environmental Protection Component

6.0 ENVIRONMENTAL PROTECTION COMPONENT

Article 80 of the Boston Zoning Code specifies that the BRA may require that the applicant conduct studies to determine the direct or indirect impact to the environment reasonably attributable to a project. In accordance with the Secretary's Certificate on the ENF and the City of Boston comment letters, this section addresses various environmental considerations of particular interest to the City of Boston and the BRA in reviewing the impacts of the Project. Where the potential for direct or indirect impacts exists, design measures are incorporated to mitigate the impacts, to the extent economically feasible.

6.1 Wind

A pedestrian wind study was conducted to assess the proposed Project's effects on local conditions in pedestrian areas around the site and provide recommendations for minimizing adverse effects. The study involved wind simulations on a 1:400 scale model of the proposed Project and surroundings. Simulations were conducted in Rowan Williams Davies & Irwin Inc.'s (RWDI's) boundary-layer wind tunnel facility in Guelph, Ontario, for the purpose of quantifying local wind speed conditions and comparing them to appropriate criteria for gauging wind comfort in pedestrian areas. The criteria recommended by the BRA were used in this study (see Section 6.1.3).

6.1.1 Overview

Major buildings, especially those that protrude above their surroundings, often cause increased local wind speeds at the pedestrian level. Typically, wind speeds increase with elevation above the ground surface, and taller buildings can intercept those faster winds and deflect them down to the pedestrian level. The funneling of wind through gaps between buildings and the acceleration of wind around building corners may also increase wind speeds. Conversely, if a building is surrounded by others of equivalent height, it may be protected from prevailing upper-level winds, resulting in no significant changes to the local pedestrian-level wind environment. The most effective way to assess potential pedestrian-level wind impacts around a proposed building is to conduct scale-model tests in a wind tunnel.

The consideration of wind in planning outdoor activity areas is important since high winds tend to deter pedestrian use. For example, winds should be light or relatively light in areas where people will be sitting, such as outdoor cafes or playgrounds. For bus stops and other locations where people will be standing, somewhat higher winds can be tolerated. For frequently used sidewalks, where people are primarily walking, stronger winds are acceptable. For infrequently used areas, wind comfort criteria can be relaxed even further. The actual effects of wind can range from pedestrian inconvenience (e.g., the blowing of dust and other loose material in a moderate breeze) to severe difficulty with walking.

6.1.2 Methodology

Information concerning the Project site and surrounding area was derived from site photographs, specifications on surrounding buildings and terrain, site plans, and elevations of the proposed Project provided by the design team. The following configurations were simulated:

- No Build Configuration: includes all existing surrounding buildings; and
- Build Configuration: includes the proposed Project and all existing surroundings.

The wind tunnel model included the proposed development and all relevant surrounding buildings and topography within a 1,600-foot radius of the Project site. The mean speed profile and turbulence of the natural wind approaching the modeled area were also simulated in RWDI's boundary layer wind tunnel. The scale model was equipped with 82 specially designed wind speed sensors connected to the wind tunnel's data acquisition system to record the mean and fluctuating components of wind speed at a full-scale height of five feet above grade in pedestrian areas throughout the study area. Wind speeds were measured for 36 wind directions in 10-degree increments, starting from true north. Measurements at each sensor location were recorded in ratios of local mean and gust speeds to the reference wind speed in the free stream above the model. Results were then combined with long-term meteorological data recorded from 1982 to 2011 at Boston's Logan International Airport to predict full-scale wind conditions. The analysis was performed separately for each of the four seasons and for an entire calendar year.

The pedestrian wind study report provided as Attachment K contains "wind roses" summarizing the annual and seasonal wind climates in the Boston area based on the data from Logan International Airport. In general, prevailing winds in spring (i.e., March, April, and May) are from the west-northwest, northwest, west, southwest, and east. On an annual basis, the most common wind directions are those between southwest and northwest.

This study involved state-of-the-art measurement and analysis techniques to predict wind conditions in the study area. Nevertheless, some uncertainty remains in predicting wind comfort, and this must be kept in mind. For example, the sensation of comfort among individuals can be quite variable. Variations in age, individual health, clothing, and other human factors can change the response of a particular individual. Comfort limits used in this report represent an average for the total population. Also, unforeseen changes in the Project area, such as construction or demolition of buildings, can affect conditions experienced at the Project site. Finally, the prediction of wind speeds is necessarily a statistical procedure. Wind speeds reported are for the frequency of occurrence stated (one percent of the time). Higher wind speeds will occur but on a less frequent basis.

6.1.3 Pedestrian Wind Comfort Criteria

The BRA has adopted two standards for assessing the relative wind comfort of pedestrians. First, the BRA wind design guidance criterion states that an effective gust velocity (hourly mean wind speed +1.5 times the root-mean-square wind speed) of 31 mph should not be exceeded more than one percent of the time. The second set of criteria used by the BRA to determine the acceptability of specific locations is based on the work of Melbourne[1]. This set of criteria is used to determine the relative level of pedestrian wind comfort for activities such as sitting, standing, or walking. The criteria are expressed in terms of benchmarks for the one-hour mean wind speed exceeded 1% of the time (i.e., the 99-percentile mean wind speed) (see Table 6-1).

Table 6-1 BRA Mean Wind Criteria*

Dangerous	> 27 mph
Uncomfortable for Walking	> 19 and ≤ 27 mph
Comfortable for Walking	> 15 and ≤ 19
Comfortable for Standing	> 12 and ≤ 15 mph
Comfortable for Sitting	< 12 mph

* Applicable to the hourly mean wind speed exceeded one percent of the time.

The wind climate found in a typical downtown location in Boston is generally comfortable for pedestrian use of sidewalks and thoroughfares, and meets the BRA effective gust velocity criterion of 31 mph. However, without any mitigation measures, this wind climate is likely to be frequently uncomfortable for more passive activities such as sitting.

6.1.4 Test Results

Mean and effective gust wind speeds for each season as well as annually are provided in the full RWDI report (see Attachment K). Figures 6-1 and 6-2 graphically depict wind comfort conditions at each wind measurement location based on the annual winds for No Build and Build conditions, respectively. Typically, summer and fall winds tend to be more comfortable than the annual winds, while the winter and spring winds are less comfortable than the annual winds. The following summary of pedestrian wind comfort is based on the annual winds for each configuration tested.

The majority of the existing site was confirmed to have acceptable conditions with respect to pedestrian safety, with the exception of one area south of the existing grandstand. These existing unsafe wind conditions will be effectively mitigated and therefore improved with the addition of the proposed Project.

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[1] Melbourne, W.H. 1978. *Criteria for Environmental Wind Conditions*. Journal or Industrial Aerodynamics. Vol 3. Pp 241-249.

6.1.4.1 No Build Configuration

Existing Grandstand Area (Sensors 21-24, 43-54 and 68-75)

A trend of increasing wind speeds west of the grandstand is evident in Figure 6-1. This trend is evidence of the sheltering effect of the existing structure. The area adjacent to the grandstand is appropriate for sitting (Sensors 24, 45, 47, 50 and 53). Further west from the grandstand, conditions are appropriate for standing (Sensors 44 and 51). Further back, towards the existing parking areas, conditions are appropriate for walking (Sensors 21-23, 43, 46, 48, 49, 52 and 54).

Along the racetrack, some shelter is provided by the grandstand to the west, creating conditions appropriate for walking (Sensors 71, 73, 75 and 76). However, the area north of the grandstand is less sheltered from prevailing easterly and westerly winds, creating conditions that are uncomfortable (Sensors 68 and 69).

Other Areas (Sensors 1 – 20, 25-42, 55-67, 76 and 77)

A wind comfort categorization of walking is considered appropriate for sidewalks. Sidewalks along Tomasello Drive and within the Orient Heights neighborhood southwest of the Project site are predominantly comfortable for walking. One segment of Tomasello Drive west of the existing grandstand currently experiences uncomfortable wind conditions due to exposure to prevailing westerly winds (Sensors 40, 57-59 and 63).

As shown in Figure 6-1, the proposed building site for Casino Area II and Hotel I was found to be mainly uncomfortable, with the eastern portion being comfortable only for walking (Sensors 1, 2, 4 and 6).

Elevated wind conditions, suitable for walking at best, are currently observed for much of the site north and south of the existing grandstand due to the exposed nature of the site (Sensors 13, 14, 16-20, 41, 42, 55, 56, 59-62 and 65-69).

6.1.4.2 Build Configuration

Casino Area II Entrance and Water Feature Area (Locations 1 through 11)

Shelter provided by the proposed Project is expected to significantly improve wind conditions over the Project site, with many of the previously uncomfortable wind conditions predicted to be comfortable for walking or better. The highly sheltered entrance to Casino Area II is predicted to be comfortable for sitting (Sensors 1-3, 5 and 6). Areas adjacent to the entrance are expected to be comfortable for standing (Sensors 4, 7 and 11), which is appropriate for the pedestrian traffic in these areas. The water feature proposed west of the casino will be located in an area where walking conditions are expected.

North and South Plazas (Locations 21 through 24, 43 through 54)

As shown in Figure 6-2, the North and South Plazas will be suitable for walking or better annually, with the majority of locations suitable for standing or sitting. The north and south extents of the plazas will have conditions appropriate for standing (Sensors 21, 22, 46 and 50-54). Increased sheltering in the central plaza areas will result in conditions appropriate for sitting, which will correspond well with the planned park benches and cafes in these areas (Sensors 43 and 47-49). Slightly increased wind conditions will occur in the narrow section between the North and South Plazas as a result of wind channeling between the adjacent structures. However, conditions appropriate for walking are anticipated, which will be appropriate for the pedestrian use of this area (Sensors 24, 44 and 45).

Other On-Site Areas (Locations 12 – 20, 34, 35, 41, 42, 55, 56, 59-62, 65-82)

The majority of other on-site areas near buildings, including secondary building entrances, will have conditions appropriate for the intended pedestrian usages. However, two areas are expected to remain uncomfortable for walking. These include the area south of the existing grandstand which currently exhibits unsafe wind conditions (Location 20), and on the proposed parking garage (Locations 80 and 81). While the area around Sensor 20 will remain uncomfortable, conditions are expected to be significantly improved from conditions currently experienced in this area. It should also be noted that this area currently does not pass the criteria used to assess pedestrian safety, and the proposed development will effectively mitigate these unsafe conditions. There is dense landscaping in the area, which should be retained or enhanced for wind reduction. Sensors 80 and 81 are on top of the proposed garage, and if frequent pedestrian use is anticipated, porous windscreens placed around the perimeter of the upper parking lot would reduce pedestrian discomfort at this location.

Off-Site Areas (Locations 25 through 33, 36-40, 57, 58, 63, 64)

Construction of the proposed Project is expected to reduce the speed of wind in most immediately surrounding areas. Further, it is not expected that the addition of the proposed development will have a significant negative effect in any of the surrounding areas. The most notable improvement is anticipated along Tomasello Drive just southeast of the shopping plaza (Sensors 57, 58 and 63). Other areas will remain in the same wind comfort category.

6.1.5 Conclusion

The pedestrian wind analysis demonstrates that shelter provided by the proposed Project is expected to significantly improve wind conditions over the site, with many previously uncomfortable wind conditions predicted to be comfortable for walking or better. Furthermore, the Project is not expected to have a significant negative effect in any of the surrounding areas. On the contrary, as described above, construction of the proposed

Project is expected to reduce wind speeds in most surrounding areas, most significantly along Tomasello Drive southeast of the existing shopping plaza. Anticipated wind conditions along pedestrian walkways, plazas, and open spaces will be comfortable for users. In addition, sheltering of the North Plaza will result in conditions appropriate for sitting, corresponding well with the planned outdoor restaurant seating areas.

6.2 Shadow

The Proponent conducted a shadow impact analysis to assess potential Project-related impacts. The analysis evaluated shadow conditions at four times of day (9:00 a.m., 12:00 noon, 3:00 p.m., and 6:00 p.m.) during the vernal equinox (March 21), summer solstice (June 21), and autumnal equinox (September 21), and at three times of day (9:00 a.m., 12:00 noon, 3:00 p.m., and 6:00 p.m.) during the winter solstice (December 21). Shadows were determined using the appropriate altitude and azimuth data for Boston.

The shadow impact analysis includes net new shadow as well as existing shadow. The incremental impact of new shadow cast by the proposed Project is shown in dark gray in Figures 6-3 through 6-17, while existing shadows are shown in light gray. The shadow analysis focuses on open spaces, residential areas, major pedestrian areas, and plazas in the Project vicinity.

The shadow analysis demonstrates that new shadow impacts from the Resort will be minimal, and will not affect any sensitive areas off-site. Likewise, the network of pathways throughout the entry landscape will be unaffected by new shadow, as will most of the open spaces on the Project site.

6.2.1 Vernal Equinox (March 21)

At 9:00 a.m. on the vernal equinox, new shadow from the Resort will extend in a westerly direction onto portions of Tomasello Drive and the Entry Court in front of Casino Area II and Hotel I (see Figure 6-3). Portions of the North Plaza and South Plaza will be covered in shade from existing shadow cast by the grandstand and clubhouse, although no new shadow will be cast onto these areas. No new shadow will fall on the grandstand or clubhouse. All new shadow will be contained on-site.

At 12:00 noon, the Resort will cast new shadow towards the north, covering a portion of the open space northwest of Casino Area II close to the building (see Figure 6-4). The southernmost portion of the North Plaza will also be in shadow. New shadow from the parking garage will cover part of the access from Tomasello Drive. No new shadow will fall on the grandstand or clubhouse. All new shadow will be contained on-site.

At 3:00 p.m., new shadow from the proposed Resort will extend northeast across southern and western sections of the North Plaza as well as the access from Tomasello Drive (see Figure 6-5). Shadow from Hotel I will fall on the roof of Casino Area II, but will have

minimal ground-level impacts. South Plaza will remain entirely unaffected by new shadow, as will the other open spaces and sidewalks on the Project site. A small area of new shadow will fall on the western roof of the grandstand. All new shadow will be contained on-site.

The sun sets at approximately 6:00 p.m. during the vernal equinox, and therefore existing shadows are abundant at this time (see Figure 6-6). Nonetheless, since the Project site is largely empty, development of the Project will generate new shadows at this time. New shadows will cover the North Plaza and most of the South Plaza, and will also extend across a portion of the eastern side of the racetrack infield. The southern half of the grandstand and northern half of the clubhouse will also be cast in new shadow. A narrow band of new shadow will extend outside of the eastern side of the Project site boundary towards Bennington Street.

6.2.2 Summer Solstice (June 21)

At 9:00 a.m. on the summer solstice, new shadow from the Resort will be minimal (see Figure 6-7). Small areas of new shadow will extend westward from Project buildings to cover the Port Cochere immediately in front of Casino Area II and Hotel I. A sliver of new shadow will fall along the northwest side of the new parking garage. No new shadow will fall on the grandstand or clubhouse. All new shadow will be contained on-site.

At 12:00 noon, new shadow will be minimal, limited to narrow sections of ground along the northern sides of Project buildings (see Figure 6-8). A small area at the southernmost end of the North Plaza will be in new shadow. No new shadow will fall on the grandstand or clubhouse. All new shadow will be contained on-site.

At 3:00 p.m., new shadows from the Resort will extend over the southern half of the North Plaza (see Figure 6-9). The access road from Tomasello Drive will also be in new shadow. A very small area of new shadow will fall on the western roof of the grandstand. All new shadow will be contained on-site.

At 6:00 p.m., shadows will extend eastward from the proposed Resort, falling across the North Plaza and South Plaza (see Figure 6-10). Other landscaped open spaces will remain unaffected at the time. A very small area of new shadow will fall on the southern portion of the grandstand roof. All new shadow will be contained on-site.

6.2.3 Autumnal Equinox (September 21)

At 9:00 a.m. on the autumnal equinox, shadows will extend toward the northwest, and new shadow from the Resort will extend over a portion of the Entry Court and sections of Tomasello Drive (see Figure 6-11). The North Plaza and South Plaza will be in sun except for a narrow band of each that will be covered in existing shadow from the grandstand and clubhouse. No new shadow will fall on the grandstand or clubhouse. All new shadow will be contained on-site.

At 12:00 noon, new shadow extending north from the Resort will fall on the southernmost portion of the North Plaza as well as a portion of the landscaped open space on the northwest side of Casino Area II (see Figure 6-12). No new shadow will fall on the grandstand or clubhouse. All new shadow will be contained on-site.

At 3:00 p.m., shadows will extend toward the northeast and the Resort will cast new shadow over southern and western portions of the North Plaza as well as the access road from Tomasello Drive (see Figure 6-13). The South Plaza and other open spaces will remain unaffected. A small portion of new shadow will fall on the western grandstand roof. All new shadow will be contained on-site.

The sun sets at just after 6:00 p.m. during the autumnal equinox, and therefore existing shadows are abundant at this time (see Figure 6-14). Nonetheless, the Resort will cast some new shadow across the easternmost portion of the North Plaza and the northernmost portion of the South Plaza. Most of the Project site will be in shadow at this time, with the exception of the Entry Court and front of Casino Area II and Hotel I as well as the northern portion of the racetrack infield. The clubhouse roof and western portion of the grandstand roof will be cast in new shadow. All new shadow will be contained on-site.

6.2.4 Winter Solstice (December 21)

At 9:00 a.m., the Resort will cast new shadow to the northwest across portions of Tomasello Drive and over a small area of the adjacent tank farm (see Figure 6-15). The northern portion of the Entry Court as well as the landscaped open space northwest of Casino Area II will also be covered in new shadow. The parking garage will cast new shadow across the western portion of the access road from Tomasello Drive. No new shadow will fall on the grandstand or clubhouse.

At 12:00 noon, new shadow extending north from the Resort will cover the southern portion of the North Plaza as well as the landscaped open space located on the northwest side of Casino Area II (see Figure 6-16). The parking garage will cast new shadow over Tomasello Drive as well as the access road along the north side of the garage. No new shadow will fall on the grandstand or clubhouse. All new shadow will be contained on-site.

At 3:00 p.m., the Resort will cast new shadow to the northeast over the North Plaza and portions of the surface parking (see Figure 6-17). A small portion of the landscaped open space located northwest of Casino Area II will also be covered in new shadow. The northern portion of the grandstand roof will be cast in new shadow. All new shadow will be contained on-site.

6.2.5 Conclusions

The shadow analysis demonstrates that new shadow impacts from the Resort will be minimal, and will not affect any sensitive areas off-site. Likewise, the network of pathways throughout the entry landscape will be unaffected by new shadow, as will most of the open spaces on the Project site. The North Plaza will have periodic impacts from new shadow, with these impacts predominantly during the late afternoon hours. During the summer this shadow will provide a welcome relief from the sun. During evening hours in warmer months, the South Plaza will also be in shadow. During fall and winter in particular, some new shadow will minimally affect the landscaped open space located northwest of Casino Area II. Roadways will be unaffected by new shadow except for some stretches of Tomasello Drive, which will be in shade during the early morning hours.

6.3 Daylight Analysis

The purpose of the daylight analysis is to estimate the extent to which a proposed project will affect the amount of daylight reaching streets and sidewalks in the immediate vicinity of a project site. The daylight analysis for the Project considers existing and proposed conditions.

Much of the 161-acre Project site is undeveloped under existing conditions, meaning that existing features on the Project site do not obstruct daylight. Under proposed conditions, Resort buildings will be situated such that large areas around the edges of the site will remain without buildings, thereby leaving buffers for adjacent communities and minimizing the Project's daylight obstruction impacts from many surrounding viewpoints.

6.3.1 Methodology

The daylight analysis was performed using the Boston Redevelopment Authority Daylight Analysis (BRADA) computer program[2]. This program measures the percentage of sky-dome that is obstructed by a project and is a useful tool in evaluating the net change in obstruction from existing to build conditions at a specific site.

Using BRADA, a silhouette view of the building is taken at ground level from the middle of adjacent city streets or pedestrian ways centered on the proposed building. The building façade facing the viewpoint, including heights, setbacks, corners and other features, is plotted onto a base map using lateral and elevation angles. The two-dimensional base map generated by BRADA represents a figure of the building in the "sky dome" from the viewpoint chosen. The BRADA program calculates the percentage of daylight that will be obstructed on a scale of 0 to 100 percent based on the width of the view, distance between

[2] Method developed by Harvey Bryan and Susan Stuebing, computer program developed by Ronald Fergle, Massachusetts Institute of Technology, Cambridge, MA, September 1984.

the viewpoint and building, and the massing and setbacks incorporated into the building design. The lower the number, the lower the percentage of daylight obstructed from any given viewpoint.

The analysis compares existing and proposed conditions. Under existing conditions, the site is largely undeveloped and contains large areas of paved surface parking as well as open space (related to the racetrack and infield). Under proposed conditions, development will still be pulled toward the middle of the Project site, leaving buffers around the site edges. Proposed uses will differ from the existing uses in surrounding areas, which include residential neighborhoods and a tank farm.

Four viewpoints were chosen to evaluate daylight obstruction for existing and proposed conditions:

- **Viewpoint 1**: from Tomasello Drive facing southeast toward the Project site;
- **Viewpoint 2**: from North Plaza facing northwest toward the proposed parking garage;
- **Viewpoint 3:** from the North Plaza facing southwest toward Casino Area II; and
- **Viewpoint 4:** from Waldemar Avenue on the southwest boundary of the Project site facing northeast toward the Project.

6.3.2 Daylight Analysis Results

Results for each viewpoint under existing and proposed conditions are described in Table 6-2. Figure 6-18 illustrates the BRADA results for each analysis; viewpoint locations are shown on Figure 6-19.

Table 6-2 Daylight analysis results for Existing and Proposed conditions.

Viewpoint	*Existing*	*Proposed*
1	0%	9.8%
2	0%	28.3%
3	0%	86.6%
4	0%	16.5%

Viewpoint 1

Tomasello Drive is a wide roadway that runs along the northwest edge of the Project site. Viewpoint 1 was taken from the center of the roadway looking southeast toward the proposed Casino Area II and the proposed parking garage. Since Tomasello Drive is relatively wide and most of the proposed buildings are set back from the property line,

daylight obstruction from this viewpoint under proposed conditions is very low (9.8%); since this portion of the site is currently undeveloped, daylight obstruction under existing conditions is 0%. The Resort's effect on daylight obstruction from this viewpoint will be minimal.

Viewpoint 2

The proposed North Plaza is situated between the proposed parking garage and Casino Area I (i.e., the existing grandstand building). Viewpoint 2 was taken from the center of the plaza looking northwest at the proposed parking garage. Since the Project site is currently undeveloped at this location, the daylight obstruction under existing conditions is 0%. Due to the relatively low height of the proposed parking garage, Project development will increase daylight obstruction from this viewpoint to just 28.3%, which is favorable for an open space.

Viewpoint 3

The proposed North Plaza is situated northeast of the proposed Casino Area II. Viewpoint 3 was taken from the center of the open space looking southwest at the proposed building. Since this portion of the Project site is currently undeveloped, the existing daylight obstruction value is 0%. Project development will increase daylight obstruction from this viewpoint to 86.6%. Although this daylight obstruction value is relatively high, surrounding viewpoints to the east, west, and north from this same location are expected to be low. Therefore, daylight obstruction throughout the open space is expected to be appropriate for its anticipated use.

Viewpoint 4

Viewpoint 4 was taken from Waldemar Avenue on the southwest boundary of the Project site looking northeast into the Project site. This viewpoint best represents the daylight obstruction impact for the residential neighborhood south of the Project. Residences further away from the Project site are at higher elevations, thus minimizing the Resort's impact on daylight. Since the Project site is undeveloped at this location, the existing daylight obstruction value is 0%. Project development will increase daylight obstruction to 16.5%, representing a minimal impact from this viewpoint.

6.3.3 Conclusions

Since the Project site is largely undeveloped and mostly consists of paved surface parking lots under existing conditions, results from the BRADA analysis indicate that Project development will increase daylight obstruction relative to existing conditions from all viewpoints. However, the Project site is separated from the surrounding community by roadways, open spaces, the racetrack, horse stalls, and surface parking lots, and the tallest elements of the Resort will be pulled toward the center of the site, reducing potential

daylight obstruction from surrounding neighborhoods. From certain vantage points within the Project site near the tallest portion of the Resort (i.e., Casino Area II and Hotel I), daylight obstruction will increase significantly. In most other areas, daylight obstruction will be greater under proposed conditions than under existing conditions, but that obstruction will not be extensive and will be entirely suitable for the proposed uses.

A minimal amount of daylight obstruction is anticipated from the residential area south of the Project site, which is the residential area closest to the Resort. Since residences further south are at higher elevations, daylight obstruction will be even less.

6.4 Solar Glare

A solar glare study is being conducted by RWDI to ensure that the Project, including the proposed PV array, will not have any significant solar glare impacts, particularly for operations at Logan International Airport and in the immediate vicinity of the Project site.

Two meetings with Massport and FAA staff have been held, with one meeting specifically conducted to discuss any potential glare impacts and the scope of the solar glare study to be conducted by RWDI. Based on a request from Massport, five additional locations at Logan International Airport (R15L, R33L, R33R, R4L, and R4R) were added to the four initial locations at the airport (R15R, R22R, R22L, and R27) for the analysis (see Figures 6-20 and 6-21) to assess any potential solar glare impacts. Airport locations will be studied using actual flight path data provided by Massport, which will greatly increase the accuracy with which the Project is able to assess potential impacts. The FEIR will include results of the solar glare study.

If any changes to the alignment of the PV array or other building elements are necessary, these changes will be described in the FEIR.

6.5 Air Quality

6.5.1 Introduction

An air quality analysis was conducted to determine the impact of pollutant emissions from combustion and mobile source emissions generated by the Resort. A microscale analysis was performed to evaluate the potential air quality impacts of carbon monoxide (CO) due to traffic flow in the Project area. A mesoscale analysis was performed to assess the net increase in ozone precursor pollutant emissions as a result of increased traffic. In addition, for stationary sources (i.e., combustion source stacks), the EPA-approved air dispersion model was used to estimate Project-generated ambient concentrations of nitrogen oxides (NOx), particulate matter (PM-10 and PM-2.5), and sulfur dioxide (SO_2) in addition to CO.

A transportation conformity analysis was not required as this Project requires no Federal funding, sponsorship, or approval by the Federal Transit Administration (FTA) or the Federal Highway Administration (FHWA).

Summary of analysis: Overall, the Project will produce no significant air quality deterioration. All predicted CO concentrations at modeled intersections are well below applicable national air quality standards. All stationary sources will be state of the art technology and will be permitted through MassDEP. Analysis of stationary sources also shows all modeled concentrations to be below applicable national air quality standards. Although increases in NOx and VOC emissions from No-Build to Build are shown in the regional analysis, roadway improvement measures (as required) are presented in Section 5.0 that are expected to minimize the increase.

6.5.2 National Ambient Air Quality Standards

The 1970 Clean Air Act was enacted by the U.S. Congress to protect the health and welfare of the public from the adverse effects of air pollution. As required by the Clean Air Act, EPA promulgated National Ambient Air Quality Standards (NAAQS) for these criteria pollutants: nitrogen dioxide (NO_2), SO_2, PM10 and PM2.5, CO, ozone (O_3), and lead (Pb). The NAAQS are listed in Table 6-3. Massachusetts Ambient Air Quality Standards (MAAQS) are typically identical to NAAQS. However, since the NAAQS are not incorporated into the MAAQS by reference, there can be differences if EPA promulgates new standards and there is delay in Massachusetts incorporating them into 310 CMR 6.04.

NAAQS specify concentration levels for various averaging times and include both "primary" and "secondary" standards. Primary standards are intended to protect human health, whereas secondary standards are intended to protect public welfare from any known or anticipated adverse effects associated with the presence of air pollutants, such as damage to vegetation. The more stringent of the primary or secondary standards were applied when comparing to the modeling results for the Project.

Table 6-3 National Ambient Air Quality Standards

Pollutant	*Averaging Period*	*National Ambient Air Quality Standards and Massachusetts Ambient Air Quality Standards (micrograms per cubic meter)*	
		Primary	*Secondary*
NO_2	Annual [1]	100	Same
	1-hour [7]	188	None
SO_2	Annual [1]	80	None
	24-hour [2]	365	None
	3-hour [2]	None	1,300
	1-hour [7]	195	None
PM10 [6]	Annual	50	Same
	24-hour [3]	150	Same
PM2.5	Annual [4]	12	15
	24-hour [5]	35	Same

Table 6-3 National Ambient Air Quality Standards (Continued)

Pollutant	*Averaging Period*	*National Ambient Air Quality Standards and Massachusetts Ambient Air Quality Standards (micrograms per cubic meter)*	
		Primary	*Secondary*
CO	8-hour [2]	10,000	Same
	1-hour [2]	40,000	Same
Ozone	8-hour [3]	235	Same
Pb	3-month [1]	1.5	Same

Notes:
[1] Not to be exceeded
[2] Not to be exceeded more than once per year.
[3] Not to be exceeded more than an average of one day per year over three years.
[4] Not to be exceeded by the arithmetic average of the annual arithmetic averages from 3 successive years.
[5] Not to be exceeded based on the 98th percentile of data collection.
[6] Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, EPA revoked the annual PM10 standard in 2006 (effective December 17, 2006). However, the annual standard remains codified in 310 CMR 6.00
[7] Not to be exceeded. Based on the 3-yr average of the 98th (NO_2) or 99th (SO_2) percentile of the daily maximum 1-hour concentrations.
Source: 40 CFR 50 and 310 CMR 6.00

The NAAQS also reflect various durations of exposure. The short-term periods (i.e., 24 hours or less) refer to exposure levels not to be exceeded more than once a year. Long-term periods refer to limits that cannot be exceeded for exposure averaged over three months or longer.

The impacts from the Project were modeled and added to monitored background values and compared to the NAAQS. The modeling methodology was developed in accordance with the latest MassDEP modeling policies and Federal modeling guidelines.[3]

Modeling assumptions and backup data for results presented in this section are provided in Attachment H.

6.5.3 Existing Air Quality and Background Concentrations

6.5.3.1 Existing Local and Regional Air Quality

The Project is located in an urban area with residential land use to the south, commercial/industrial directly to the west, marshland to the east, and commercial land to the north. Massachusetts Route 1A is the major local roadway nearest to the Project site. Boston Logan International Airport's nearest operations are approximately 1.5 kilometers south of the Project site. The western edge of the property abuts a number of petroleum storage facilities (tank farms) as well as ocean oil tanker transfer ports.

[3] 40 CFR 51 Appendix W, Guideline on Air Quality Models, 70 FR 68228, Nov. 9, 2005

The Massachusetts Port Authority (Massport) completed its first round of ambient monitoring in 2010 as required in the MEPA certificate issued for the FEIR for the Logan Airside Improvements Project (LAIP), which included several airside improvements. The study was required relative to the construction of a new 9,300-foot-long centerfield taxiway running between the two major parallel runways 4 and 22.[4]

The study lasted 24 months, included three primary locations and eleven "satellite" locations, and focused on specific "air toxics" (VOCs, Carbonyls, Poly-Aromatic Hydrocarbons) and particulate matter (PM-2.5 and black carbon). A number of basic meteorological variables were also observed at two of the primary locations. The nearest monitoring locations to the Project site were located at Annavoy and Saratoga Streets (primary), Constitution Beach (satellite), and Bayswater Street (satellite). Concentrations of the targeted pollutants are presented, and exceedances of the 24-hour PM2.5 concentrations[5] against the "study benchmark" are shown at a monitor location directly adjacent to Logan Airport. Concentrations of speciated VOCs are mostly below benchmarks. These are commonly attributable to emissions from aircraft engines and tend to diminish quickly with increasing distance from the airport runways.

The Massachusetts Department of Public Health (MassDPH), with the help of Massport, has undertaken the Logan Airport Health Study. This study began about 13 years ago but was delayed due to funding problems in 2007. A draft report has not been released to the public. A final report was expected to be released in Spring 2013 but as of July 2013 had still not been released.

Tank farms are typical sources of fugitive VOCs and associated toxic air pollutants (e.g., benzene). VOCs are often emitted through tank vents during filling as the pollutant-laden air within the tanks is displaced by the petroleum liquid being stored. A number of petroleum storage tanks (not affiliated with Suffolk Downs or Caesars) are located near the Project site.

Another good measure of regional air quality in the area is MassDEP's local ambient monitoring network and pollutant concentrations compared to NAAQS. These values are discussed more in Section 6.5.3.2.

6.5.3.2 Background Concentrations

To estimate background pollutant levels representative of the area, the most recent air quality monitor data reported by MassDEP in Annual Air Quality Reports was obtained for 2007 to 2012. MassDEP guidance specifies the use of the latest three years of available monitoring data from within 10 km of the Project site.

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[4] Massport, Logan International Airport Air Quality Monitoring Study, Baseline Year Report, August 2010

[5] Federal Reference Method (FRM) concentration at Saratoga & Annavoy Streets primary monitor station.

The Clean Air Act allows for one exceedance per year of the CO and SO_2 short-term NAAQS per year. Therefore, the second highest concentration accounts for the one allowed exceedance. Annual NAAQS are never to be exceeded. The 24-hour PM-10 standard is not to be exceeded more than once per year on average over three years. To attain the 24-hour PM-2.5 standard, the three-year average of the 98th percentile of 24-hour concentrations must not exceed 35 $\mu g/m^3$. For annual PM-2.5 averages, the average of the highest yearly observations was used as the background concentration. A new one-hour NO_2 standard was recently promulgated. To attain this standard, the 3-year average of the 98th percentile of the maximum daily one-hour concentrations must not exceed 188 $\mu g/m^3$.

Background concentrations were determined from the closest available monitoring stations to the proposed development. Since all pollutants are not measured at all monitors, the nearest monitor may change depending on the pollutant being measured. The closest monitors are located at 390 Parkland in Lynn, Kenmore Square in Boston, One City Square in Charlestown, and at 174 North Street in Boston's North End. A summary of the background air quality concentrations are presented in Table 6-4.

Table 6-4 Observed Ambient Air Quality Concentrations and Selected Background Levels

Poll.	*Avg. Time*	*2010*	*2011*	*2012*	*Back-ground Conc. ($\mu g/m^3$)*	*NAAQS ($\mu g/m^3$)*	*% of Std*	*Location*
SO_2 [1,7,8]	1-Hr	69.9	127.4	41.6	127.4	195	65%	Kenmore Sq., Boston
	3-Hr	88.4	62.4	49.4	88.4	1300	7%	Kenmore Sq., Boston
	24-Hr	21.8	31.5	15.6	31.5	365	9%	Kenmore Sq., Boston
	Ann	5.8	6.1	6.5	6.5	80	8%	Kenmore Sq., Boston
PM-10	24-Hr	32.0	39.0	41.0	41.0	150	27%	One City Sq. Boston
	Ann	15.1	15.9	17.9	17.9	50	36%	One City Sq. Boston
PM-2.5	24-Hr [4]	24.8	23.9	21	23.2	35	66%	174 North St., Boston
	Ann [5]	10.0	10.3	9.5	10.0	12	83%	174 North St., Boston
NO_2 [3]	1-Hr [6]	94.6	112.8	95.9	112.8	188	60%	390 Parkland, Lynn
	Ann	13.7	19.3	13.2	19.3	100	19%	390 Parkland, Lynn
CO [2]	1-Hr	1140	1083	1026	1140	40000	3%	390 Parkland, Lynn
	8-Hr	798	684	798	798	10000	8%	390 Parkland, Lynn

Notes: From 2007-2012 MA DEP Annual Data Summaries

[1] SO_2 reported in ppm or ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 2600 $\mu g/m^3$.

[2] CO reported in ppm or ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 1140 $\mu g/m^3$.

[3] NO_2 reported in ppm or ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 1880 $\mu g/m^3$.

[4] Background level for 24-hour PM-2.5 is the average concentration of the 98th percentile for three years.

[5] Background level for annual PM-2.5 is the average for three years.

[6] Maximum annual 1-hr concentrations.

[7] The 24-hour and Annual standards were revoked by EPA on June 22, 2010, Federal Register 75-119, p. 35520.

[8] The 2010 & 2011 SO_2 3-hr value is not reported. Years 2007-2009 used instead. 2012 Annual SO_2 not reported; 2009 value used instead. 2012 AnnualPM10 not reported; 2009 value used instead. 2012 Annual NO_2 not reported; 2009 value used instead.

All nearby monitored concentrations in MassDEP's system are well below NAAQS.

For use in the microscale analysis, background concentrations of CO in parts per million (ppm) were required. The corresponding maximum background concentrations in ppm were 1.0 ppm for one-hour and 0.7 ppm for eight-hour CO.

6.5.4 Methodology

Air quality modeling methodology, utilized as explained in guidance set forth by the MassDEP and U.S. EPA, is outlined below.

6.5.4.1 Mesoscale/GHG Analysis

A mesoscale analysis is required to ensure that the proposed Project will not adversely impact the existing State Implementation Plan (SIP), which tracks how the state intends to maintain compliance with the NAAQS or plans for reductions in emissions to attain compliance in the future. A mesoscale analysis does not involve predictions of pollutant concentrations.

A mesoscale analysis predicts the change in regional ozone precursor emissions (i.e., NOx and VOCs) due to the Project. In addition, emissions of carbon dioxide (CO_2) are calculated for use in the GHG analysis presented in Section 7.0.

In accordance with MassDEP guidance[6], a mesoscale analysis is required for the following projects for which an ENF is filed under MEPA after May 1, 1991:

- any office project generating 3,000 or more ADT; and
- any other non-residential project generating 6,000 or more ADT.

A mesoscale analysis will be required for the following projects for which a decision on the adequacy of an EIR is issued under MEPA after May 1, 1991:

- any non-residential project generating 10,000 or more ADT.

A mesoscale analysis is required to ensure that a proposed project will not negatively impact the existing SIP. The SIP is created to track how the state intends to maintain compliance with NAAQS or to plan for future emissions reductions to attain compliance.

The analysis includes a comparison of the future Build conditions to the No-Build condition. If emissions are greater for the Build conditions, reasonable and feasible roadway improvement measures are to be evaluated. The methodology and parameters for the mesoscale analysis follow methodology approved by MassDEP.

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[6] MassDEP, Guidelines For Performing Mesoscale Analysis Of Indirect Sources, May 1991

The mesoscale analysis predicts the change in regional ozone precursor emissions due to the proposed redevelopment of the Project sites. The total vehicle pollutant burden was estimated for the 2012 existing conditions and the No-Build and Build conditions for year 2022. Traffic conditions are described in more detail in Section 5.0.

Emissions Calculations (MOBILE6.2)

The EPA's MOBILE6.2 computer program was used to estimate motor vehicle emission factors of VOC and NOx (and CO_2 for GHG) on the roadway network in the Project area. Conservatively, emission factors derived from MOBILE6.2 for VOC and NOx (and CO_2) are based on the worst case of either wintertime or summertime conditions. Daily and yearly emission estimates were calculated using the vehicle count data, mileage between intersections, modeled signalized intersection delay times, and emission factors.

Traffic

The traffic volumes provided in Section 5.0 form the basis of the mesoscale study. Peak hour traffic volumes were provided by the transportation consultant. Estimates of ADT were made from the peak hour volumes assuming a 10% K-Factor. Average speeds were assumed for all links. Distances for the links were estimated with mapping software. A total of 107 roadway links were included in the analysis.

Average per-vehicle idle times were based on SYNCHRO output reports provided by the transportation consultant to calculate emissions from idling vehicles. Further idling on roadway links was included assuming a one-minute per hour per vehicle idling time. A total of 27 intersections were included in the analysis.

6.5.4.2 Microscale Analysis

The BRA requires an analysis of the effect on air quality of the increase in traffic generated by the Project. This "microscale" analysis is required for any intersection (including garage entrances/exits where the LOS is expected to deteriorate to D and the proposed Project causes a 10 percent increase in traffic or where the LOS is E or F and the proposed Project contributes to a reduction in LOS. The microscale analysis involves modeling CO emissions from vehicles idling at and traveling through both signaled and unsignalized intersections. Predicted ambient concentrations of CO for the Build and No Build cases are compared with NAAQS and MAAQS for CO.

The microscale analysis typically examines ground-level CO impacts due to traffic queues in the immediate vicinity of a project. CO is used in microscale studies to indicate roadway pollutant levels since it is the most abundant pollutant emitted by motor vehicles and can result in so-called "hot spot" (high concentration) locations around congested intersections. The NAAQS standards do not allow ambient CO concentrations to exceed 35 ppm for a one-hour averaging period and 9 ppm for an eight-hour averaging period, more than once

per year at any location. The widespread use of CO catalysts on current vehicles has reduced the occurrences of CO hotspots. Air quality modeling techniques (computer simulation programs) are typically used to predict CO levels for both existing and future conditions to evaluate compliance of the roadways with the standards. The analyses for the Project followed the procedure outlined in U.S. EPA's intersection modeling guidance.[7]

The microscale analysis has been conducted using the latest versions of EPA MOBILE6.2, CAL3QHC, and AERMOD to estimate CO concentrations at sidewalk receptor locations.

Baseline (2012) and future year (2022) emission factor data calculated from the MOBILE6.2 model, along with traffic data, were input into the CAL3QHC program to determine CO concentrations due to traffic flowing through the selected intersections. AERMOD was used to estimate potential ground-level impacts due to emissions from the combustion sources.

Existing background values of CO at the nearest monitor location in Kenmore Square were obtained from the MassDEP. CAL3QHC and AERMOD results were then added to background CO values of 1.9 ppm (one-hour) and 1.5 ppm (eight-hour), as provided by the MassDEP, to determine total air quality impacts due to the Project. This value was compared to the NAAQS for CO of 35 ppm (one-hour) and 9 ppm (eight-hour).

Emissions Calculations (MOBILE6.2)

The EPA MOBILE6.2 computer program was used to estimate motor vehicle emission factors on the roadway network. Emission factors calculated by the MOBILE6.2 model are based on motor vehicle operations typical of daily periods. The Commonwealth's statewide annual Inspection and Maintenance (I&M) program was included, as well as the state specific vehicle age registration distribution. The input files for MOBILE6.2 for the existing (2012) and build year (2022) are provided by MassDEP. As is typical, minor edits to the files were necessary to allow the program to output emission factors for the various speeds used in the analyses.

Idle emissions can be obtained from a vehicle speed of 2.5 mph (the lowest speed MOBILE6 will model). The resulting emission rate given in (grams/mile) is then multiplied by 2.5 mph to estimate idle emissions (in grams/hour). Moving emissions are calculated based on actual speeds at which free-flowing vehicles travel through the intersections. A speed of 30 mph is used for all free-flow traffic. Speeds of 10 and 15 mph were used for right (and U-turns, if necessary) and left turns, respectively.

Winter CO emission factors are typically higher than summer for CO. Therefore, winter vehicular emission factors were conservatively used in the microscale analyses.

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[7] U.S. EPA, Guideline for Modeling Carbon Monoxide from Roadway Intersections; EPA-454/R-92-005, November 1992.

Intersection Selection

As stated previously, a "microscale" analysis is required for a project at intersections where (1) project traffic would impact intersections or roadway links currently operating at LOS D, E, or F or would cause LOS to decline to D, E, or F; (2) project traffic would increase traffic volumes on nearby roadways by 10% or more (unless the increase in traffic volume is less than 100 vehicles per hour); or (3) a project will generate 3,000 or more new ADT on roadways providing access to a single location.

Given the large number of intersections meeting the above criteria, it was necessary to determine the worst intersections to analyze. Through consultation with transportation engineers, it was determined that the following intersections are the worst performing intersections with the most Project-related traffic and were selected to be modeled:

- the intersection of Route 1A, Route 60, Route 16, Beach Street, and Everett Street (Bell Circle);
- the intersection of Route 1A and Boardman Street;
- the intersection of Revere Street and Route 60;
- the intersection of Route 145 (Winthrop Avenue), Route 16, and Harris Street; and
- the intersection of Route 145 (Winthrop Avenue), North Shore Road, and Tomasello Drive.

Since the intersection of Route 1A and Boardman Street is planned to undergo a significant physical change, and this change will also affect the intersection of Waldemar Avenue and the South Site Driveway with Route 1A, these intersections were included in the analysis of Route 1A and Boardman Street in the Build cases.

Microscale modeling was performed for the intersections based on the aforementioned methodology. The 2012 existing conditions, 2022 No Build conditions, and 2022 Build and Build with HCA Improvements conditions were each evaluated.

Receptors & Meteorology Inputs

Sets of up to 600 receptors were placed in the vicinity of each of the modeled intersections and spaced every five meters. Receptors extended approximately 200 to 300 feet on the sidewalks along the roadways approaching the intersection. Roadway links and receptor locations of the modeled intersections are presented in Figures 6-22 through 6-27. For the CAL3QHC model, limited meteorological inputs are required. Following EPA

guidance[8], a wind speed of 1 m/s, stability class D (4), and a mixing height of 1,000 meters was used. To account for the intersection geometry, wind directions from 0° to 350°, every 10° were selected. A surface roughness length of 175 cm was selected for all intersections.[9]

Impact Calculations

The CAL3QHC model predicts one-hour concentrations using queue-links at intersections, worst-case meteorological conditions, and traffic input data. The one-hour concentrations were scaled by a factor of 0.7 to estimate 8-hour concentrations.[10] The CAL3QHC methodology was based on EPA CO modeling guidance. Signal timings were provided directly from the traffic modeling outputs. The CAL3QHC input parameters are also described in Attachment H.

6.5.4.3 Stationary Source Analysis

AERMOD

The most recent version of the U.S. EPA AERMOD refined dispersion model (Version 12345) was selected to predict concentrations from the stationary sources related to the Project. AERMOD is the U.S. EPA's preferred model for regulatory applications. The use of AERMOD provides the benefits of using the most current algorithms available for steady state dispersion modeling.

The AERMOD View graphical user interface (GUI) Version 8.2.0, created by Lakes Environmental, was used to facilitate model setup and post-processing of data. The AERMOD model was selected for this analysis because it:

- is the required U.S. EPA model for all refined regulatory analyses for receptors within 50 km of a source;
- is a refined model for facilities with multiple sources, source types, and building-induced downwash;
- uses actual representative hourly meteorological data;

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[8] U.S. EPA, *Guideline for Modeling Carbon Monoxide from Roadway Intersections.* EPA-454/R-92-005, November 1992 (the "Guideline").

[9] U.S. EPA, *User's Guide for CAL3QHC Version 2: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections*. EPA –454/R-92-006 (Revised), September 1995.

[10] U.S. EPA, Screening Procedures for Estimating the Air Quality Impact of Stationary Sources; EPA-454/R-92-019, October 1992.

- incorporates direction-specific building parameters which can be used to predict impacts within the wake region of nearby structures;

- allows the modeling of multiple sources together to predict cumulative downwind impacts;

- provides for variable emission rates;

- provides options to select multiple averaging periods between one-hour and one year (scaling factors can be applied to adjust the one-hour impact to a peak impact less than one-hour); and

- allows the use of large Cartesian and polar receptor grids, as well as discrete receptor locations.

Regulatory default options adopted for the model include the options described below.

- *Use stack-tip downwash (except for building downwash):* Stack-tip downwash is an adjustment of the actual stack release height for conditions when the gas exit velocity is less than 1.5 times the wind speed. For these conditions, the effective release height is reduced a bit, based on the diameter of the stack and the wind and gas exit velocity. This option applies to point sources only, such as emergency generators, cooling towers, boiler units and garage vents.

- *Use the missing data and calms processing routines:* The model treats missing meteorological data in the same way as the calms processing routine (i.e., it sets the concentration values to zero for that hour, and calculates the short term averages according to U.S. EPA's calms policy, as set forth in the Guideline). Since only one-hour averages are being used, concentrations predicted with calm or missing data would not affect model results.

The AERMOD model is able to assign sources to a rural or urban category to allow specified urban sources to use the effects of increased surface heating under stable atmospheric conditions. The urban dispersion classification was selected based on a visual inspection of the area within a three-kilometer radius of the Project site. A population estimate of 1,118,961 was obtained from the U.S. Census website (www.census.gov) for the Boston area and surrounding cites of Brookline, Cambridge, Chelsea, Everett, Malden, Revere, Somerville and Winthrop. This value was used in the AERMOD model to estimate the urban boundary layer height.

The regional meteorology in Boston is best approximated with meteorological data collected by the nearby Boston Logan International Airport in East Boston. The station is located approximately 2.3 miles (3.7 km) east of the Project site at an elevation of 15 feet (4.57 m) above mean sea level. This station is the closest site for which extensive meteorological data are available which are representative of similar topographic influences

that affect the proposed sites. Five years (2007-20011) of hourly surface data collected at the station include wind speed and direction, temperature, cloud cover and ceiling height. Upper air data from Gray, Maine was processed along with the surface data. The processed meteorological files for use in AERMOD were provided by the MassDEP. These files have been used on other AERMOD applications in the area for review by MassDEP and are presumed to be of sufficient quality for regulatory applications.

A network of 2,197 receptors was used for the refined AERMOD modeling analysis. A nested grid of Cartesian receptors centered on the Project was used. The entire modeling domain encompassed 132.25 square kilometers (11.5 by 11.5 kilometers). The spacing of the receptors was as follows:

- a one-kilometer square area surrounding the Project site with receptors spaced every 25 meters;
- a 500-meter area extending from the initial one-kilometer square area with receptors spaced every 100 meters;
- a 500-meter area extending from the 1.5-kilometer square area with receptors spaced every 250 meters;
- a one-kilometer area extending from the two-kilometer square area with receptors spaced every 500 meters; and
- a three-kilometer area extending from the three-kilometer square area with receptors spaced every 1,000 meters.

Receptors falling on Resort building footprints were removed from the analysis.

Terrain data were obtained from the U.S.G.S National Map Seamless Server (www.seamless.usgs.gov) according to guidance set forth by EPA.[11] Receptor elevations were processed using the AERMAP processor by way of the Lakes AERMOD View interface. Figure 6-28 presents the source and receptor locations, as well as the buildings used in the GEP stack height/downwash analysis described below.

Sources

Stationary sources of air pollution are typically units that combust fuel. In this case, these sources consist of heating units and electrical generating units. The Project also includes a CHP (also called "cogeneration") facility. Cooling towers, although not a combustion source, are a source of particulate emissions and are included in the analysis.

[11] U.S. EPA, AERMOD Implementation Guide, March 19, 2009.

Current plans include a number of small condensing boilers for heat and domestic hot water. All units will be natural gas-fired and located in a penthouse mechanical area on the roof of the building. The units are expected to be exhausted through individual stacks. The current design includes four heating boilers at 6 MMBtu/hour (heat input) each. The boilers will be within requirements of the MassDEP's Environmental Results Program (ERP) since individual estimated heat inputs are within or below the 10 to 40 MMBtu/hour ERP range. However, emissions were conservatively estimated for each boiler based on the MassDEP Boiler ERP program emission limits. Dispersion modeled impacts from the heating units were estimated from exhaust stacks 10 feet above the building roof heights (48 feet above ground level). For all impacts, the heating equipment is assumed to be in operation 24 hours per day, seven days per week.

Current design plans include emergency generators to be installed next to the CUP building to be constructed. The units will provide life safety and standby emergency power to the buildings. The units will be diesel-fired and located in a mechanical area to the northeast of the CUP building. The generator is assumed to be designed such that its exhaust stack extends at least 10 feet above the unit enclosure height (23.75 feet above ground level). The current design includes two 2,000 kilowatt emergency generators.

Typically, the generators will operate for approximately one hour each month for testing and general maintenance. The ERP regulation applies to new emergency generators greater than 37 kW. The regulation is similar to the boiler ERP in that new engines are subject to emission standards, recordkeeping, certification, and compliance with the MassDEP noise policy. Since the generator maximum rating capacity is greater than the ERP limit of 37 kW, it will be subject to the new ERP program. Per the ERP, the generator owner will limit operation of the generator to less than 300 hours per year and submit a certification form to MassDEP within 60 days of installation.

Emissions were estimated for the emergency generators based on vendor supplied data. Comparable equipment was assumed when not provided by the architects or design engineers. The generators are assumed to operate 300 of 8,760 hours per year in the modeling for annual averaging times.

Current plans call for cooling towers to be installed in the mechanical area northeast of the building. These units will remove the excess heat generated by the buildings' mechanical equipment. All units will be located on the roofs of the buildings. The current design includes three 3,000-ton single-celled cooling towers.

Only emissions of PM are assumed to be produced by the cooling tower cells. The cooling towers are assumed to operate at 100% capacity for 8,760 hours per year. Emissions of all other pollutants from the cooling towers are expected to be negligible.

Emissions and exhaust parameters were based on vendor supplied data and/or engineering judgment.

A CHP system is planned for the Project. A system includes a natural gas-fired reciprocating engine to provide power while collecting the waste heat energy to produce steam for other uses, mainly heating. The currently-planned system consists of two natural gas-fired reciprocating engines and heat recovery units capable of producing a combined 100 kilowatts of power each. It is assumed to exhaust from the roof of the building. The unit is assumed to operate 8,760 hours per year.

Emissions and exhaust parameters were based on vendor supplied data and/or engineering judgment. Since this is not considered final design, all sources and parameters are subject to change and final configurations will be permitted through MassDEP as necessary.

GEP Stack Height Analysis

The Good Engineering Practice (GEP) stack height evaluation of the facility has been conducted in accordance with the EPA revised Guidelines for Determination of Good Engineering Practice Stack Height (EPA, 1985). A GEP stack is sufficiently high to avoid aerodynamic downwash effects from nearby buildings or structures. As defined by the EPA guidelines, the formula for computing GEP stack height is the greater of:

1. 65 meters, or

2. for stacks constructed after January 12, 1979,

$$H_{GEP} = H_b + 1.5L$$

where H_{GEP} = GEP stack height,

H_b = Height of adjacent or nearby structures,

L = Lesser of height or maximum projected width of adjacent or nearby building (*i.e.*, the critical dimension), and nearby is within 5L of the stack from downwind (trailing edge) of the building.

The GEP formula was applied to each input building. EPA's Building Profile Input Program Prime Version (BPIP-Prime) was run to confirm the GEP height and to calculate direction-specific building dimensions for use in AERMOD.

The point sources subject to building influences are the boiler stacks, cooling towers, CHP, and emergency generator stacks.

The proposed boiler stacks, cooling towers, and emergency generator stacks are all below GEP height; therefore, building downwash effects were considered in the air quality modeling. The AERMOD model determines when and if to include downwash in its calculations. In addition, if downwash applies, the AERMOD downwash algorithm will be used to estimate concentrations in the building cavity areas.

6.5.5 Air Quality Analysis Results

The following sections present results of the air quality analyses.

6.5.5.1 Mesoscale Analysis

Results of the regional emissions calculations as part of the mesoscale analysis are presented in Tables 6-5 and 6-6.

The decrease in total emissions from Existing 2012 to 2022 No-Build, even with the modest increases in traffic VMT and delay times, is attributable to anticipated improvements in vehicle engine and emissions technologies, which are expected to reduce per-vehicle emission rates.

Table 6-5 Regional Mesoscale (Indirect) Emissions Analysis Summary (No-Build versus Existing)

Pollutant	*VOC (lbs/day)*	*VOC (tons/yr)*	*NOx (lbs/day)*	*NOx (tons/yr)*
2012 Existing	340.7	53.2	690.0	107.6
2022 No Build	238.9	37.3	239.4	37.4
Difference	-101.8 -29.9%	-15.9 -29.9%	-450.6 -65.3%	-70.3 -65.3%

For Build conditions, shown in Table 6-6, the 2022 Build condition shows increases of NOx and VOC emissions compared to 2022 No Build conditions. Primarily due to trip (VMT) increases, results show increases of approximately 7% in VOCs and 8% in NOx emissions.

Table 6-6 Regional Mesoscale (Indirect) Emissions Analysis Summary (Build versus No-Build)

Pollutant	*VOC (lbs/day)*	*VOC (tons/yr)*	*NOx (lbs/day)*	*NOx (tons/yr)*
2022 No Build	238.9	37.3	239.4	37.4
2022 Build	255.3	39.8	259.3	40.4
Difference	16.4 6.9%	2.6 6.9%	19.8 8.3%	3.1 8.3%

Transportation Improvement Measures

The Proponent has identified and reviewed reasonable and feasible HCA improvement measures to address traffic impacts and the resulting minimal increase in emissions associated with the 2022 Build scenario. Section 5.0 provides a description of the HCA improvements as well as the TDM program that will be implemented to reduce vehicle trips. The Proponent is committed to implementing transportation management improvements to minimize potential impacts to the transportation system including signal improvements at area intersections, encouraging alternative modes of travel, and rideshare programs. Proposed transportation-related improvement measures are further described in Section 5.0.

The HCA improvements on Route 16 are expected to divert trips from the two-mile stretch of Route 60 between Route 1 and Routes 16/145 (just south of Bell Circle) to the 1.25-mile stretch of Route 16 from Route 1 to Route 145, resulting in a significant reduction of VMT annually. Combined with reductions in delay at other intersections, the improvements are expected to reduce emissions from the Build condition.

6.5.5.2 Microscale Analysis

Results of the maximum one-hour predicted CO concentrations from CAL3QHC are provided in Tables 6-7 through 6-10 for the 2012 and 2022 scenarios. Eight-hour average concentrations are calculated by multiplying the maximum one-hour concentrations by a factor of 0.7.[12]

Results of the one-hour and eight-hour maximum modeled CO ground-level concentrations from CAL3QHC were added to EPA-supplied background levels for comparison to NAAQS. These values represent the highest potential concentrations at the intersection as they are predicted during the simultaneous occurrence of "defined" worst case meteorology. The highest one-hour traffic-related concentration predicted in the Project area, for the modeled

[12] U.S. EPA, Screening Procedures for Estimating the Air Quality Impact of Stationary Sources; EPA-454/R-92-019, October 1992

conditions (4.2 ppm) plus background (1.0 ppm) is 5.2 ppm for the 2022 Friday afternoon peak hour case at the intersection of Routes 1A, 16, and 60 (Bell Circle) for multiple conditions. The highest eight-hour traffic-related concentration predicted in the Project area for the modeled conditions (2.9 ppm) plus background (0.7 ppm) is 3.6 ppm at the same intersection for the same conditions. All concentrations are well below the one-hour NAAQS of 35 ppm and the eight-hour NAAQS of 9 ppm.

Physical roadway improvements (memorialized in the HCAs) would be made to improve intersections in the Project vicinity. Significant improvements would be made to the intersection of Routes 16 and 145, while minor improvements would be made to Bell Circle and the North Site Driveway area. Microscale results including these improvements are shown in Table 6-10.

Table 6-7 Summary of Microscale Modeling Analysis (Existing 2012)

Intersection	*Peak*	*CAL3QHC Modeled CO Impacts (ppm)*	*Monitored Background Concentration (ppm)*	*Total CO Impacts (ppm)*	*NAAQS (ppm)*
1-Hour					
Bell Circle	PM	4.2	1.0	5.2	35
	SA	4.2	1.0	5.2	35
Route 1A and Boardman Street	PM	2.4	1.0	3.4	35
	SA	2.2	1.0	3.2	35
Route 60 and Revere Street	PM	2.3	1.0	3.3	35
	SA	2.2	1.0	3.2	35
Route 145 and Route 16	PM	2.2	1.0	3.2	35
	SA	2.5	1.0	3.5	35
Route 145, North Shore Road, and North Site Driveway	PM	2.9	1.0	3.9	35
	SA	2.1	1.0	3.1	35
8-Hour					
Bell Circle	PM	2.9	0.7	3.6	9
	SA	2.9	0.7	3.6	9
Route 1A and Boardman Street	PM	1.7	0.7	2.4	9
	SA	1.5	0.7	2.2	9
Route 60 and Revere Street	PM	1.6	0.7	2.3	9
	SA	1.5	0.7	2.2	9
Route 145 and Route 16	PM	1.5	0.7	2.2	9
	SA	1.8	0.7	2.5	9
Route 145, North Shore Road, and North Site Driveway	PM	2.0	0.7	2.7	9
	SA	1.5	0.7	2.2	9

Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.7.

Table 6-8 Summary of Microscale Modeling Analysis (No Build 2022)

Intersection	*Peak*	*CAL3QHC Modeled CO Impacts (ppm)*	*Monitored Background Concentration (ppm)*	*Total CO Impacts (ppm)*	*NAAQS (ppm)*
1-Hour					
Bell Circle	PM	4.1	1.0	5.1	35
	SA	4.0	1.0	5.0	35
Route 1A and Boardman Street	PM	2.5	1.0	3.5	35
	SA	2.3	1.0	3.3	35
Route 60 and Revere Street	PM	2.5	1.0	3.5	35
	SA	2.3	1.0	3.3	35
Route 145 and Route 16	PM	2.2	1.0	3.2	35
	SA	2.1	1.0	3.1	35
Route 145, North Shore Road, and North Site Driveway	PM	2.9	1.0	3.9	35
	SA	2.1	1.0	3.1	35
8-Hour					
Bell Circle	PM	2.9	0.7	3.6	9
	SA	2.8	0.7	3.5	9
Route 1A and Boardman Street	PM	1.8	0.7	2.5	9
	SA	1.6	0.7	2.3	9
Route 60 and Revere Street	PM	1.8	0.7	2.5	9
	SA	1.6	0.7	2.3	9
Route 145 and Route 16	PM	1.5	0.7	2.2	9
	SA	1.5	0.7	2.2	9
Route 145, North Shore Road, and North Site Driveway	PM	2.0	0.7	2.7	9
	SA	1.5	0.7	2.2	9

Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.7.

Table 6-9 Summary of Microscale Modeling Analysis (Build 2022)

Intersection	*Peak*	*CAL3QHC Modeled CO Impacts (ppm)*	*Monitored Background Concentration (ppm)*	*Total CO Impacts (ppm)*	*NAAQS (ppm)*
1-Hour					
Bell Circle	PM	4.3	1.0	5.3	35
	SA	3.8	1.0	4.8	35
Route 1A and Boardman Street	PM	3.9	1.0	4.9	35
	SA	4.0	1.0	5.0	35
Route 60 and Revere Street	PM	2.9	1.0	3.9	35
	SA	2.5	1.0	3.5	35
Route 145 and Route 16	PM	2.6	1.0	3.6	35
	SA	2.0	1.0	3.0	35
Route 145, North Shore Road, and North Site Driveway	PM	3.4	1.0	4.4	35
	SA	2.5	1.0	3.5	35
8-Hour					
Bell Circle	PM	3.0	0.7	3.7	9
	SA	2.7	0.7	3.4	9
Route 1A and Boardman Street	PM	2.7	0.7	3.4	9
	SA	2.8	0.7	3.5	9
Route 60 and Revere Street	PM	2.0	0.7	2.7	9
	SA	1.8	0.7	2.5	9
Route 145 and Route 16	PM	1.8	0.7	2.5	9
	SA	1.4	0.7	2.1	9
Route 145, North Shore Road, and North Site Driveway	PM	2.4	0.7	3.1	9
	SA	1.8	0.7	2.5	9

Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.7.

Table 6-10 Summary of Microscale Modeling Analysis (Build with HCA Improvements 2022)

Intersection	*Peak*	*CAL3QHC Modeled CO Impacts (ppm)*	*Monitored Background Concentration (ppm)*	*Total CO Impacts (ppm)*	*NAAQS (ppm)*
1-Hour					
Bell Circle	PM	4.3	1.0	5.3	35
	SA	3.8	1.0	4.8	35
Route 145 and Route 16	PM	4.0	1.0	5.0	35
	SA	3.3	1.0	4.3	35
Route 145, North Shore Road, and North Site Driveway	PM	3.2	1.0	4.2	35
	SA	2.8	1.0	3.8	35
8-Hour					
Bell Circle	PM	3.0	0.7	3.7	9
	SA	2.7	0.7	3.4	9
Route 145 and Route 16	PM	2.8	0.7	3.5	9
	SA	2.3	0.7	3.0	9
Route 145, North Shore Road, and North Site Driveway	PM	2.2	0.7	2.9	9
	SA	2.0	0.7	2.7	9

Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.7.

6.5.5.3 Stationary Source Analysis

The AERMOD dispersion model was used to evaluate the expected air quality impacts due to emissions from the Project's stationary sources. Local background concentrations, determined from the ambient monitoring data, are added to model results and compared to the applicable National Ambient Air Quality Standards for each pollutant and averaging period. Table 6-11 presents the results of the stationary source analysis. Compliance is demonstrated with the NAAQS for all pollutants and averaging periods.

Table 6-11 Summary of Stationary Source Modeling Analysis

Pollutant	*Averaging Time*	*Max Modeled Conc. ($\mu g/m^3$)*	*Modeled Year*	*Background Concentration ($\mu g/m^3$)*	*Total Conc. ($\mu g/m^3$)*	*Standard ($\mu g/m^3$)*	*% Of Standard*
SO_2	1 HR [1]	2.03	5-yr	127.4	129.4	195	66%
	3 HR [2]	2.00	2009	88.4	90.4	1300	7%
	24 HR [2]	1.50	2011	31.5	33.0	365	9%
	ANN. [3]	0.16	2010	6.5	6.7	80	8%
PM-10	24 HR [4]	13.55	5-yr	44.0	57.5	150	38%
	ANN. [3]	1.91	2010	17.9	19.8	50	40%
PM-2.5	24 HR [5]	27.70	5-yr	[8]	27.7	35	79%
	ANN. [6]	1.70	5-yr	10.2	11.9	12	99%
NO_2	1 HR [7]	153.98	5-yr	[8]	154.0	188	82%
	ANN. [3]	17.06	2010	19.3	36.3	100	36%
CO	1 HR [2]	146.39	2011	1140.0	1286.4	40000	3%
	8 HR [2]	127.43	2009	798.0	925.4	10000	9%

Notes:
[1] Maximum 4th-Highest Maximum Daily 1-Hr Concentration Averaged Over 5 Years
[2] Highest 2nd-High Concentration Over 5 Years
[3] Highest Annual Concentration Over 5 Years
[4] Highest 6th-High Concentration Over 5 Years
[5] Maximum 1st-Highest 24-Hour Concentration Averaged Over 5 Years
[6] Maximum Annual Concentration Averaged Over 5 Years
[7] Maximum 8th Highest Maximum Daily 1-hour Concentrations Averaged Over 5 Years. Plume volume molar ratio method used to convert stack NOx to NO_2.
[8] Background concentrations included directly in modeled output.

6.5.6 Conclusions

6.5.6.1 Mesoscale Analysis

Although results of the mesoscale analysis show increases in NO_x and VOC emissions, the quantitative values (in tons per year) are relatively small (~3 tons per year) between No-Build and Build cases. With the HCA improvements, reductions of NOx and VOCs are expected from the Build case.

6.5.6.2 Microscale Analysis

Results of the microscale analysis show that all predicted CO concentrations are well below one-hour and eight-hour NAAQS. Therefore, it can be concluded that there are no adverse air quality impacts resulting from increased traffic in the area.

6.5.6.3 Stationary Source Analysis

Results of the stationary source air quality dispersion modeling analysis show that all predicted concentrations are well below the NAAQS. Therefore, it can be concluded that the stationary sources associated with the Project will not cause or contribute to a violation of the NAAQS.

6.5.7 Stationary Source Permitting

It is expected that the majority of stationary sources (e.g., boilers, engines) would either be exempt from or subject to MassDEP's Environmental Results Program (ERP). However, with the integration of larger sources (such as CHP), other air quality regulations may apply if total emissions exceed thresholds for other air pollution control requirements, including Massachusetts minor source preconstruction approvals (NMCPA), New Source Review (NSR), Operating Permits, and Prevention of Significant Deterioration (PSD).

6.5.7.1 Combined Heat and Power

Depending on the unit's final design size and operating conditions, the CHP system could be permitted under the ERP regulations (310 CMR 7.26) or under the Plan Approval regulations (310 CMR 7.02). Operating restrictions could allow the system to be permitted under the ERP and require the facility to submit a self-certification to MassDEP after installation. The Plan Approval process requires consultation with and approval by MassDEP before construction. Both permits require full compliance with all applicable air quality standards.

6.5.7.2 Boilers

Projects typically include a number of small condensing boilers for heat and domestic hot water. All units are often natural gas-fired and located in a penthouse mechanical area on the roofs of buildings. The units are typically exhausted through individual stacks.

The boilers will likely be within the requirements of the ERP since individual estimated heat inputs would be within or below the 10 to 40 million British Thermal Units per hour (MMBtu/hr) ERP range. If boilers are below the ERP limits of 10 MMBtu/hr, registration with MassDEP would not be required.

6.5.7.3 Emergency Generators

Emergency generators are required to provide life safety and standby emergency power to the buildings. The units are often diesel-fired and located in a mechanical area on the roofs of buildings. The generators are required to be designed such that exhaust stacks extend at least 10 feet above the individual building roof height above ground level.

Typically, generators will operate for approximately one hour each month for testing and general maintenance. The ERP regulation applies to new emergency generators greater than 37 kW. The regulation is similar to the boiler ERP in that new engines are subject to emission standards, recordkeeping, certification, and compliance with MassDEP noise policy. Since the generators' maximum rating capacities are likely to be greater than the ERP limit of 37 kW, they will be subject to the new ERP program. Per the ERP, the generator owner will be required to limit operation of the generator to less than 300 hours per year and submit a certification form to MassDEP within 60 days of installation.

6.5.7.4 Parking Garage Exhausts

According to local building codes and best construction practices, CO monitors will be installed within any underground levels in the parking garages to ensure that CO levels do not exceed health standards and to control abatement ventilation when necessary. Compliance will be certified by local inspection authorities.

6.5.8 General Air Quality Mitigation Measures

Pollutant emissions from the Project will be reduced in a variety of ways. Stationary sources will be required to comply with applicable emission regulations promulgated for the specific sources. Diesel emergency generators will be required to meet emission performance standards as specified in 40 CFR 89 and/or 310 CMR 7.26(42). Heating boilers subject to ERP will be required to meet emissions limits specified in 310 CMR 7.26(33)(b). Sources not meeting these emission limits will require aftermarket pollution control.

Curbside vehicle idling of taxis, shuttle buses, and private vehicles will be limited to five minutes. Massachusetts state laws (M.G.L. Chapter 90, Section 16A and M.G.L. Chapter 90, Section 16B) and MassDEP regulations [310 CMR 7.11(1)(b)] limit vehicle idling to no more than five minutes in most cases. A vehicle may idle longer only if absolutely necessary. There are exceptions for vehicles being serviced, vehicles making deliveries that need to keep their engines running (to power refrigerators, for example), and vehicles that need to run their engines to operate accessories (such as power lifts). MassDEP provides tools for both facilities and fleets to use to discourage curbside idling.

6.5.9 Construction Air Quality

See the Draft CMP in Attachment L for air quality mitigation from construction activities.

6.6 Noise

This section describes the noise analysis conducted for the Project. The analysis includes a baseline noise-monitoring program to determine existing background levels and an estimate of future noise impacts from stationary sources (i.e., mechanical equipment), mobile sources (i.e., traffic), and construction activities associated with the Project. Predicted

sound levels are compared to existing background levels, and impacts are evaluated against the City of Boston Zoning District Noise Standards, MassDEP Noise Policy, U.S. EPA guidelines, HUD Environmental Criteria and Standards, and FHWA Noise Abatement Criteria.

Summary of Analysis: Baseline noise levels were measured in the vicinity of the proposed Project and were compared to predicted stationary-source noise levels based on information provided by the manufacturers of representative mechanical equipment or estimated from the equipment's capacity. With appropriate mitigation, the Resort is expected to meet City of Boston and MassDEP noise limits as well as the recommended EPA and HUD guidelines. In addition, a mobile source analysis of future traffic impacts indicates that sound levels due to increases in traffic volumes associated with the Resort will meet the applicable FHWA noise criteria at each of the nearest residences and community receptors. Furthermore, an analysis of construction noise resulting from the operation of diesel-powered equipment indicates that the Resort is expected to meet the applicable City of Boston construction noise limits during daytime construction hours.

6.6.1 Noise Terminology

There are several ways in which sound (noise) levels are measured and quantified, all of which use the logarithmic decibel (dB) scale. The following information defines the noise terminology used in this analysis.

The decibel scale is logarithmic to accommodate the wide range of sound intensities observed in the environment. A property of the decibel scale is that the sound pressure levels of two distinct sounds are not purely additive. For example, if a sound of 50 dB is added to another sound of 50 dB, the total is only a three-decibel increase (53 dB), not a doubling (100 dB). Thus, every three-decibel change in sound level represents a doubling or halving of sound energy. Related to this is the fact that a change in sound level of less than three dB is generally imperceptible to the human ear.

Another property of the decibel scale is that if one source of noise is 10 dB (or more) louder than another source, then the total combined sound level is simply that of the louder source (i.e., the quieter source contributes negligibly to the overall sound level). For example, a source of sound at 60 dB plus another source at 47 dB is 60 dB.

The sound level meter used to measure noise is a standardized instrument.[13] It contains "weighting networks" to adjust the frequency response of the instrument to approximate that of the human ear under various conditions. One network is the A-weighting network (there are also B- and C-weighting networks), which most closely approximates how the

[13] *American National Standard Specification for Sound Level Meters*, ANSI S1.4-1983, published by the Standards Secretariat of the Acoustical Society of America, Melville, NY.

human ear responds to sound as a function of frequency, and is the accepted scale used for community sound level measurements. Sounds are frequently reported as detected with the A-weighting network of the sound level meter, in dBA. A-weighted sound levels emphasize the middle frequencies (*i.e.,* middle pitched – around 1,000 Hertz sounds), and de-emphasize lower- and higher-frequencies.

Because the sounds in our environment vary with time, they cannot simply be represented with a single number. In fact, there are several methods used for quantifying variable sounds which are commonly reported in community noise assessments, as defined below.

- L_{eq}, the equivalent level, in dBA, is the level of a hypothetical steady sound that would have the same energy (*i.e.,* the same time-averaged mean square sound pressure) as the actual fluctuating sound observed.

- L_{90} is the sound level, in dBA, exceeded 90 percent of the time in a given measurement period. The L_{90}, or residual sound level, is close to the lowest sound level observed when there are no obvious nearby intermittent noise sources.

- L_{50} is the median sound level, in dBA, exceeded 50 percent of the time in a given measurement period.

- L_{10} is the sound level, in dBA, exceeded only 10 percent of the time in a given measurement period. The L_{10}, or intrusive sound level, is close to the maximum sound level observed due to occasional louder intermittent noises, like those from passing motor vehicles.

- L_{max} is the maximum instantaneous sound level observed in a given measurement period.

By employing various noise metrics it is possible to separate prevailing, steady sounds (the L_{90}) from occasional louder sounds (L_{10}) in the noise environment. In the design of noise controls, which do not function quite like the human ear, it is important to understand the frequency spectrum of the noise source of interest. The spectra of noises are usually stated in terms of octave-band sound pressure levels, in dB, with the octave frequency bands being those established by standard. To facilitate the noise-control design process, the estimates of noise levels in this analysis are also presented in terms of octave-band sound pressure levels.

6.6.2 Noise Regulations and Criteria

6.6.2.1 City of Boston Zoning District Noise Standards

The primary set of regulations relating to the potential increase in noise levels is the City of Boston Zoning District Noise Standards (City of Boston Code – Ordinances: Section 16–26 Unreasonable Noise and City of Boston Air Pollution Control Commission Regulations for

the Control of Noise in the City of Boston). Separate regulations within the Standards provide criteria to control different types of noise. Regulation 2 is applicable to the effects of stationary sources associated with the proposed Project, as completed. Table 6-12 includes maximum allowable sound pressure levels per the Zoning District Standards.

Regulation 3 is applicable to the effects of noise associated with the proposed Project during construction. Lot line noise limits for construction devices are shown in Table 6-13.

In addition, according to the City of Boston Noise Ordinance, Section 16-26.5 (Ord. 1985 c. 3 §1 [354d]), *"it shall be unlawful to operate any construction device(s), including but not limited to impact devices, on any construction site if the operation of such device(s) emits noise, measured at the lot line of a residential lot in excess of 50 dBA between the hours of 6:00 PM and 7:00 AM."*

Table 6-12 City of Boston Zoning District Noise Standards

Octave-band Center Frequency (Hz)	Residential Zoning District Daytime (dB)	Residential Zoning District All Other Times (dB)	Residential-Industrial Zoning District Daytime (dB)	Residential-Industrial Zoning District All Other Times (dB)	Business Zoning District Anytime (dB)	Industrial Zoning District Anytime (dB)
32	76	68	79	72	79	83
63	75	67	78	71	78	82
125	69	61	73	65	73	77
250	62	52	68	57	68	73
500	56	46	62	51	62	67
1000	50	40	56	45	56	61
2000	45	33	51	39	51	57
4000	40	28	47	34	47	53
8000	38	26	44	32	44	50
A-Weighted (dBA)	**60**	**50**	**65**	**55**	**65**	**70**

Notes: Noise standards are extracted from Regulation 2.5, City of Boston Air Pollution Control Commission, "Regulations for the Control of Noise in the City of Boston", adopted December 17, 1976.
All standards apply at the property line of the receiving property.
dB and dBA based on a reference sound pressure of 20 micropascals.
'Daytime' refers to the period between 7:00 am and 6:00 pm daily, excluding Sunday.

Table 6-13 City of Boston Restrictions on Noise Emitted from Construction Sites

Lot Use of Affected Property	L10 Level	Maximum Noise Level
Residential or Institutional	75 dBA	86 dBA
Business or Recreational	80 dBA	-
Industrial	85 dBA	-

Notes:
Noise standards are extracted from Regulation 3.1, City of Boston Air Pollution Control Commission, "Regulations for the Control of Noise in the City of Boston", adopted December 17, 1976.
All standards apply at the property line of the receiving property, no closer than 50 feet from the nearest active construction device on the construction site.
These standards are not applicable to impact devices.

As further defined by the City of Boston Noise Ordinance Section 16-26.1 (Ord. 714 § 354; Ord. 1991 c. 4 § 1), *"Unreasonable or excessive noise shall mean...noise measured in excess of 50 dBA between the hours of 11:00PM and 7:00AM, or in excess of 70 dBA at all other hours."*

6.6.2.2 MassDEP Noise Policy

MassDEP has the authority to regulate noise under 310 CMR 7.10, which is part of the Commonwealth's air pollution control regulations. According to MassDEP regulations, "unnecessary" noise is considered an air contaminant and thus is prohibited by 310 CMR 7.10. MassDEP administers this regulation through Noise Policy DAQC 90-001, which limits a source to a 10-dBA increase above the L_{90} ambient sound level measured at the Project property line and at the nearest residences. MassDEP policy further prohibits "pure tone" conditions where the sound pressure level in one octave-band is three dB or more greater than the sound levels in each of two adjacent bands.

6.6.2.3 U.S. EPA Guidelines

Another useful publication for evaluating sound levels is the *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (U.S. Environmental Protection Agency, Office of Noise Abatement and Control, Washington, DC, 550/9-74-004, March 1974). This report, often referred to as the "Levels" document, recommends an outdoor L_{dn} of 55 dBA (or equivalent L_{eq} of 48.6 dBA) in residential areas as the level below which no effects on public health or welfare would be expected to occur due to the interference of speech or other activities. This guideline, which incorporates a 10 dBA "penalty" for sound levels at night (10 p.m. to 7 a.m.), was developed to promote normal speech communication and protect against sleep interference inside a home with windows open.

6.6.2.4 HUD Environmental Criteria and Standards

The HUD Environmental Criteria and Standards (24 CFR Part 51), Subpart B – Noise Abatement and Control specifies noise criteria for HUD-funded housing developments. The HUD exterior noise goal for residential construction is a day-night average sound level (L_{dn}) of 65 dBA or less. This is considered "Acceptable." L_{dn} sound levels above 65 dBA but not exceeding 75 dBA are considered "Normally Unacceptable," and L_{dn} levels above 75 dBA are considered "Unacceptable." Funding for HUD approvals in 'Normally Unacceptable' areas require a minimum of 10 dB of additional sound attenuation for buildings having noise-sensitive uses. The HUD interior noise goal is an L_{dn} of 45 dBA.

6.6.2.5 U.S. DOT FHWA Noise Abatement Criteria

The U.S. Department of Transportation (DOT) Federal Highway Administration's (FHWA) Code of Federal Regulations (CFR), Title 23, Part 772 specifies hourly A-weighted noise abatement criteria (NAC) applicable to the assessment of traffic noise impacts at receivers classified by "Activity Category," as shown in Table 6-14.

Table 6-14 U.S. Department of Transportation FHWA Noise Abatement Criteria (NAC) Hourly A-Weighted Sound Level Decibels (dBA)[1]

Activity Category	Activity Criteria[2]		Evaluation Location	Activity Description
	$L_{eq}(h)$	$L_{10}(h)$		
A	57	60	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B[3]	67	70	Exterior	Residential
C[3]	67	70	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings

1. Either Leq(h) or L10(h) (but not both) may be used on a project.
2. The Leq(h) and L10(h) Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.
3. Includes undeveloped lands permitted for this activity category

Table 6-14 U.S. Department of Transportation FHWA Noise Abatement Criteria (NAC) Hourly A-Weighted Sound Level Decibels (dBA)[1] (Continued)

D	52	55	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios
E[3]	72	75	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F
F	--	--	--	Agricultural, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing
G	--	--	--	Undeveloped lands that are not permitted

1. Either Leq(h) or L10(h) (but not both) may be used on a project.
2. The Leq(h) and L10(h) Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.
3. Includes undeveloped lands permitted for this activity category

6.6.3 Existing Conditions

6.6.3.1 Baseline Noise Environment

The Proponent has conducted an ambient sound level measurement program to document existing "baseline" conditions surrounding the proposed Project. Existing noise sources include: vehicular traffic on local roadways, trains, aircraft, birds, wind and leaf noise, pedestrian conversation and foot traffic, rooftop and residential mechanical equipment located on the surrounding buildings, and sound from the loudspeaker at the existing Suffolk Downs racetrack.

6.6.3.2 Noise Monitoring Locations

Noise monitoring locations were selected upon a review of zoning and land-use in the area to represent the existing noise levels at sensitive residential receptors north, east, and south of the Project. Three long-term, continuous noise monitoring locations were selected as representative sites to obtain a sampling of the ambient baseline noise environment on-site. In addition, three short-term monitoring stations were selected to represent off-site conditions in the surrounding elevated residential neighborhoods to the north (Crescent Heights), east (Beachmont), and south (Orient Heights). The locations of all six monitoring stations, described below, are presented in Figure 6-29 and Table 6-15.

- **Location LT-1** is along the southern Project property line at the southernmost tip of the Suffolk Downs racetrack, approximately eight feet from the fence. This location was selected to represent the property line closest to residences south of the Project along Waldemar Avenue (Boston).

- **Location LT-2** is along the eastern Project property line within the horse stable area, approximately 10 feet from the fence. This location was selected to represent sound levels at the property line closest to residences east of the Project along Washburn Avenue (Revere).

- **Location LT-3** is at the northern corner of the Project property line within a clearing between the Stop & Shop and Revere Beach Parkway. This location was selected to represent sound levels at the property line closest to residences north of the Project along Northshore Road (Revere).

- **Location ST-1** is south of the Project at the intersection of Beach View Road and Orient Avenue (Boston). This location was selected to represent the residential Orient Heights neighborhood.

- **Location ST-2** is east of the Project in front of #103 Crest Avenue (Revere). This location was selected to represent the residential Beachmont neighborhood.

- **Location ST-3** is north of the Project between #30 and #34 Clark Road (Revere). This location was selected to represent the residential Crescent Heights neighborhood.

Table 6-15 GPS Coordinates – Sound Level Measurement Locations

Location	Latitude	Longitude
LT-1 Southern Property Line	42.39122°	70.99945°
LT-2 Eastern Property Line	42.39692°	70.99353°
LT-3 Northern Property Line	42.40043°	70.99772°
ST-1 Orient Avenue (Boston)	42.39023°	71.00219°
ST-2 Crest Avenue (Revere)	42.39688°	70.98792°
ST-3 Clark Road (Revere)	42.40201°	70.99488°

6.6.3.3 Noise Monitoring Methodology

The background monitoring program was designed to document the variability of sound levels within the Project area throughout the course of a day, evening, and night, including both weekdays and weekends. The measurement period was also selected to capture horse racing events held at the existing Suffolk Downs racetrack.

Approximately six days of continuous ambient sound level monitoring was conducted from Friday, October 5, 2012 to Thursday, October 11, 2012 at three long-term sites (LT-1, LT-2, and LT-3). Continuous broadband (dBA) and one-third octave-band sound level measurements were made at all three of these locations where the sound level meters logged data, including L_{eq}, L_{max}, L_{10}, L_{50}, and L_{90} sound levels, every 20 minutes with a one-minute time history. The meters were housed in an environmental suitcase and were connected to a microphone fitted with the manufacturer's environmental windscreen that was mounted on a tripod at a height of approximately five feet (1.5 meters) above ground. These measurements were generally unattended, although the field technician checked on the equipment and recorded ambient noise sources three times during the program: upon deployment (daytime); during the quietest nighttime period between midnight and 4 a.m.; and upon demobilization (daytime). During the month of October 2012, live horse racing took place each Monday, Wednesday, and Saturday beginning at 12:45 p.m. Three horse racing periods occurred within the measurement period.

Additional short-term sound level measurements were taken for 20 minutes per location during the daytime (11:30 a.m. to 1:30 p.m.) on Thursday, October 11, 2012, and during nighttime hours (12:00 a.m. to 2:00 a.m.) on Wednesday, October 10, 2012. Since noise impacts are greatest at night when existing noise levels are lowest, the study was designed to measure community noise levels under conditions typical of a "quiet period" for the area. Daytime measurements were scheduled to exclude peak traffic conditions while coinciding with a live horse racing event.

All short-term measurements were made at publicly accessible locations at a height of five feet (1.5 meters) above ground level, under low wind conditions, and with dry roadway surfaces. Wind speed measurements were made with a Davis Instruments TurboMeter electronic wind speed indicator, and temperature and humidity measurements were made using a General Tools digital psychrometer. Unofficial observations of meteorology or land use in the community were made solely to characterize the existing sound levels in the area and to estimate the noise sensitivity at properties near the proposed Project.

Meteorological data from the closest National Weather Service station in Boston (Logan International Airport, KBOS) were archived for the duration of the measurement period and field-verified during the short-term measurements. Sound level data collected from October 5 to October 11, 2012 were evaluated against these conditions and any time measurement periods occurring during precipitation events were discarded.

6.6.3.4 Noise Monitoring Equipment

Four Larson Davis Model 831 sound level meters equipped with a PRM831 Type I Preamplifier, a 377B20 half-inch microphone, and manufacturer-provided windscreen were used to collect long-term and short-term background sound pressure level data. This instrumentation meets the "Type 1 - Precision" requirements set forth in American National Standards Institute (ANSI) S1.4 for acoustical measuring devices. The measurement equipment was calibrated in the field before and after the surveys with a Larson Davis CAL200 acoustical calibrator which meets the standards of IEC 942 Class 1L and ANSI S1.40-1984. Statistical descriptors (e.g., L_{eq}, L_{90}) were calculated for each 20-minute sampling period, with one-third octave-band sound levels corresponding to the same data set processed for the broadband levels.

6.6.3.5 Measured Background Noise Levels

The continuous L_{90} and L_{eq} sound level data for Locations LT-1 through LT-3 are plotted in Figures 6-30 and 6-31, respectively, along with periods of precipitation as reported by the National Weather Service in Boston.

It can be seen from Figure 6-30 that residual L_{90} sound levels at the long-term sites ranged from 30 dBA during the quietest nighttime hours to 60 dBA during the day. Typical nighttime L_{90} sound levels ranged from approximately 40 to 45 dBA depending on location while daytime L_{90}'s ranged from approximately 45 to 55 dBA. While occasional sound from the Suffolk Downs racetrack loudspeaker was audible during horse racing events, there was no significant increase in the residual sound levels at any of the short-term monitoring locations due to the races.

A summary of the baseline noise monitoring results for the selected study periods considered in this analysis are presented in Table 6-16. A tabular summary of the short-term background measurements is presented in Table 6-17.

Table 6-16 Summary of Background Sound Level Measurements

Monitoring Location ID	Average Daily L90 Sound Pressure Level[1] (dBA)		
	8PM-9PM	3AM - 4AM	7AM-7PM
LT-1	43	39	48
LT-2	43	38	45
LT-3	51	44	53
ST-1	41	38	45
ST-2	43	38	45
ST-3	43	41	45

1. Arithmetic average of 20 minute L90's recorded between the hours specified

Table 6-17 Summary of Short-term Background Measurements

Location	Period	Start Time	L_{eq}	L_{max}	L_{90}	L_{90} Sound Pressure Level by Octave-Band								
						32 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
			dBA	dBA	dBA	dB	dB	dB	dB	dB	dB	dB	dB	dB
ST-1	Day	11:45 AM	57	74	46	52	53	49	45	43	41	36	34	30
ST-2	Day	12:20 PM	54	77	44	51	52	47	42	40	40	34	31	24
ST-3	Day	12:49 PM	53	68	48	53	53	48	45	44	44	37	30	22
ST-1	Night	12:03 AM	48	66	40	46	47	44	40	37	36	27	22	20
ST-2	Night	12:38 AM	43	68	38	44	44	38	35	34	33	30	27	23
ST-3	Night	1:12 AM	44	59	39	44	45	39	36	36	36	30	24	19

Weather Conditions:

	Date	Temp	RH	Sky	Wind
Daytime	Thursday, October 11, 2012	57ºF	37%	Clear	0-7 mph N-NW
Nighttime	Wednesday, October 10, 2012	56ºF	72%	Overcast	2-6 mph NE

Monitoring Equipment Used:

	Manufacturer	Model	S/N
Sound Level Meter	Larson Davis	LD831	1993
Microphone	Larson Davis	377B20	110889
Preamp	Larson Davis	PRM831	015260
Calibrator	Larson Davis	CAL200	7146

6.6.4 Future Conditions

6.6.4.1 Stationary Sources

Overview of Potential Project Stationary Noise Sources

The primary sources of continuous sound due to stationary sources exterior to the Project will include ventilation, cooling, central utility and emergency power noise sources. Two energy recovery units (ERUs) will be located on the roof of the Hotel I building, each surrounded by eight-foot-tall screening walls. The roof of Casino Area II will contain up to three air handling units (AHUs) surrounded by a screening wall approximately 15 feet tall, a single ERU, and six to ten kitchen exhaust fans. Ten to twelve kitchen exhaust fans will also be located on the roof of Casino Area I. The CUP will contain two 100 kW cogen engines assumed to be well-controlled within a windowless building with acoustically louvered openings. Both engines will exhaust vertically through the roof of the CUP building with ten-foot stacks fitted with critical grade exhaust silencers. Four cooling towers and two emergency diesel generators will be located at ground level adjacent to the CUP, surrounded on all sides by barrier walls approximately 20 feet tall. Both emergency generators will be housed in dedicated weather-proof, sound-attenuating enclosures exhausted vertically through 15-foot stacks fitted with critical grade exhaust silencers. It is assumed that these generators will only operate during the day for brief, routine testing when background sound levels will be higher or during an emergency interruption of the electrical grid when other rooftop mechanical equipment will not be operating.

Other secondary and interior noise sources including hot water heaters, chillers, boilers, and pumps, are not considered in this analysis to contribute significantly to the overall sound level. Stair pressurization fans will be for emergency use only and are not included as steady sources of mechanical noise. The parking garage will be naturally ventilated.

A tabular summary of the modeled mechanical equipment proposed for the Project is presented in Table 6-18. Sound power level data for each unit, as provided by the manufacturer or calculated from provided sound pressure level data, is presented in Table 6-19. Sound power levels of those units for which data was not provided were assumed based on data for similar or representative equipment. Approximate locations of the mechanical equipment were provided by the Project team in a preliminary roof plan.

Additional mitigation will be applied to multiple sources as needed to ensure compliance with applicable noise regulations. Attributes of the emergency generator enclosures and exhaust silencers are described in Tables 6-20 through 6-22. To further limit impacts, the required periodic routine testing of emergency generators should be scheduled during daytime hours when background sound levels will be highest.

Table 6-18 Modeled Noise Sources

Noise Source	*Quantity*	*Location*	*Size/Capacity per Unit*
Energy Recovery Unit	3	Casino Area II Roof at 50′ AGL (x1) Hotel I Roof at 135' AGL (x2)	8,000 CFM
Air Handling Unit	3	Casino Area II Roof at 21′ AGL (x3)	8,000 CFM
Kitchen Exhaust Fan	17	Casino Area I Roof at 36′ AGL (x11) Casino Area II & Hotel Roof at 29' & 51' AGL (x6)	10,000 CFM
Cooling Tower	4	CUP at 0′ AGL (x4)	3,000 Ton
Cogen Package	2	CUP Roof at 37′ AGL (x4)	100 kW
Emergency Generator	2	CUP at 0′ AGL (x2)	2,000 kW

Table 6-19 Modeled Sound Power Levels per Unit

Noise Source	*Broadband*	*32 Hz*	*63 Hz*	*125 Hz*	*250 Hz*	*500 Hz*	*1000 Hz*	*2000 Hz*	*4000 Hz*	*8000 Hz*
	dBA	dB	dB	dB	dB	dB	dB	dB	dB	dB
Energy Recovery Unit[1]	101	97	97	93	93	98	93	93	92	88
Air Handling Unit[1]	101	97	97	93	93	98	93	93	92	88
Kitchen Exhaust Fan[2]	89	83	83	87	93	84	84	81	75	67
Cooling Tower[3]	102	106	106	103	101	98	98	94	90	83
Cogen Package[4]	102	90	90	108	101	101	97	89	88	89
Emergency Generator - Mechanical (Unenclosed)[5]	127	130	130	139	130	121	117	116	114	118
Emergency Generator - Exhaust (Unsilenced)[6]	131	121	121	136	132	124	122	123	123	121

1. Venmar CES Air Handler, Total Sound Power, Unsilenced
2. Greenheck Model VEKTOR-H-30 Fume Exhaust System, 10,000 CFM
3. Marley Model NC8411WLN4 4500-ton Cooling Tower
4. InVerde INV-100 CHP Module, 100kW
5. Caterpillar Diesel Generator Set (DM8263), 2000 kW, Unenclosed
6. Caterpillar Diesel Generator Set (DM8263), 2000 kW, Unsilenced

Table 6-20 Noise Reduction Values Used for Noise Modeling (dB)

Noise Control	*Noise Source*	*Noise Reduction (dB) per Octave-band Center Frequency (Hz)*								
		32	63	125	250	500	1000	2000	4000	8000
Exhaust Silencer[1]	Emergency Diesel Generator Exhaust, Cogen Stack	-	20	35	35	27	20	20	22	22

1. Assumed JB Series Critical Grade Silencer (JB-18), or similar

Table 6-21 Transmission Loss Used for Noise Modeling (dB)

Noise Control	*Noise Source*	*Noise Reduction (dB) per Octave-band Center Frequency (Hz)*								
		32	63	125	250	500	1000	2000	4000	8000
Generator Enclosure[1]	Emergency Diesel Generator	-	-	20	22	32	42	50	57	-

1. Assumed Panl-Wall Modular Acoustical Metal Panels, PWL-2-18 (2" Thickness)

Table 6-22 Absorption Coefficients Used for Noise Modeling

Noise Control	*Noise Source*	*Noise Reduction (dB) per Octave-band Center Frequency (Hz)*								
		32	63	125	250	500	1000	2000	4000	8000
Generator Enclosure[1]	Emergency Diesel Generator	-	-	0.21	0.61	1.01	1.07	1.07	0.98	-

1. Assumed Panl-Wall Modular Acoustical Metal Panels, PWL-2-18 (2" Thickness)

Noise Modeling Methodology

Noise impacts from mechanical equipment associated with the Project were predicted using Cadna/A noise calculation software (DataKustik Corporation, 2005). This software, which uses the ISO 9613-2 international standard for sound propagation (Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation), offers a refined set of computations accounting for local topography, ground attenuation, drop-off with distance, barrier shielding, diffraction around building edges, reflection off building facades, and atmospheric absorption of sound from multiple noise sources.

An initial analysis considered all of the mechanical equipment without the emergency generators running to simulate typical nighttime operating conditions at nearby receptors. A second analysis combined the mechanical equipment and the emergency generators to reflect worse-case daytime conditions during brief, routine, testing of the generators. Both analyses conservatively assume all mechanical equipment will be operating simultaneously and at full load.

Noise Modeling Results & Evaluation

In the first modeling scenario, the analysis of sound levels at night considered all of the stationary mechanical equipment without the emergency generators running to simulate typical nighttime operating conditions at nearby receptors. In the second modeling scenario, the analysis combined sound emissions from the mechanical equipment and the emergency generators to reflect worse-case conditions during brief, routine, daytime testing of the generators when ambient levels are higher. Ten modeling locations with a height of 1.5 meters above grade were included in both analyses, consisting of the nearest noise sensitive receptors and residential neighborhoods, and were evaluated against the applicable daytime or nighttime background sound levels and noise limits. Figure 6-32 shows the locations of each modeled receptor as well as the monitoring locations selected for background measurements.

In both scenarios, the predicted future sound levels (Project plus background) are well below the MassDEP criteria of 10dBA over the measured background L_{90} sound levels at all sensitive receptor locations. This evaluation, with and without emergency generators, is presented in Tables 6-23a and b, respectively. No background sound level measurements were conducted near receptors R8 through R10, which were selected only to evaluate mobile source impacts (see Section 6.6.4.2). As such, no compliance evaluation with MassDEP policy was possible for stationary sources at these locations, which are absent from Tables 6-23a and b. In addition, modeled sound levels from stationary mechanical equipment are predicted to be within the most stringent broadband and octave-band residential zoning limits for the City of Boston at the closest residential receptors. This evaluation is presented with and without emergency generators in Tables 6-24a and b, respectively, which also show stationary noise sources are not expected to create any "pure-tone" conditions as defined by MassDEP at these locations.

Table 6-23a MassDEP Compliance Evaluation (*with* Emergency Generators)

Receptor ID	*Land Use*	*Representative Background ID*	*Evaluation Period*	*Measured Background Noise Level*	*Modeled Project-Only Noise Level*	*Combined Project + Background Noise Level*	*Project Impact*[1]	*Meets MassDEP Noise Policy?*
				dBA	dBA	dBA	dBA	
R1	Residential	LT-3	Fri 8-9PM	51	49	53	2	YES
R2	Residential	ST-3	Fri 8-9PM	43	48	49	6	YES
R3	Residential	LT-2	Fri 8-9PM	43	50	51	8	YES
R4	Residential	LT-2	Fri 8-9PM	43	45	47	4	YES
R5	Residential	ST-2	Fri 8-9PM	43	45	47	4	YES
R6	Residential	LT-1	Fri 8-9PM	43	43	46	3	YES
R7	Residential	ST-1	Fri 8-9PM	41	42	44	3	YES

1. Calculation of increase over background performed using data rounded to nearest whole decibel

Table 6-23b MassDEP Compliance Evaluation (*without* Emergency Generators)

Receptor ID	*Land Use*	*Representative Background ID*	*Evaluation Period*	*Measured Background Noise Level*	*Modeled Project-Only Noise Level*	*Combined Project + Background Noise Level*	*Project Impact*[1]	*Meets MassDEP Noise Policy?*
				dBA	dBA	dBA	dBA	
R1	Residential	LT-3	Sat 3-4AM	44	37	44	0	YES
R2	Residential	ST-3	Sat 3-4AM	41	37	43	2	YES
R3	Residential	LT-2	Sat 3-4AM	38	38	41	3	YES
R4	Residential	LT-2	Sat 3-4AM	38	34	40	2	YES
R5	Residential	ST-2	Sat 3-4AM	38	32	39	1	YES
R6	Residential	LT-1	Sat 3-4AM	39	42	44	5	YES
R7	Residential	ST-1	Sat 3-4AM	38	41	43	5	YES

1. Calculation of increase over background performed using data rounded to nearest whole decibel

Table 6-24a City of Boston Compliance Evaluation: Project-Only Modeling Results (*with* Emergency Generators)

Receptor ID	*Land Use*	*Period*	*dBA*	*32 Hz*	*63 Hz*	*125 Hz*	*250 Hz*	*500 Hz*	*1000 Hz*	*2000 Hz*	*4000 Hz*	*8000 Hz*
				dB	dB	dB	dB	dB	dB	dB	dB	dB
R1	Residential	Fri 8-9PM	49	72	64	60	45	40	43	40	23	0
R2	Residential	Fri 8-9PM	48	71	63	59	45	39	42	37	18	0
R3	Residential	Fri 8-9PM	50	74	66	63	47	41	43	41	28	0
R4	Residential	Fri 8-9PM	45	68	61	59	43	34	34	29	12	0
R5	Residential	Fri 8-9PM	45	69	61	58	42	35	37	32	7	0
R6	Residential	Fri 8-9PM	43	65	55	50	44	41	35	32	24	6
R7	Residential	Fri 8-9PM	42	64	54	48	42	41	35	32	20	0
R8	Residential	Fri 8-9PM	36	61	52	47	34	34	29	25	8	0
R9	Residential	Fri 8-9PM	24	53	44	38	20	13	8	1	0	0
R10	Residential	Fri 8-9PM	27	55	45	40	26	24	16	9	0	0
City of Boston Daytime Residential Noise Limits			**60**	**76**	**75**	**69**	**62**	**56**	**50**	**45**	**40**	**38**

Table 6-24b City of Boston Compliance Evaluation: Project-Only Modeling Results (*without* Emergency Generators)

Receptor ID	*Land Use*	*Period*	*dBA*	*32 Hz*	*63 Hz*	*125 Hz*	*250 Hz*	*500 Hz*	*1000 Hz*	*2000 Hz*	*4000 Hz*	*8000 Hz*
				dB	dB	dB	dB	dB	dB	dB	dB	dB
R1	Residential	Sat 3-4AM	37	41	41	40	38	35	33	25	6	0
R2	Residential	Sat 3-4AM	37	44	44	41	39	35	33	24	1	0
R3	Residential	Sat 3-4AM	38	44	43	40	39	37	34	28	12	0
R4	Residential	Sat 3-4AM	34	41	40	37	35	33	29	21	0	0
R5	Residential	Sat 3-4AM	32	38	38	34	32	31	27	18	0	0
R6	Residential	Sat 3-4AM	42	46	46	42	44	41	35	32	24	6
R7	Residential	Sat 3-4AM	41	43	43	40	42	41	35	32	20	0
R8	Residential	Sat 3-4AM	33	37	36	32	32	33	27	23	8	0
R9	Residential	Sat 3-4AM	14	27	24	18	15	13	7	0	0	0
R10	Residential	Sat 3-4AM	23	32	30	25	25	24	16	9	0	0
City of Boston Nighttime Residential Noise Limits			**50**	**68**	**67**	**61**	**52**	**46**	**40**	**33**	**28**	**26**

With appropriate mitigation (listed below), the Resort is not expected to introduce significant outdoor mechanical equipment noise into the surrounding community.

The recommended mitigation efforts included in the analysis are as follows:

- Each emergency generator should be fitted with a critical-grade exhaust silencer and sound-attenuating enclosure. Routine testing of generators should be scheduled during daytime hours only when background sound levels are higher.

- The CUP cogen engine exhaust ducts should be fitted with critical-grade exhaust silencers, and any proposed ventilation openings in the CUP building should contain acoustical louvers.

- Noise barrier walls should enclose the CUP cooling towers and emergency generators as well as the rooftop air handling units and energy recovery units associated with Hotel I and Casino Area II.

Results of this analysis indicate that noise levels from the Resort at the nearest receptors will be equal to or below the City of Boston Noise Zoning requirements based on land-use, and will comply with all MassDEP A-weighted and tonal noise limits. Worst-case operations are also expected to meet the U.S. EPA guideline of 48.6 dBA which is equal to an Ldn of 55 dBA during the quietest nighttime hours. Even with the emergency generators running, all Ldn sound levels from the Project will be less than 60 dBA and will not significantly increase the existing Ldn in the Project area. Therefore, the Resort will not affect the area's compliance with the HUD Residential Site Acceptability Standards after the Project is complete.

At this time, mechanical equipment and noise controls are conceptual in nature and, during final Project design, will be specified to meet the applicable City of Boston, MassDEP, and HUD noise limits. Additional mitigation may include the selection of quieter units, acoustical louvers, screening walls, mufflers, or equipment enclosures, as needed.

6.6.4.2 Mobile Sources

Overview of Potential Project Mobile Noise Sources

Major off-site roadways in the immediate Project vicinity applicable to this analysis include: Route 1A, Waldemar Avenue, Boardman Street (with proposed Route 1A infrastructure improvements), Bennington Street, and Winthrop Avenue (Route 145). Noise impacts from increased vehicle activity on primary onsite roadways including Tomasello Drive and Blue Line Drive were also considered. A detailed description of existing and future Project noise sources relating to traffic can be found in Section 5.0.

Noise Modeling Methodology

Traffic noise calculations were conducted using the Federal Highway Administration's Traffic Noise Model (FHWA TNM 2.5) software which computes the sound propagation between roadways and nearby receptors using cruise-throttle vehicle noise emission levels based on vehicle type and speed. This mobile source analysis allowed for consideration of geometric divergence, atmospheric absorption, and acceleration of vehicles following traffic-control devices including stop signs and traffic signals.

Traffic data consisting of hourly traffic volumes, vehicle speed, and the distribution of automobiles and heavy trucks was used as input in the noise model. Off-site and existing onsite roadway centerlines were derived from the official state-maintained MassGIS street transportation dataset, while future onsite roadways and traffic control device locations were provided by the Project team in a proposed site plan. Traffic data for existing conditions used in this noise analysis were obtained from automated traffic counts taken in July 2012, October 2012 and June 2013. Projections of traffic volumes were provided for assessing future conditions. A summary of the existing and future traffic data used in the evaluation is presented in Tables 6-25 and 6-26, respectively.

Based on a review of both hourly and daily traffic distributions, the following two scenarios were selected for evaluation:

1) Friday 8:00 PM – 9:00 PM represents the single hour corresponding to the greatest number of patron arrivals and departures within a given week. This modeling scenario considers "worst-case" absolute sound levels due to the highest traffic volumes.

2) Saturday 3:00 AM – 4:00 AM represents the hour of greatest increase over existing sound levels measured during the background study. This modeling scenario considers noise impacts due to relatively high traffic volumes observed during relatively quiet nighttime periods.

Table 6-25 Existing Traffic Volumes and Vehicle Speeds

			Friday 8:00 PM-9:00 PM			Saturday 3:00 AM-4:00 AM		
Roadway	*Traffic Flow Direction*	*Road Width (m)*	*Auto Volume (v/h)*	*Truck Volume (v/h)*	*Vehicle Speed (km/h)*	*Auto Volume (v/h)*	*Truck Volume (v/h)*	*Vehicle Speed (km/h)*
Route 1A	NB	7.3	1365	42	64	302	3	64
	SB	7.3	1001	31	64	331	7	64
Waldemar Avenue	EB	3.7	108	6	45	23	0	51
	WB	3.7	76	3	40	8	0	50
Boardman Street	EB	3.7	344	2	55	62	4	60
	WB	3.7	320	11	53	61	4	61
Bennington Street	NB	7.3	297	3	50	55	0	51
	SB	7.3	292	3	51	30	0	53
Winthrop Avenue (Route 145)	EB	11.0	868	14	56	128	2	61
	WB	11.0	839	14	56	140	2	61
Tomasello Drive (East of Route 1A)	EB	3.7	85	1	48	4	0	39
	WB	3.7	24	0	53	3	0	39
Tomasello Drive (South of Route 145)	NB	11.0	302	5	50	6	0	42
	SB	7.3	193	6	55	16	1	56
Blue Line Drive	EB	3.7	0	6	65	0	0	0
	WB	3.7	0	6	65	0	0	0

Table 6-26 Future (Build) Traffic Volumes and Vehicle Speeds

			Friday 8:00 PM-9:00 PM			Saturday 3:00 AM-4:00 AM		
Roadway	*Traffic Flow Direction*	*Road Width (m)*	*Auto Volume (v/h)*	*Truck/Bus Volume (v/h)*	*Vehicle Speed (km/h)*	*Auto Volume (v/h)*	*Truck/Bus Volume (v/h)*	*Vehicle Speed (km/h)*
Route 1A	NB	7.3	1536	48	64	407	4	64
	SB	7.3	1219	38	64	378	8	64
Waldemar Avenue	EB	3.7	108	6	45	23	0	51
	WB	3.7	76	3	40	8	0	50
Boardman Street	EB	3.7	350	2	55	67	4	60
	WB	3.7	329	11	53	64	4	61
Bennington Street	NB	7.3	297	3	50	55	0	51
	SB	7.3	292	3	51	30	0	53
Winthrop Avenue (Route 145)	EB	11.0	1034	14	56	163	2	61
	WB	11.0	1085	15	56	265	3	61
Tomasello Drive (East of Route 1A)	EB	7.3	1145	7	48	196	3	39
	WB	14.6	783	6	53	362	3	39
Tomasello Drive (South of Route 145)	NB	11.0	482	5	50	130	0	42
	SB	7.3	456	6	55	50	0	56
Blue Line Drive	EB	3.7	125	12	65	26	2	65
	WB	3.7	104	12	65	55	2	65

Noise Modeling Results & Evaluation

Table 6-27 presents the modeling results for the two selected scenarios under existing and future traffic conditions at each of the receptor locations identified in Figure 6-32. All noise levels computed represent an hourly A-weighted equivalent sound level, or Leq(h), in dBA.

Table 6-27 Mobile Source Modeling Results

Receptor ID	Friday 8:00 PM - 9:00 PM			Saturday 3:00 AM - 4:00 AM		
	Existing Leq(h)	*Future Leq(h)*	*Difference*	*Existing Leq(h)*	*Future Leq(h)*	*Difference*
	dBA	dBA	dBA	dBA	dBA	dBA
R1	64	64	0	56	57	1
R2	58	59	1	50	52	2
R3	59	59	0	50	51	1
R4	66	67	1	57	59	2
R5	52	53	1	43	45	2
R6	55	55	0	45	48	3
R7	52	53	1	44	47	3
R8	64	67	3	57	60	3
R9	67	68	1	61	62	1
R10	65	65	0	59	59	0

Results of this analysis indicate that traffic noise from mobile sources associated with the proposed Project will not result in a significant impact on nearby sensitive receptors. As seen in Tables 6-25 and 6-26, the increase in traffic volumes for off-site roadways is expected to be minimal (less than 50% of existing volumes). For perspective, a doubling of source sound emissions (corresponding to a 100% increase in traffic volumes) would result in a three decibel increase in received sound pressure levels (see Section 6.6.1 for further explanation). Onsite roadways will accommodate a more substantial increase in vehicle traffic volumes, however the increase in community sound levels at the closest residences and quietest neighborhoods are predicted to be no more than three dBA louder than experienced today, as seen in Table 6-27. A comparison with the relevant FHWA Noise Abatement Criteria for residential receptors indicates that, without mitigation, worst-case predicted sound levels from future traffic volumes will be equal to or less than the noise limit of 67 dBA specified in Table 6-14 on an hourly, A-weighted basis.

6.6.4.3 Construction

Overview of Potential Project Construction Noise Sources

The Project includes a combination of new construction, redevelopment of existing buildings, retention of existing infrastructure and facilities, and demolition. The Project also includes construction of access drives, parking lots, sidewalks, utilities (water, gas, storm, sewer, electric), and extensive landscaping. The proposed construction process, expected to commence in Spring 2014, has been designed around site constraints to isolate construction activities while providing safe access for pedestrians and automobiles during normal daily activities, and is expected to last for a duration of approximately 26 months.

Typical construction hours will be between 6:00 a.m. and 7:00 p.m. Monday through Saturday. Sunday and/or 3rd shift activities will be the exception, and will be performed in a manner that will minimize noise impacts. Some activities, such as materials unloading, will need to be performed during off hours; however, no truck idling, construction activity, or staging outside of the construction site fencing will be allowed between the hours of 6:00 p.m. and 7:00 a.m. Within the site, activities such as excavation, pile driving, and steel erection will also be prohibited during these hours to minimize noise impacts.

A schedule of proposed construction activities, broken down into periods of three to six months, is provided in Table 6-28. Each activity has been categorized into one of five discrete phases of construction, as defined by the U.S. EPA[14], and described below:

- Ground Clearing;
- Excavation;
- Foundations;
- Erection; and
- Finishing.

[14] U.S. Environmental Protection Agency,"Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances",Table 1-b, December 31, 1971.

Table 6-28 Proposed Schedule of Construction Activities

Construction Activity	*EPA Category* Name
Month 1-5	
Install Erosion Control/Environmental Protection	Ground Clearing
Demo & Prep for New Maintenance Building	Ground Clearing
Temp Road	Ground Clearing
Reclaim Asphalt	Ground Clearing
Prep Sub Compound	Ground Clearing
Crushing Area	Excavation
CUP Piles	Foundation
Grandstand Demo	Erection
Setup Suffolk/Owners Compound	Erection
Start Work for Final Configuration	Erection
Month 5-8	
Construction Laydown	Ground Clearing
Demo Existing Maintenance Building	Ground Clearing
Temp Road	Ground Clearing
Surface Parking Utilities & Prep	Excavation
Roadwork & Utility Relocation	Excavation
Garage/Casino Piles & Foundations	Foundation
Phase 1 CUP Structure	Foundation/Erection
Complete New Maintenance Building	Erection
Month 8-14	
Construction Laydown & Crane Locations	Ground Clearing
Queuing for Precast Trailers	Ground Clearing
Prep for Patron Parking	Excavation
Roadwork & Utility Relocation	Excavation
Garage/Casino Area II Structure	Erection
Casino CUP Fitout	Finishing
Month 14-17	
Landscaping	Excavation
Porte Corchere Main Entry	Erection
Stage II Complete Façade	Erection
Loading & Hoist	Erection
Casino CUP Fitout	Finishing
Casino & CUP Operational	Finishing
Garage Fit & Finish	Finishing
Month 17-26	
Landscaping	Excavation
Porte Corchere Fit & Finish	Erection
Casino Fit/Finish & Construction Access	Finishing

While the exact pieces of equipment used at the Project site have yet to be finalized, typical earthmoving activities will include highly mobile excavating equipment (e.g., backhoes, bulldozers, shovels, front loaders) as well as road-building machinery (e.g., compactors, scrapers, graders, pavers). Other activities will involve partly-mobile materials-handling equipment (e.g., cranes, mixers, concrete pumps), pneumatically or hydraulically-powered impact machinery (e.g., jack hammers, rock drills, pile drivers), and stationary sources (e.g., pumps, generators, compressors).

Table 6-29 presents a list of reference sound levels for each EPA construction activity category used as input in the noise model. These sound levels represent typical ranges of noise levels at construction sites in urban areas due to equipment operations associated with each activity category, as defined by the EPA.

Table 6-29 Reference Sound Pressure Levels for Typical Building Construction Activities

EPA Category	*Sound Pressure Level[1,2], dBA*
Ground Clearing	84
Excavation	89
Foundation	78
Erection	85
Finishing	89

1. Reference sound pressure level at 50 feet (energy average) for "Industrial, Parking Garage, Religious, Amusement & Recreations, Store, Service Station" construction sites, ALL pertinent equipment present at site
2. Source: U.S. Environmental Protection Agency,"Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances",Table 1-b, December 31, 1971

Noise Modeling Methodology

Noise impacts associated with Project construction were predicted using Cadna/A noise calculation software (DataKustik Corporation, 2005). This software, which implements the ISO 9613-2 international standard for sound propagation (Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation), offers a refined set of computations accounting for local topography, ground attenuation, drop-off with distance, reflection, barrier shielding, and atmospheric absorption of sound from multiple sound sources.

A site-wide noise model was developed for each construction period using the activity schedule presented in Table 6-28 along with site plans illustrating construction phasing and staging locations on the Project site (see Section 6.12 and referenced plans). All equipment associated with a given construction activity was assumed to be collocated within the relevant work area. While the location of individual pieces of equipment will vary depending on operations, source locations were modeled to represent routine construction operations from the Project site. Sound levels from construction activities were modeled at the same set of receptor locations evaluated in both the stationary and mobile source analyses representing the closest receptors in the Project vicinity.

Noise Modeling Results & Evaluation

Table 6-30 presents the predicted sound levels due to Project construction at each of the modeling locations shown in Figure 6-32 along with a comparison to the City of Boston 70 dBA daytime limit. The results indicate that predicted sound levels from construction within the proposed Project site are not anticipated to cause a significant noise impact and are expected to meet the relevant City of Boston daytime construction noise criteria at all noise-sensitive locations. If required, a waiver of the City of Boston nighttime limits will be sought for any work performed between the hours of 6 a.m. to 7 a.m. and 6 p.m. to 7 p.m.

Table 6-30 Received Sound Pressure Levels Due to Project Construction

Receptor ID	Predicted Sound Pressure Level by Construction Period (dBA)				
	Month 1-3	*Month 3-6*	*Month 6-12*	*Month 12-15*	*Month 15-20*
R1	59	60	56	54	51
R2	56	57	54	53	49
R3	58	58	58	57	53
R4	56	56	55	54	50
R5	52	52	52	51	48
R6	67	62	64	66	66
R7	59	58	60	61	60
R8	68	56	58	59	56
R9	39	37	38	38	35
R10	46	46	45	45	40
City of Boston Noise Limit	**70**	**70**	**70**	**70**	**70**

While the locations assumed for each construction activity were chosen to be representative, there will be times when some of the mobile sources associated with ground clearing and excavation will be closer to the southern Project property line, resulting in elevated sound levels up to 80 dBA at some of the residences along Waldemar Avenue. However, as with other forms of facility construction, this work will be transient and thus the duration of potential daytime construction noise effects at a given residence will be limited. Predicted sound levels based on the assumption that all activities proposed within a given period are concurrent, and that all equipment associated with a given activity will be collocated, are conservative. In practice, many of the activities modeled cumulatively will occur at different times, equipment will be spread out within each work area, and not all equipment will operate simultaneously at full load. In addition, the majority of the construction will occur in areas well removed from residences or other sensitive receptors.

With respect to traffic, the daily workforce will arrive prior to peak traffic periods and will be encouraged to utilize public transportation. Personal vehicles will be allowed to park within designated areas at the Project site, and no construction vehicle parking will be

allowed in adjacent neighborhoods where streets will remain open to the public during the construction period. Therefore, traffic associated with jobsite personnel is not expected to result in a significant noise impact.

Measures recommended to minimize the noise impact of construction activities include:

- Scheduling work during daytime hours, with construction hours planned from 6:00 a.m. to 7:00 p.m., including "start-up" time;
- Using appropriate mufflers on all equipment and providing ongoing maintenance of intake and exhaust mufflers;
- Maintaining muffler enclosures on continuously operating equipment, such as air compressors and welding generators;
- Replacing specific construction operations and techniques with less noisy ones where feasible and practical;
- Selecting the quietest practicable equipment (e.g., electric instead of diesel-powered equipment);
- Selecting equipment operations to keep average noise levels low, to synchronize the noisiest activities with times of highest ambient noise levels, and to maintain relatively uniform noise levels;
- Locating noisy equipment at locations that protect sensitive locations by shielding or distance; and
- Turning off idle equipment.

6.6.5 Conclusions

Baseline noise levels were measured in the vicinity of the proposed Project and were compared to predicted stationary-source noise levels based on information provided by the manufacturers of representative mechanical equipment or estimated from the equipment's capacity. With appropriate mitigation the Resort is expected to meet the City of Boston and MassDEP noise limits as well as the recommended EPA and HUD guidelines. Additionally, a mobile source analysis of future traffic impacts indicates that sound levels due to increases in traffic volumes associated with the Resort will meet the applicable FHWA noise criteria at each of the nearest residences and community receptors. Furthermore, an analysis of construction noise resulting from the operation of diesel-powered equipment indicates that the Resort is expected to meet the applicable City of Boston construction noise limits during daytime construction hours.

In conclusion, results of these analyses indicate that predicted sound levels due to stationary mechanical equipment, increased traffic volumes, and temporary construction activities are not anticipated to cause a significant noise impact on the surrounding community, and, with appropriate mitigation, are expected to meet relevant noise limits at all noise-sensitive locations.

6.7 Public Benefit Review and Determination

In November 2007, the Massachusetts House and Senate passed An Act Relative to the Licensing Requirements for Certain Tidelands (HB 4324), which was signed by Governor Patrick on November 15, 2007 (Chapter 168 of the Acts of 2007) as the "Landlocked Tidelands Legislation." The legislation, among other things, names the Secretary of EEA as the "administrator of tidelands," and requires the Secretary to conduct a "public benefit review" for projects located on tidelands and to issue a written determination (the "Public Benefit Determination"). The Secretary must conduct a public benefit review for any proposed project located on tidelands or on landlocked tidelands that requires an EIR pursuant to MEPA.

6.7.1 Nature of Affected Tidelands

As evidenced by Attachment F of the ENF, MassDEP determined that the Project site is not subject to Chapter 91 licensing jurisdiction and the only tidelands on the Project site are landlocked tidelands. In the agency's comment letter on the ENF, MassDEP affirmed this prior determination. Pursuant to Chapter 168 of the Acts of 2007 and accompanying regulatory changes, the portion of the site that constitutes landlocked tidelands is subject to an analysis of its public benefits as well as any impacts on the public trust rights to access, use, and enjoy tidelands that are protected by Chapter 91.

6.7.2 Public Benefit of Project

In making the Public Benefit Determination, the Landlocked Tidelands Legislation requires that the Secretary consider the following:

> *"Purpose and effect of the development, the impacts on abutters and the surrounding community; enhancement to the property, benefits to the public trust rights in tidelands or other associated rights, including but not limited to, benefits provided through previously obtained municipal permits; community activities on the development site; environmental protection and preservation; public health and safety; and the general welfare; provided further that the secretary shall also consider the differences between tidelands and landlocked tidelands and great ponds when assessing the public benefit and shall consider the practical impact of the public benefit on the development."*

As described in Section 1.6, the Project offers numerous public benefits. The following sections describe these public benefits in the terms required by the Landlocked Tidelands legislation.

6.7.2.1 Purpose and Effect of the Development

The Project is proposed to redevelop the 161-acre site of Suffolk Downs into a Caesars-branded world-class resort and casino at New England's only thoroughbred racetrack. The $1 billion development plan includes hotel, entertainment, restaurant, luxury spa, and retail spaces as well as continued operations at the Suffolk Downs racetrack. In addition, the Project includes plans to improve the track's racing facilities and provide millions of dollars in funding to reduce longstanding transportation concerns and to make improvements to the local road network.

6.7.2.2 Impact on Abutters and Surrounding Community

The design for the Resort has been thoroughly reviewed in numerous meetings with abutters to the Project site and is expected to have an overall positive impact on the surrounding community.

The Resort will bring major new investment to the cities of Boston and Revere, increase governmental revenue, and create construction jobs as well as new permanent employment opportunities for residents of the host cities and other local communities. Furthermore, pursuant to Chapter 23K, a portion of the taxes on the proposed Resort's gross gaming revenue will be allocated to a community mitigation fund, from which the Massachusetts Gaming Commission will allocate funds to the host and surrounding communities to address potential Project impacts. In addition to new jobs, public funding, and direct investment at Suffolk Downs, the proposed Resort will promote small business and the tourism industry and have positive economic effects on the cities and the Commonwealth of Massachusetts. Locating a Category 1 gaming establishment at Suffolk Downs will permit tourists to enjoy both the gaming establishment and the unique cultural and social resources of Boston and Revere, and will result in additional enjoyment of and support for those resources.

Consistency with planning initiatives and municipal zoning are discussed in Sections 3.4 and 3.5, respectively.

Project development will benefit local water quality by significantly improving the quality of stormwater discharged from the Project site relative to existing conditions by incorporating a mix of low-impact development (LID) and conventional Best Management Practices (BMPs) into the site design to provide water quality treatment (see Section 9.3). In addition, proposed transportation improvements described in Section 5.0 will address existing historic and background traffic issues of concern to the community and the region, and will have significant positive effects on abutters and the surrounding community.

Construction-period impacts will be avoided and minimized through a series of Best Management Practices (BMPs) as described in the Draft CMP in Attachment L.

Furthermore, and in accordance with Section 9(a)(8)(ii) of Chapter 23K, the Proponent shall provide on-site space for an independent substance abuse and mental health counseling service for a provider identified by the Massachusetts Gaming Commission.

6.7.2.3 Enhancement to Property

The property is currently home to Suffolk Downs, which opened in 1935 and remains New England's only operating thoroughbred racetrack. Much of the Project site, however, contains surface parking, and as such is underutilized.

As proposed, the Project will redevelop the site into a Caesars-branded world-class resort and casino. The Project is a $1 billion economic development initiative that will bring significant new investment to the cities of Boston and Revere and will create thousands of new jobs. Proposed redevelopment plans will significantly improve site access (for vehicles and bicycles as well as pedestrians), surrounding roads, and stormwater management.

6.7.2.4 Benefits to Public Trust Rights in Tidelands or Other Associated Rights

As described above, a portion of the Project site is located on filled Private Tidelands that have been determined to be Landlocked Tidelands (see Attachment F of the ENF, reaffirmed in the MassDEP comment letter on the ENF); the Project site does not contain any jurisdictional tidelands. Redevelopment proposed on the Project site will largely displace existing surface parking, and will not displace any water-dependent uses. Furthermore, the Project is separated from flowed tidelands by several interconnecting roadways.

The Project will provide the following public benefits:

- Creation of New Publicly-Accessible Open Space: The Project design creates a number of high-quality open spaces that will establish aesthetically-pleasing entrances to the Resort, provide the public with areas for outdoor enjoyment, and establish outdoor green spaces suitable for entertainment and other events (see Figure 1-38). As proposed, the Project design will increase open space by approximately 16 acres relative to existing conditions.

- Streetscape Improvements: The Project will also enhance the landscape and pedestrian experience along Winthrop Avenue, another front door to the Project site. Pedestrian accommodations at the Tomasello Drive intersection will be significantly improved by the introduction of concurrent pedestrian phasing and the provision of a new "missing" crosswalk on Winthrop Avenue east of Tomasello Drive. In addition, traffic and pedestrian safety improvements will be implemented in Donnelly Square, which will incorporate streetscape improvements on the east of

Beachmont Station. The Project will also provide plantings to provide shade and visual interest at the edge of the neighborhood as well as an attractive new fence along the Resort edge.

- Public Transit Improvements: The Project will improve access to the MBTA Blue Line Suffolk Downs Station, including upgraded pedestrian, bicycle, and shuttle connections to the Resort. The Proponent has also agreed to Suffolk Downs Station improvements, each of which remains subject to further negotiation and discussion with the MBTA:

    - Maintenance improvements including concrete restoration and repair of the existing structure, ramps, stairs, overpass, and platform as well as repainting;

    - Installation of two new ADA-compliant elevators, along with associated foundations, structure, and improvements;

    - Three new turnstiles; and

    - Various site improvements including new sidewalks, ramps, railings, lighting, way-finding, and landscaping, along with a pedestrian shelter located at the entrance to the Project site.

- Active Uses: Ground levels of the proposed Resort buildings are designed to activate the public realm with daytime and nighttime uses. For example, restaurant, entertainment, and retail spaces will promote activity throughout the day and night, and the Project site connections with existing MBTA Suffolk Downs and Beachmont Stations will encourage pedestrian activity and a sense of neighborhood continuity.

- Recreation: The Proponent has agreed to provide on-street bicycle accommodations to connect Constitution Beach, Belle Isle Marsh, and Revere Beach along the Bennington Street corridor, along with connections to and through the Project site from the Suffolk Downs MBTA station and from Winthrop Avenue. This network will effectively create pedestrian and bicycle loop systems that will enhance public access to open space and will improve access to a walkway in the Belle Isle Marsh that is being constructed as part of a separate project associated with a U.S. EPA consent order in accordance with a plan developed by the Friends of Belle Isle Marsh. In addition, the Proponent has agreed to provide two Hubway bicycle stations, one near the Suffolk Downs MBTA Station and one near the south entry to Casino Areas I and II, when the network expands into East Boston. On-site pedestrian paths and aesthetically-pleasing open spaces will encourage pedestrian activity and access, including at the site entries. The pedestrian connection from Orient Heights will be maintained.

- Enhancement of public access to tidelands of a unique and high quality: The Proponent is responsible for additional improvements that will promote better public access to DCR's park at the 241-acre salt marsh, the only remaining salt marsh in Boston.

- Drainage Improvements: The Project will significantly improve stormwater management on the Project site and thus improve the water quality within Sales Creek.

6.7.2.5 Community Activities on the Development Site

The Project will create a number of high-quality open spaces that will establish aesthetically-pleasing entrances to the Resort, provide the public with areas for outdoor enjoyment, and establish outdoor green spaces suitable for education, entertainment, and other events. In addition, the Project will improve pedestrian and bicycle accommodations and will provide ground-floor retail space.

The Proponent has demonstrated a commitment to community support and activities. For example, the Project site currently functions as a community gathering location for a variety of public activities and events with attendance levels in the thousands. These events include:

- Starting point of half marathon;
- Food Truck Festival;
- Greater Boston Walk Now For Autism Speaks;
- Assembly area for Columbus Day Parade (even years);
- Kentucky Derby Day;
- Preakness Stakes Day;
- Opening Day of the live racing season;
- Belmont Stakes Day; and
- Breeders' Cup Saturday.

6.7.2.6 Environmental Protection and Preservation

The Project consists of redeveloping surface parking lots and renovating existing buildings into a world-class resort and casino at New England's only thoroughbred racetrack. The Project will comply with the applicable environmental regulatory programs of the Commonwealth. Regulatory programs specifically applicable to this Project and the status of the Project with respect to these programs are summarized below.

- *The Massachusetts Environmental Policy Act (MEPA).* This Draft EIR follows the January 31, 2013 submission of an ENF and issuance of the Secretary's Certificate on April 5, 2013. The Proponent anticipates filing a Final EIR with the MEPA Office before completing MEPA review.

- *The Massachusetts Wetlands Protection Act (WPA).* A Notice of Intent (NOI) will be filed with each of the Conservation Commissions in Boston, Revere, and Chelsea describing jurisdictional activities associated with Project construction. The Project will contribute to the protection of the interests identified in the WPA by complying with the applicable general performance standards.

- *Massachusetts Historical Commission State Register Review.* The Project is subject to review by the MHC in compliance with MGL Chapter 9 §§ 26-27C as amended by St. 1988, c. 254. Consultation with MHC was initiated with the filing of the ENF.

The balance of this section discusses the Project in terms of development review components, and as such addresses potential Project impacts and mitigation measures to avoid and minimize such impacts.

6.7.2.7 Public Health and Safety, and General Welfare

The Project will enhance public health and safety as well as the general welfare in a number of ways, including providing significant transportation-related improvements not only on the immediate Project site but also in the surrounding neighborhoods. These improvements, such as the proposed Route 1A infrastructure improvements, will address existing historic and background traffic issues of concern to the community.

The Project will also provide streetscape improvements and high-quality open spaces that will establish aesthetically-pleasing entrances to the resort, provide the public with areas for outdoor enjoyment, and establish outdoor green spaces suitable for entertainment and other events. Enhanced bicycle access, including on-street bicycle accommodations to connect Constitution Beach with Belle Isle Marsh and Revere Beach, will encourage walking and cycling.

As noted previously, the Project will significantly improve stormwater management on site by incorporating a mix of LID and conventional BMPs into the site design to provide water quality treatment and improve the water quality discharged ultimately into Boston Harbor (see Section 9.3).

Furthermore, pursuant to the HCAs with Boston and Revere and in accordance with Section 9(a)(8)(ii) of Chapter 23K, the Proponent shall provide on-site space for an independent substance abuse and mental health counseling service for a provider identified by the Massachusetts Gaming Commission.

As described in Section 1.6, the Project will provide numerous significant public benefits, many of which will boost economic development and enhance annual property tax revenues for the Cities of Boston and Revere. Approximately 2,500 construction jobs and more than 4,000 permanent jobs will be created as a result of the proposed development.

6.8 Consistency with Policies of the Office of Coastal Zone Management

As currently proposed, the Project does not require any federal actions that are subject to the CZM federal consistency requirement. This fact notwithstanding, the Project site is located within the coastal zone and therefore information demonstrating consistency with CZM's enforceable policies is provided herein.

The Proponent certifies to CZM that the Project complies with the enforceable policies of the approved Massachusetts Coastal Zone Management Plan and will occur in a manner consistent with such policies. This certification is made in accordance with the requirements of the Federal Coastal Zone Management Act (16 U.S.C. 1451 et seq.) (CZMA) and implementing regulations at 15 CFR Part 930, as amended, and pursuant to 301 CMR 21.00 and relevant statutory and regulatory authorities for the Commonwealth of Massachusetts Coastal Zone Management Plan and Program Policies. The analysis contained herein describes Project compliance with each of the Massachusetts Coastal Zone Management Plan enforceable policies.

6.8.1 Jurisdiction for Federal Consistency Certification

According to the coastal zone boundary defined by the Coastal Zone Management Program Federal Consistency Review Procedures regulations at 301 CMR 21.99, the Project site lies entirely within the coastal zone. Although the Project as currently proposed does not require any federal actions that are subject to the CZM federal consistency requirement, Project consistency with CZM's enforceable policies is nonetheless discussed herein. Applicable review procedures are set forth at 301 CMR 21.07 (see 301 CMR 21.04(2)).

The following section describes the Project's consistency with the program policies of the Massachusetts approved Coastal Zone Management Program Plan as set forth in the policy appendix at 301 CMR 21.98.

6.8.2 Certification of Consistency with MCZM Program Policies

The Proponent certifies that the proposed activity complies with the enforceable policies of the Massachusetts approved Coastal Zone Management Plan (the Plan) and will be conducted in a manner consistent with such policies.

The following sections list each of the Program Policies and Management Principles contained in the Plan and describe how the Project is consistent with the Plan.

6.8.2.1 Water Quality

Water Quality Policy #1

Ensure that point-source discharges in or affecting the coastal zone are consistent with federally-approved state effluent limitations and water quality standards.

The Project will not result in any new point-source discharges; therefore, this policy is not applicable.

Water Quality Policy #2

Ensure that non-point source pollution controls promote the attainment of state surface water quality standards in the coastal zone.

The Project design includes stormwater management measures and techniques that will significant improve the quality of stormwater runoff from the site relative to existing conditions. Section 9.3 contains a detailed discussion of proposed stormwater management.

Water Quality Policy #3

Ensure that activities in or affecting the coastal zone conform to applicable state and federal requirements governing subsurface waste discharges and sources of air and water pollution and protection of wetlands.

The Project does not involve any subsurface waste discharges; therefore, this policy is not applicable. Please see Section 6.5 for a discussion of air quality, Section 9.3 for a discussion of water quality in the context of stormwater management, and Section 6.9 for a discussion related to wetlands protection.

6.8.2.2 Habitat

Habitat Policy #1

Protect wetland areas including salt marshes, shellfish beds, dunes, beaches, barrier beaches, salt ponds, eelgrass beds, and freshwater wetlands for their role as natural habitats.

No coastal wetland resource areas are present on the Project site, and the Project will have no impact to those resources. On-site activities will occur within Bordering Land Subject to Flooding (BLSF) and the 25-foot Riverfront Area (RFA) associated with Sales Creek, but there will be no direct wetlands impacts; no work is proposed in Bordering Vegetated Wetlands (BVW). Compliance with the performance standards of the WPA is presented in Section 6.9.1.3.

Off-site roadway improvements will entail work in Land Subject to Coastal Storm Flowage (LSCSF) and RFAs associated with Sales Creek and Mill Creek. The WPA does not prescribe any specific performance standards for work in LSCSF. Work in RFAs associated with the off-site roadway improvements will occur within the footprint of existing roadways or in maintained lawn, and therefore qualifies as a redevelopment project. Improvements at these locations will include enhancing and restoring degraded areas with native plantings to improve the capacity of the RFA to protect interests of the WPA. Depending on the outcome of MassDOT review, off-site improvements along Lee Burbank Highway may entail minor alteration of Coastal Bank and Salt Marsh. As described in Section 6.9.2, these alterations qualify as limited projects.

Habitat Policy #2

Promote the restoration of degraded or former wetland resources in coastal areas and ensure that activities in coastal areas do not further wetland degradation but instead take advantage of opportunities to engage in wetland restoration.

The Project will not degrade any wetland areas; rather, since the Project includes a stormwater management system, it will significantly improve the quality of stormwater runoff from the site relative to existing conditions, thus benefitting Sales Creek and downstream areas. The off-site roadway improvements will include using native plantings to enhance and restore RFAs that are presently covered by lawn. If the off-site roadway improvements along Lee Burbank Highway result in alteration of Salt Marsh, the Proponent will consult with resource agencies regarding appropriate mitigation. The EEA's Division of Ecological Restoration has several ongoing and future restoration projects in the Belle Isle Marsh area that the Proponent could support if compensation for Salt Marsh alteration is needed.

6.8.2.3 Protected Areas

Protected Areas Policy #1

Assure preservation, restoration, and enhancement of complexes of coastal resources of regional or statewide significance through the Areas of Critical Environmental Concern (ACEC) program.

Sales Creek, which crosses through the site, is associated with the Belle Isle Inlet that is within the Rumney Marshes ACEC. The boundary for this ACEC extends through the Project site from approximately its northwest corner, passing between the proposed Project development and the existing horse barns, through the northern portion of the racetrack infield, and continues east of the Project site. Since stormwater from the Project site discharges into Sales Creek, the stormwater management system proposed as part of the Project will significantly improve the stormwater quality entering the ACEC.

The off-site roadway improvements at the intersection of Winthrop Avenue/Revere Beach Parkway and Tomasello Drive will occur within the above-referenced ACEC. As identified in Section 6.8.2.2, these activities will occur within the footprint of existing roadways and in areas that consist of maintained lawn. Improvements will include enhancing and restoring adjacent disturbed areas with native plantings, thereby improving habitat values associated with the Sales Creek corridor.

Protected Areas Policy #2

Protect state and locally designated scenic rivers and state-classified scenic rivers in the coastal zone.

The Project is not located in or near any state or locally designated scenic rivers; therefore, this policy does not apply.

Protected Areas Policy #3

Review proposed developments in or near designated or registered historic districts or sites to ensure that the preservation intent is respected by federal, state, and private activities and that potential adverse effects are minimized.

The Project site does encompass a few historic resources that are included in the Inventory of Historic and Archaeological Assets of the Commonwealth. In addition, there are a number of historic resources in the vicinity of the Project site, including Revere Beach Parkway, which is listed in the National Register of Historic Places. The Project design avoids and minimizes potential adverse effects to these historic resources, as described in Section 8.0.

6.8.2.4 Coastal Hazards

Coastal Hazard Policy #1

Preserve, protect, restore, and enhance the beneficial functions of storm damage prevention and flood control provided by natural coastal landforms, such as dunes, beaches, barrier beaches, coastal banks, land subject to coastal storm flowage, salt marshes, and land under the ocean.

The Project site does not contain any of these coastal wetland resource areas. Some of the transportation improvements proposed off-site will occur within LSCSF, salt marsh, and coastal bank, but will not adversely affect the ability of these resource areas to provide storm damage prevention or flood control because the improvements will be designed in accordance with applicable AASHTO/MassDOT structural requirements and the affected coastal banks will be reconstructed to preexisting conditions.

Coastal Hazard Policy #2

Ensure construction in water bodies and contiguous land areas will minimize interference with water circulation and sediment transport. Approve permits for flood or erosion control projects only when it has been determined that there will be no significant adverse effects on the project site or adjacent or down coast areas.

The Project does not involve any in-water construction nor is it a flood or erosion control project; therefore, this policy does not apply. Nonetheless, it is relevant to note that erosion and sedimentation control measures will be used during construction, and these are described in the Draft CMP in Attachment L.

Coastal Hazard Policy #3

Ensure that state and federally funded public works projects proposed for location within the coastal zone will: (1) not exacerbate existing hazards or damage natural buffers or other natural resources; (2) be reasonably safe from flood and erosion related damage; (3) not promote growth and development in hazard-prone or buffer areas, especially in Velocity zones and ACECs; and (4) not be used on Coastal Barrier Resource Units for new or substantial reconstruction of structures in a manner inconsistent with the Coastal Barrier Resource/Improvements Acts.

This Project is not a state or federally funded public works project; therefore, this policy does not apply.

Coastal Hazard Policy #4

Prioritize public funds for acquisition of hazardous coastal areas for conservation or recreation use, and relocation of structures out of coastal high hazard areas, giving due consideration to the effects of coastal hazards at the location to the use and manageability of the area.

The Project does not involve the use of public funds; therefore, this policy does not apply.

6.8.2.5 Port and Harbor Infrastructure

Ports Policy #1

Ensure that dredging and disposal of dredged material minimize adverse effects on water quality, physical processes, marine productivity and public health.

The Project does not involve dredging; therefore, this policy does not apply.

Ports Policy #2

Promote the widest possible public benefit from channel dredging, ensuring that designated ports and developer harbors are given highest priority in the allocation of federal and state dredging funds. Ensure that this dredging is consistent with marine environment policies.

The Project does not involve dredging; therefore, this policy does not apply.

Ports Policy #3

Preserve and enhance the capacity of Designated Port Areas (DPAs) to accommodate water-dependent industrial uses and prevent the exclusion of such uses from tidelands and any other DPA lands over which a state agency exerts control by virtue of ownership, regulatory authority, or other legal jurisdiction.

The Project is not located in a DPA; therefore, this policy does not apply.

Ports Management Principle #1

Encourage, through technical and financial assistance, expansion of water dependent uses in designated ports and developed harbors, re-development of urban waterfronts, and expansion of visual access.

The Project is not located in a designated port, developed harbor, or urban waterfront; therefore, this principle does not apply.

6.8.2.6 Public Access

Public Access Management Principle #1

Improve public access to coastal recreation facilities and alleviate auto traffic and parking problems through improvements in public transportation. Link existing coastal recreation sites to each other or to nearby coastal inland facilities via trails for bicyclists, hikers, and equestrians, and via rivers for boaters.

The Proponent has agreed to provide on-street bicycle accommodations to connect Constitution Beach with Belle Isle Marsh and Revere Beach along the Bennington Street corridor, along with connections to and through the Project site from the Suffolk Downs MBTA station and from Winthrop Avenue. This network will effectively create pedestrian and bicycle loop systems that will enhance public access to open space and will improve access to a walkway in the Belle Isle Marsh that is being constructed as part of a separate project associated with a U.S. EPA consent order in accordance with a plan developed by the Friends of Belle Isle Marsh. In addition, the Proponent has agreed to host two Hubway bicycle stations, one near the Suffolk Downs MBTA Station and one near the south entry to Casino Areas I and II, when the system expands into East Boston.

Public Access Management Principle #2

Increase capacity of existing recreation areas by facilitating multiple uses and by improving management, maintenance and public support facilities. Resolve conflicting uses whenever possible through improved management rather than through exclusion of uses.

Although the Project site does not contain any existing recreation areas, the Proponent has agreed to provide on-street bicycle accommodations to connect Constitution Beach with Belle Isle Marsh and Revere Beach along the Bennington Street corridor, along with connections to and through the Project site from the Suffolk Downs MBTA station and from Winthrop Avenue. This network will effectively create pedestrian and bicycle loop systems that will enhance public access to open space and will improve access to a walkway in the Belle Isle Marsh that is being constructed as part of a separate project associated with a U.S. EPA consent order in accordance with a plan developed by the Friends of Belle Isle Marsh. In addition, the Proponent has agreed to host two Hubway bicycle stations, one near the Suffolk Downs MBTA Station and one near the south entry to Casino Areas I and II, when the system expands into East Boston.

Public Access Management Principle #3

Provide technical assistance to developers of private recreational facilities and sites that increase public access to the shoreline.

The Project does not involve a private recreational facility; therefore, this principle does not apply.

Public Access Management Principle #4

Expand existing recreation facilities and acquire and develop new public areas for coastal recreational activities. Give highest priority to expansions or new acquisitions in regions of high need or limited site availability. Assure that both transportation access and the recreational facilities are compatible with social and environmental characteristics of surrounding communities.

The Proponent has agreed to provide on-street bicycle accommodations to connect Constitution Beach with Belle Isle Marsh and Revere Beach along the Bennington Street corridor, along with connections to and through the Project site from the Suffolk Downs MBTA station and from Winthrop Avenue. This network will effectively create pedestrian and bicycle loop systems that will enhance public access to open space and will improve access to a walkway in the Belle Isle Marsh that is being constructed as part of a separate project associated with a U.S. EPA consent order in accordance with a plan developed by the Friends of Belle Isle Marsh. In addition, the Proponent has agreed to host two Hubway bicycle stations, one near the Suffolk Downs MBTA Station and one near the south entry to Casino Areas I and II, when the system expands into East Boston.

6.8.2.7 Energy

Energy Policy #1

For coastally dependent energy facilities, consider siting in alternative coastal locations. For non-coastally dependent energy facilities, consider siting in areas outside of the coastal zone. Weigh the environmental and safety impacts of locating proposed energy facilities at alternative sites.

The Project does not involve an energy facility; therefore, this policy does not apply.

Energy Management Principle #1

Encourage energy conservation and the use of alternative sources such as solar and wind power in order to assist in meeting the energy needs of the Commonwealth.

Energy conservation measures have been incorporated into the Project design, as described in Section 9.5. Although the Project site is not suitable for wind power, a PV array is included in the Project design.

6.8.2.8 Ocean Resources

Ocean Resources Policy #1

Support the development of environmentally sustainable aquaculture, both for commercial and enhancement (public shellfish stocking) purposes. Ensure that the review process regulating aquaculture facility sites (and access routes to those areas) protects ecologically significant resources (salt marshes, dunes, beaches, barrier beaches, and salt ponds) and minimizes adverse impacts upon the coastal and marine environment.

The Project does not involve aquaculture; therefore, this policy does not apply.

Ocean Resources Policy #2

Extraction of marine minerals will be considered in areas of state jurisdiction, except where prohibited by the Massachusetts Ocean Sanctuaries Act, where and when the protection of fisheries, air and marine water quality, marine resources, navigation and recreation can be assured.

The Project does not involve extraction of marine minerals; therefore, this policy does not apply.

Ocean Resources Policy #3

Accommodate offshore sand and gravel mining needs in areas and in ways that will not adversely affect shoreline areas due to alteration of wave direction and dynamics, marine resources and navigation. Mining of sand and gravel, when and where permitted, will be primarily for the purpose of beach nourishment.

The Project does not involve offshore mining or beach nourishment; therefore, this policy does not apply.

6.8.2.9 Growth Management

Growth Management Principle #1

Encourage, through technical assistance and review of publicly funded development, compatibility of proposed development with local community character and scenic resources.

The Project is not a publicly-funded development; therefore, this principle does not apply.

Growth Management Principle #2

Ensure that state and federally funded transportation and wastewater projects primarily serve existing developed areas, assigning highest priority to projects that meet the needs of urban and community development centers.

This Project is not a state or federally funded transportation or wastewater project; therefore, this principle does not apply.

Growth Management Principle #3

Encourage the revitalization and enhancement of existing development centers in the coastal zone through technical assistance and federal and state financial support for residential, commercial and industrial development.

This Project involves the redevelopment of an under-utilized site into a world-class destination resort that will also maintain and enhance the Suffolk Downs racetrack operations. It will have numerous economic benefits for the area without requiring federal or state financial support.

6.8.3 Conclusion

As described herein, the Project complies with the enforceable policies of the Massachusetts approved Coastal Zone Management Plan and will be conducted in a manner consistent with such policies.

6.9 Wetlands

6.9.1 Description of On-Site Wetland Resource Areas

On April 24 through 26 and May 3, 2012, wetland and soil scientists from Epsilon Associates, Inc. (Epsilon) delineated wetlands and other resource areas[15] within the approximately 161-acre Project site. The purpose of the delineation was to define the extent of wetlands, resource areas, and buffer zones regulated under the Massachusetts WPA (MGL Ch. 131 § 40), Sections 401/404 of the U.S. Clean Water Act (CWA, 33 U.S.C. 1344), and local wetland ordinances in the Cities of Revere and Boston.[16] Delineated wetland resource areas on the Project site are shown on Figure 6-33.

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[15] "Resource Area," as used herein, means any of the areas specified in the Massachusetts Wetlands Protection Act regulations at 310 CMR 10.25 through 10.35 and 310 CMR 10.54 through 10.58. It is used synonymously with Area Subject to Protection Under M.G.L. c. 131, § 40, each one of which is enumerated in 310 CMR 10.02(1).

[16] The City of Boston does not currently have a Wetlands Protection Ordinance with the exception of a provision for local filing fees.

Table 6-31 summarizes the delineated wetlands and other resource areas and identifies the jurisdictional status of each under the Wetlands Protection Act and Revere Wetlands Protection Ordinance. For the purposes of this evaluation, Epsilon assumed that all delineated vegetated wetlands and streams located on the Project site are jurisdictional "waters of the United States"[17] as defined under Sections 401 and 404 of the U.S. Clean Water Act. The wetland resource areas delineated by Epsilon are located in both Revere and Boston (the municipal boundary bisects the site). Boundaries of the delineated wetland resource areas and associated buffer zones are depicted on Figure 6-33. Additional details pertaining to the wetland delineation work conducted by Epsilon are provided in the technical memo in Attachment I, which includes more detailed graphics, wetland determination field forms, representative site photographs, and information describing the 1999 Densely Developed Area (DDA) designation relative to the Sales Creek Riverfront Area.

In general, wetland resource areas identified on or immediately adjacent to the Project site include BVW, RFA associated with Sales Creek, Inland Bank and Land Under Water (LUW) associated with Sales Creek, on-site intermittent streams, and a pond located in the center of the racetrack infield. No Isolated Land Subject to Flooding is delineated.

The RFA associated with Sales Creek is the area of land between a river's mean annual high-water line measured horizontally outward from the river and a parallel line located 200 feet away, except that the parallel line is located 25 feet away in Boston and 25 feet away in DDAs, as designated by the Secretary of EEA pursuant to 301 CMR 10.00 (see 310 CMR 10.58(2)(a)3). On March 12, 1999, Sales Creek and the surrounding environs on the Project site were designated as a DDA by the Secretary; accordingly, the RFA is also 25 feet in the City of Revere. RFA does not have a buffer zone.

An ACEC is an area designated by the EEA Secretary in accordance with 301 CMR 12.00 of CZM regulations. Sales Creek is associated with the Belle Isle Inlet, which is within the Rumney Marshes ACEC. The ACEC extends through the Project site from approximately its northwest corner, passing between the proposed Project development and the existing horse barns, through the northern portion of the racetrack infield, and continues east of the Project site (see Figure 5 in Attachment I).

Portions of the Project site are located within the 100-year floodplain as delineated by the FEMA (see Figure 2 in Attachment I), and the floodplain has been conservatively classified as BLSF based on two open Orders of Conditions issued by the Boston and Revere Conservation Commissions in 2011 (MassDEP File Nos. 006-1276 and 061-0620).

[17] "Waters of the United States" is broadly defined in the federal regulations that implement the Clean Water Act. It includes tidal waters, rivers, streams, lakes, ponds and wetlands.

According to the applicable FEMA FIRM panel numbers 25025C0038G and 252025C0019G, portions of the Suffolk Downs property are located within a mapped 100-year floodplain, Zone AE, Base Elevation 9 feet NGVD (15.46 feet Boston City Base).

The Proponent reviewed the Massachusetts Natural Heritage Atlas (MassGIS, 2008), prepared by the Massachusetts Natural Heritage and Endangered Species Program (NHESP), for state-listed species on or near the Project site. The Project site does not contain any areas of Priority Habitat or Estimated Habitat for state-listed species. There are also no mapped certified or potentially certifiable vernal pools located on or near the Project site.

Table 6-31 Summary of Jurisdictional Wetland Resource Areas under the Wetlands Protection Act and Revere Wetlands Ordinance

Wetland Flag Series	*Wetland Resource Areas in Flag Series*				*Comments*
	Inland Bank	LUW	BVW	RFA	
A			•		Flag Series A delineates a detention basin that connects directly to Sales Creek (Series F/FF) via a culvert under Furlong Drive (thus making it a BVW). Series A and Flag Series B/BB are connected via a flood control gate running under an upland berm. This wetland series has a 100 foot buffer zone and is located in the City of Revere.
B/BB	•	•	•		Series B/BB delineates the edge of a linear BVW that borders an intermittent stream. The Inland Bank of the stream was not formally delineated because it exists down gradient of the BVW and is non-descript in certain stretches. This series is connected under Route 1A via a culvert. This wetland series has a 100 foot buffer zone and is located in the City of Revere and the City of Boston.
C	Non Jurisdictional Stormwater Basin				This non-jurisdictional stormwater basin is depicted as an open water body with no wetland flags shown on the referenced existing conditions plan. The vegetation is predominantly common reed *(Phragmites australis)*. The stormwater basin is located in the City of Revere. This stormwater basin does not meet the criteria to be regulated as a wetland resource area including but not limited to "ponds" and "streams" (see 310 CMR 10.04) comprised of Inland Bank (310 CMR 10.54) and Land Under Water (310 CMR 10.56) or Isolated Land Subject to Flooding (310 CMR 10.57) and BVW (310 CMR 10.55). It is also Epsilon's opinion that the Corps would not likely regulate this area as a water of the U.S.
D	Non Jurisdictional Stormwater Basin				This non-jurisdictional stormwater basin is depicted as an open water body with no wetland flags shown on the enclosed existing conditions plan. The vegetation is predominantly common reed. The stormwater basin is located in the City of Revere. Similar to Series C described above, this stormwater basin does not meet the criteria to be regulated as a wetland resource area including but not limited to "ponds" and "streams" (see 310 CMR 10.04) comprised of Inland Bank (310 CMR 10.54) and Land Under Water (310 CMR 10.56) or Isolated Land Subject to Flooding (310 CMR 10.57) and BVW (310 CMR 10.55). It is also Epsilon's opinion that the Corps would not likely regulate this area as a water of the U.S.
E			•		Flag Series E delineates a small pocket BVW/stormwater feature that is connected to Flag Series F/FF (Sales Creek) via three culverts. This wetland series has a 100 foot buffer zone and is located in the City of Revere.
F/FF	•	•	•	•	Flag Series F/FF delineates BVW and the ordinary high water mark (OHWM) of Sales Creek (the lines are generally coincident). The 25-foot RFA extends from OHWM. Inland Bank and LUW were not formally delineated but exist down-gradient of the flag series. This wetland series has a 100-foot buffer zone from the BVW edge; RFA does not have a buffer zone. It is located in the City of Revere.
G/GG			•		Flag Series G/GG delineates a pocket BVW/stormwater feature connected via a culvert to Flag Series F/FF; it has a 100-foot buffer zone and is located in the City of Revere.

Wetland Flag Series	*Wetland Resource Areas in Flag Series*				*Comments*
	Inland Bank	LUW	BVW	RFA	
H	•	•	•		Flag Series H/HH delineates a Bank and BVW that borders an intermittent stream (drainage ditch); these resource areas are generally coincident throughout. LUW was not formally delineated but it exists down-gradient of the flag series. The higher elevation culvert inlet near Route 1A receives drainage from adjacent roads, as does the culvert outlet. Wetland Series H has a 100-foot buffer zone and is located in the City of Boston.
I/II	•	•		•	Flag Series I/II delineates Inland Bank and Sales Creek OHWM where it flows aboveground in the study area. The 25-foot RFA extends from OHWM. This wetland series has a 100-foot buffer zone from the Bank; RFA does not have a buffer zone. It is located in Revere.
J/JJ	•	•		•	Flag Series J/JJ delineates Inland Bank and Sales Creek OHWM where it flows aboveground in the study area. The 25-foot RFA extends from OHWM. This wetland series has a 100-foot buffer zone from Bank; RFA does not have a buffer zone. It is located in the City of Revere.
K/KK	•	•	•		Flag Series K/KK delineates BVW that borders an intermittent stream comprised of Inland Bank and LUW. Select portions of this series also delineate Sales Creek OHWM and its associated 25-foot RFA. This wetland series has a 100-foot buffer zone from BVW; RFA does not have a buffer zone. It is located in the City of Revere and the City of Boston.
L/LL	•	•	•		Flag Series L/LL delineates BVW that borders an intermittent stream comprised of Inland Bank and LUW. Select portions of this series also delineate Sales Creek OHWM and its associated 25-foot RFA. This wetland series has a 100-foot buffer zone from BVW; RFA does not have a buffer zone. It is located in the City of Revere.
Pond in Infield & Up-gradient Drainage Ditch	•	•			The open water body located in the center of the racetrack infield appears to meet the definition of a "pond" as defined under 310 CMR 10.04.[18] The pond is comprised of Inland Bank and LUW; no discernible BVW is present. There is a 100-foot buffer zone that extends from the edge of the pond (it was not formally delineated in the field because its boundary is so well defined). The pond is located in the City of Boston. The man-made drainage ditch up-gradient of the pond was not classified as a jurisdictional wetland resource area. According to 310 CMR 10.04, such a body of running water which does not flow throughout the year (i.e., which is intermittent) is a stream <u>except</u> for that portion up-gradient of all bogs, swamps, wet meadows, and marshes.

[18] According to 310 CMR 10.04, "pond" means any open body of fresh water with a surface area observed or recorded within the last ten years of at least 10,000 square feet. Ponds may be either naturally occurring or man-made by impoundment, excavation, or otherwise. Ponds shall contain standing water except for periods of extended drought. Periods of extended drought for purposes of 310 CMR 10.00 shall be those periods, in those specifically identified geographic locations, determined to be at the "Advisory" or more severe drought level by the Massachusetts Drought Management Task Force, as established by the Executive Office of Environmental Affairs and the Massachusetts Emergency Management Agency in 2001, in accordance with the Massachusetts Drought Management Plan (MDMP). Notwithstanding the above, the following man-made bodies of open water shall not be considered ponds: (a) basins or lagoons which are part of wastewater treatment plants; (b) swimming pools or other impervious man-made basins; and (c) individual gravel pits

6.9.1.1 Significance of On-Site Wetland Resource Areas Under the Wetlands Protection Act

The WPA recognizes eight interests (i.e., functions and values) of wetland resource areas, which are identified in 310 CMR 10.01. Interests of the Act may be grouped into three general categories: water quality, water supply protection and pollution prevention; storm damage prevention and flood control; and wildlife habitat and fisheries protection. Each of the presumed WPA interests is identified in Table 6-32 relative to the wetland resource areas delineated on the Project site.

From a pure functions and values perspective, BVWs on the Project site are generally degraded given their context within a heavily developed urban environment. These BVWs are comprised primarily of invasive herbaceous and woody plant species including but not limited to common reed *(Phragmites australis),* multiflora rose *(Rosa multiflora),* buckthorn *(Frangula alnus),* and purple loosestrife *(Lythrum salicaria).* Non-invasive species include but are not limited to sweetgale *(Myrica gale)* and various sedges, rushes, and grasses. The primary functions of the BVWs appear to be flood control, storm damage prevention, and pollution attenuation.

Similarly, a portion of the RFA associated with Sales Creek is previously developed and degraded as defined by the WPA regulations. A significant area of BLSF on and adjacent to the Project site primarily overlays previously developed areas comprised of pavement and fill material.

Table 6-32 Significance of On-Site Wetland Resource Areas Under the WPA

Protected Interests of the Act	*Wetland Resource Areas within Study Area*				
	BVW	*Inland Bank*	*Land Under Water*	*RFA*	*BLSF*
Protection of Public and Private Water Supply	•	•	•	•	
Protection of Groundwater Supply	•	•	•	•	
Flood Control	•	•	•	•	•
Storm Damage Prevention	•	•	•	•	•
Prevention of Pollution	•	•	•	•	
Protection of Land Containing Shellfish					
Protection of Fisheries	•	•	•	•	
Protection of Wildlife Habitat	•	•	•	•	•

6.9.1.2 Activities Proposed in On-Site Wetland Resource Areas

A portion of on-site activities will occur within BLSF and the 25-foot RFA associated with Sales Creek. Activities proposed in BLSF and RFA are shown on Figure 6-34 and quantified in Table 6-33. No work is proposed in BVW, Inland Bank, or LUW.

Table 6-33 On-Site Wetland Resource Area Impacts

Wetland Resource Areas	*Approximate Impacts*	*Description of Activities*
BLSF	615,000 sf/ 14 acres	These alterations are associated with cutting and filling activities to properly grade the site, including a part of the existing stable area, the parking lot south of Sales Creek and north of the proposed building, and areas located along Tomasello Drive to accommodate construction of the new roadway. The work will occur in previously developed areas comprised of pavement or urban fill. Cutting and filling activities will result in a net increase of approximately 60,000 cubic feet of floodplain storage capacity (see Section 2.3.5 for a detailed discussion of floodplain activities). The enhanced floodplain storage areas will be designed to comply with WPA performance standards for BLSF (310 CMR 10.57). The locations of these areas are shown on Figures 2-1 and Figure 6-34.
25-foot RFA (Sales Creek)	Approximately 7,000 SF/0.16 acres	Activities in the 25-foot RFA are limited to proposed stormwater management system improvements including installation of flared end structures and riprap erosion controls and the construction of floodplain compensation areas. A portion of the RFA in this location has been previously developed and degraded as defined under 310 CMR 10.58(5). The proposed upgrades to the stormwater management system will also be designed to comply with MassDEP stormwater standards and should substantially improve water quality following construction.
BVW	0	No work is proposed in BVW. Erosion controls will be installed along the limit of work line in these locations to protect the BVW.
Inland Bank	0	No work is proposed on Inland Bank associated with on-site intermittent streams (drainage ditches) or Sales Creek. Erosion controls will be installed along the limit of work line in these locations to protect the resource areas.
LUW	0	No work is proposed on LUW associated with on-site intermittent streams (drainage ditches) or Sales Creek. Erosion controls will be installed along the limit of work line in these locations to protect the resource areas.

Activities proposed in BLSF will occur primarily in three locations: (1) in a part of the existing stable area north of Sales Creek in Revere; (2) in the parking lot located south of Sales Creek and north of the proposed casino and hotel buildings; and (3) along Tomasello Drive to accommodate construction of the new roadway. These activities will involve grading, which will consist of both cutting and filling activities. There will also be some grading associated with the installation and construction of utilities and stormwater management system components. All work will occur in previously developed areas comprised of pavement or urban fill. Pursuant to the WPA regulations (310 CMR 10.57), the filling of BLSF requires compensatory flood storage to prevent an increase in the horizontal extent and level of flood waters during peak flows. Although the Project will fill some areas of BLSF, the site design calls for more cutting than filling, and these activities will result in a net *increase* in approximately 60,000 cubic feet of floodplain storage (see

Section 2.3.5). The additional flood storage areas will be designed to comply with WPA performance standards for BLSF (see Section 2.3 for additional detail). The locations of proposed floodplain storage areas are shown on Figures 2-1 and 6-34.

With regard to the Sales Creek RFA, activities in this location are limited to proposed stormwater management system improvements and upgrades and construction of a small floodplain compensatory storage area adjacent to Sales Creek at the north end of the site. A portion of the RFA is previously developed and degraded as defined under 310 CMR 10.58(5). Proposed upgrades to the stormwater management system, including any new or modified discharges, will be appropriately set back from Sales Creek and will comply with MassDEP stormwater standards. No work will occur on or below the Inland Bank of Sales Creek or its adjoining BVW. Proposed upgrades to the stormwater management system should substantially improve the quality of stormwater discharged to Sales Creek relative to existing conditions. In addition, the proposed development will decrease impervious area on the site by approximately 14 acres, thereby reducing the rate and volume of stormwater leaving the site. The Proponent evaluated a number of alternatives to reduce impervious surfaces, including but not limited to reduced parking ratios, consolidated parking areas, building footprints, and the incorporation of green space and landscaping into the overall design. Sustainable site design measures are described in Section 2.0, and proposed stormwater management is described in Section 9.3.

Activities in the 100-foot buffer zone to BVW and Inland Bank include construction of the proposed entrance drive and parking areas, utility connections, and upgrades to the stormwater management system, including construction of LID bioretention basins. These activities will occur in previously developed areas of the buffer zone comprised of impervious surfaces or urban fill. No work is proposed in BVW or Inland Bank. Sedimentation and erosion controls will be installed along the limit of work line in these locations to protect the adjacent resource areas.

6.9.1.3 Compliance with Wetlands Protection Act General Performance Standards for On-Site Activities

In accordance with 310 CMR 10.03(1)(2), activities proposed within RFA and BLSF will contribute to the protection of interests identified in the WPA by complying with the general performance standards established for each area. Additional information is provided below.

Bordering Land Subject to Flooding

310 CMR 10.57(4)(a)(1) - Compensatory storage shall be provided for all flood storage volume that will be lost as the result of a proposed project within Bordering Land Subject to Flooding, when in the judgment of the issuing authority said loss will cause an increase or will contribute incrementally to an increase in the horizontal extent and level of flood waters during peak flows.

The Project will not result in the loss of any flood storage volume within BLSF on the Project site. On the contrary, proposed grading activities will result in a net *increase* of approximately 60,000 cubic feet of floodplain storage capacity (see Figure 6-34). Table 6-34 demonstrates that compensatory flood storage will be provided for all flood storage volume that will be permanently lost as a result of the Project. The volume will be created in areas not previously used for flood storage and will be incrementally equal to or greater than the theoretical volume of flood water lost at each elevation, up to and including the 100-year flood elevation, which will be displaced by the Project.

Table 6-34 Cut and fill impacts in existing 100-year floodplain along Tomasello Drive.

Elevation (feet)	*Fill (cubic feet)*	*Cut (cubic feet)*	*Net (cubic feet)*
Along Tomasello Drive			
14-15	3000	-9000	-6000
15-15.5	10000	-12000	-2000
total	*13000*	*-21000*	*-8000 (compensatory storage)*
North Parking Lot/CAFO Parking Lot			
11-12	800	-1000	-200
12-13	7000	-10000	-3000
13-14	20000	-27000	-7000
14-15	33000	-58000	-25000
15-15.5	19000	-36000	-17000
total	*79800*	*-132000*	*-52200 (compensatory storage)*
Total Site			
11-12	800	-1000	-200
12-13	7000	-10000	-3000
13-14	20000	-27000	-7000
14-15	36000	-67000	-31000
15-15.5	29000	-48000	-19000
total	*92800*	*-156000*	*-60200 (compensatory storage)*

310 CMR 10.57(4)(a)(2) - Work within Bordering Land Subject to Flooding, including that work required to provide the above-specified compensatory storage, shall not restrict flows so as to cause an increase in flood stage or velocity.

As depicted on Figure 6-34, the proposed compensatory flood storage areas have been designed and sited so as not to restrict flows that in turn could potentially cause an increase in flood stage or velocity.

310 CMR 10.57(4)(a)(3) - Work in those portions of bordering land subject to flooding found to be significant to the protection of wildlife habitat shall not impair its capacity to provide important wildlife habitat functions. Except for work which would adversely affect vernal pool habitat, a project or projects on a single lot, for which Notice(s) of Intent is filed

on or after November 1, 1987, that (cumulatively) alter(s) up to 10% or 5,000 square feet (whichever is less) of land in this resource area found to be significant to the protection of wildlife habitat, shall not be deemed to impair its capacity to provide important wildlife habitat functions. Additional alterations beyond the above threshold, or altering vernal pool habitat, may be permitted if they will have no adverse effects on wildlife habitat, as determined by procedures contained in 310 CMR 10.60.

According to 310 CMR 10.57(1)(a)3, certain portions of BLSF may be treated as potentially significant to the protection of wildlife habitat. These include areas on the "lower floodplain" which is comprised of the ten-year floodplain or the portion of BLSF that is located within 100 feet of the Bank or BVW (whichever is farther from the waterbody or waterway, as long as such area is contained within the 100-year floodplain), and all vernal pool habitat on the 100-year floodplain.

Approximately 106,000 square feet of lower floodplain on the Project site will be altered, but proposed impacts are confined to areas extensively altered by human activity (e.g., paved surfaces, urban fill) adjacent to existing previously-developed areas and major roadways, thus resulting in no impacts to wildlife habitat.

There are no mapped certified or potentially certifiable vernal pools located on or near the Project site.

Riverfront Area

The Sales Creek RFA is 25 feet wide in the cities of Revere and Boston. Sales Creek is surrounded on all sides by impervious surfaces from existing parking lots, horse stables, and related maintenance facilities. A narrow band of woody and herbaceous vegetation exists along the side slopes of Sales Creek and includes small saplings, shrubs, and pockets of common reed.

Activities proposed in the Sales Creek RFA include stormwater management system improvements including installation of flared-end structures and riprap erosion control that will discharge from the closed drainage system to Sales Creek and construction of a small floodplain compensation area. Proposed upgrades to the stormwater management system, including any new or modified discharges, will be set back from Sales Creek and will comply with MassDEP stormwater standards. No work will occur on or below the Inland Bank of Sales Creek or its adjoining BVW. Proposed upgrades to the stormwater management system should substantially improve the quality of discharged water relative to existing conditions.

While a portion of the RFA where work is proposed can arguably be classified as "previously developed and degraded" as defined under 310 CMR 10.58(5), the Project has nonetheless been designed to comply with the General Performance Standards for undeveloped RFA as follows.

310 CMR 10.58(4)(a) - Protection of Other Resource Areas. The work shall meet the performance standards for all resource areas within the riverfront area, as defined in 310 CMR 10.30 (coastal bank), 10.32 (salt marsh), 10.55 (Bordering Vegetated Wetland), and 10.57 (Land Subject to Flooding). When work in the riverfront area is also within the buffer zone to another resource area, the performance standards for the riverfront area, shall contribute to the protection of the interests of MGL c. 131, §40 in lieu of any additional requirements that might otherwise be imposed in the buffer zone within the riverfront area.

Activities proposed in the RFA do not involve alterations to Bank, LUW, or BVW. These resource areas will be protected during construction by sedimentation and erosion controls and a clear limit of work setback. Activities proposed in BLSF have been designed to conform to the relevant performance standards as demonstrated herein.

310 CMR 10.58(4)(b) - Protection of Rare Species. No project may be permitted within riverfront area which will have any adverse effect on specified habitat sites of rare wetland or upland vertebrate or invertebrate species, as identified by the procedures established under 310 CMR 10.59 or 10.37 or which will have any adverse effect on vernal pool habitat certified prior to the filing of the Notice of Intent.

This standard is not applicable. No portion of the Project site is mapped as rare species habitat by the NHESP.

310 CMR 10.58(4)(c) - Practicable and Substantially Equivalent Economic Alternatives. There must be no practicable and substantially equivalent economic alternative to the proposed project with less adverse effects on the interests identified in M.G.L. c. 131 §40.

Section 1.9 contains an analysis of potential alternatives, including development alternatives, on the Project site. Activities proposed in the RFA have been avoided to the maximum extent practicable and are limited to minor stormwater management system improvements and upgrades, compensatory flood storage and grading associated with the proposed parking lot and access drive. All of the proposed parking areas, buildings, and access drives have been sited outside the RFA. Proposed upgrades to the stormwater management system, including any new or modified discharges, will be set back as far as possible from Sales Creek and will comply with MassDEP stormwater standards. Because of topographic constraints it is not feasible to locate stormwater discharges outside the RFA and still convey treated stormwater runoff to the creek. No work will occur on or below the Inland Bank of Sales Creek. Proposed upgrades to the stormwater management system should substantially improve the quality of discharged water relative to existing conditions.

310 CMR 10.58(4)(d) - No Significant Adverse Impact. The work including proposed mitigation measures must have no significant adverse impact on the riverfront area to protect the interests in M.G.L. c. 131 §40. Within 25 foot riverfront areas, any proposed work shall cause no significant adverse impact by:

a. Limiting alteration to the maximum extent feasible, and at a minimum, preserving or establishing a corridor of undisturbed vegetation of a maximum feasible width. Replication and compensatory storage required to meet other resource area performance standards are allowed within this area; structural stormwater management measures shall be allowed only when there is no practicable alternative;

As demonstrated under 310 CMR 10.58(4)(c) above, alterations to RFA have been limited to the maximum extent feasible with only limited disturbance to existing vegetation. Proposed upgrades to the stormwater management system, including any new or modified discharges, will be set back as far as practicable from Sales Creek and will comply with MassDEP stormwater standards. Because of topographic constraints it is not feasible to locate stormwater discharges outside the RFA. No work will occur on or below the Inland Bank of Sales Creek. Proposed upgrades to the stormwater management system should substantially improve the quality of discharged water relative to existing conditions.

b. Providing stormwater management according to standards established by the Department;

The Project includes a new stormwater management system that should significantly improve existing conditions. In addition, the proposed development will decrease impervious area on the site by approximately 14 acres and will harvest rainwater from building roofs for reuse, thereby reducing the rate and volume of stormwater leaving the site. A combination of conventional and LID drainage BMPs will be included as part of the site's drainage design. These measures will include water quality swales, bioretention basins, catch basins with hoods and sumps, and proprietary structural water quality units. See Section 9.3 for additional information demonstrating compliance with MassDEP stormwater standards.

c. Preserving the capacity of the riverfront area to provide important wildlife habitat functions. Work shall not result in an impairment of the capacity to provide vernal pool habitat when identified by evidence from a competent source but not yet certified; and

The limited amount of work proposed in the 25-foot RFA will not impact the capacity of the RFA to provide important wildlife habitat functions (assuming such functions even exist in the proposed impact area).

d. Proposed work shall not impair groundwater or surface water quality by incorporating erosion and sedimentation controls and other measures to attenuate nonpoint source pollution.

Sedimentation and erosion control devices will be installed along the limit of work to protect Sales Creek during construction. These devices will be routinely inspected and maintained throughout the duration of construction until the work area has been stabilized with vegetation or other means.

6.9.2 Off-Site Wetland Resource Areas

Environmental Scientists from VHB identified wetlands and other resource areas that occur in proximity to potential off-site roadway improvements. The purpose of this effort was to estimate the extent of wetlands, resource areas and buffer zones regulated under the Massachusetts Wetlands Protection Act, Section 401/404 of the U.S. Clean Water Act and local Revere Wetland Ordinance.

Table 6-35 presents a summary of wetlands and other resource areas that have been identified and their corresponding jurisdictional status under the Wetlands Protection Act and Revere Wetlands Protection Ordinance. For the purpose of this evaluation, VHB assumed that all of the vegetated wetlands and streams located in proximity to the off-site improvements are jurisdictional "waters of the US" as defined under Section 401 and 404 of the U.S. CWA. The general location of off-site roadway improvements that are proximal to wetland resources are depicted on Figure 6-35. The approximate limits of the wetland resource areas in each of these areas and estimated impacts are depicted on Figures 6-35 through 6-39.

In general, wetland resources were identified within or immediately adjacent to four areas where off-site roadway improvements are anticipated. These wetland systems (identified as Off-site Wetlands 1 through 4) are located in Boston, Chelsea and/or Revere. Off-site Wetlands 1, 2 and 4 are jurisdictional under the Massachusetts WPA and include LUW, inland Bank, BVW, RFA, Salt Marsh, and/or Coastal Bank. Off-site Wetland (OSW) 3 consists of a scrub-shrub swamp that occupies an isolated depression. This wetland does not appear to be regulated under the WPA (because it does not border or drain to or from a water body or watercourse and does not confine enough standing water to be regulated as Isolated Land Subject to Flooding) but is assumed to be jurisdictional under the CWA as a water of the U.S.

According to FEMA FIRM panels 25025C0017G, 25025C009G and 25025C0038G, OSW 1, 2 and 4 lie within areas subject to flooding (Zone AE) during a 100-year frequency storm event. Based on the configuration of the floodplains depicted on the panels and their proximity to coastal water bodies, these areas are characterized as Land Subject to Coastal Storm Flowage under the WPA.

OSW 2 is part of the Rumney Marshes ACEC. As determined through the review of the Massachusetts Natural Heritage Atlas, the off-site roadway improvements will not occur within any areas of Priority Habitat or Estimated Habitat for state-listed species. There are also no mapped certified or potentially certifiable vernal pools located on or near the off-site roadway improvements.

Table 6-35 Summary of Off-Site Jurisdictional Wetland Resource Areas under the Wetlands Protection Act and Revere Wetlands Ordinance

Wetland Identifier[19]	Inland Bank	Land Under Waterways	Bordering Vegetated Wetland	Riverfront Area	Salt Marsh	Land Subject to Coastal Storm Flowage	Coastal Bank	Federal Wetland	Comments
OSW1					•	•	•	•	Off-site Wetland 1 consists of an approximately 200-square-foot Salt Marsh, which borders a small tidal creek, located between a former railroad bed adjacent to Chelsea Creek and a vertical retaining wall on the west side of Route 1A. Coastal bank occurs along both sides of the marsh and along the retaining wall. Where not composed of the retaining wall, the coastal bank is moderately-sloping (3:1) and is currently stabilized by a mixture of rock armor and dense vegetation. For these reasons, the coastal bank associated with Off-site Wetland 1 functions as a vertical buffer to storm waters. Salt Marsh and coastal bank have a 100-foot buffer zone under the WPA and the Revere Ordinance. Additionally, FEMA mapping of the area indicates that the resource Land Subject to Coastal Storm Flowage (LSCSF) occurs on Route 1A in the vicinity of OS1.
OSW2	•	•	•	•		•		•	Off-site Wetland 2 is a combination of an emergent marsh and open water associated with Sales Creek. This system occurs on both sides of Revere Beach Parkway, immediately southeast of the intersection with North Shore Road. It is located in the Rumney Marshes ACEC. Resource areas associated with OS2 include LUW, Bank, and BVW. Because it is identified as a perennial watercourse, and the area is considered a DDA, there is a 25-foot wide RFA from the mean annual high water line (MAHWL) of Sales Creek. The BVW and Bank (where not bordered by wetlands) have an associated 100-foot buffer zone under the WPA and Revere Ordinance. Additionally, FEMA mapping of the area indicates that the resource area LSCSF extends across portions of Revere Beach Parkway that are located southeast of the intersection with North Shore Road.
OSW3								•	Off-site Wetland 3 is an isolated wetland area located at a low point between the Route 16 westbound and eastbound lanes, just north of the intersection with Winthrop Avenue. The wetland does not have a hydrologic connection to other resource areas and therefore is not regulated under the WPA as BVW but may be regulated under the federal Clean Water Act as a water of the U.S.
OSW4	•	•	•	•	•	•	•	•	Off-site Wetland 4 is salt/brackish marsh and tidal creek complex located at the western limit of Mill Creek at the interchange of Revere Beach Parkway (Route 16) and Route 1. Under the WPA and Revere Ordinance, OS4 is regulated as Salt Marsh, Coastal Bank, LUW, inland Bank and BVW. The coastal banks associated with Off-site Wetland 4 are moderately sloping (3:1) and are stabilized with a dense cover of vegetation. Accordingly, they function as a vertical buffer to storm waters. RFA (25-feet wide in Chelsea and 200-feet wide in this section of Revere) extends from the MAHWL of Mill Creek. Under the WPA and Revere Ordinance, a 100-foot buffer zone extends from the limits of Salt Marsh, Coastal Bank, Inland Bank (where not bordered by wetlands) and BVW. Additionally, FEMA mapping of the area indicates that the on/off ramp infields and portions of the roadways are inundated during storm events. These areas are regulated as LSCSF under the WPA and Revere Ordinance.

[19] Off-site wetlands identified were not delineated in the field. Wetland boundaries were interpolated from aerials and available wetland mapping, inspected in the field, and refined as necessary using a GPS with sub-meter accuracy.

6.9.2.1 Roadway Improvements and Potential Wetland Impacts to OSW1

The off-site improvements planned along Route 1A (Gen. William McClellan/Lee Burbank Highway) will occur within and adjacent to resource areas associated with Off-site Wetland 1. As currently proposed, direct impacts to wetland resources associated with the improvements (adding turning lanes by reducing the width of the grassed median) will include approximately 64,000 square feet of work within LSCSF and work within the 100-foot buffer zone to coastal bank.

To achieve full compliance with roadway standards, MassDOT may require full width shoulders which could necessitate relocating the sidewalk along the west side of Route 1A in this area. If so, the off-site roadway improvements will require the alteration of approximately 70 linear feet of Coastal Bank, approximately 200 square feet of work in Salt Marsh and an additional 3,000 square feet of work in LSCSF. As identified in Table 6-35, the coastal bank in this area is stable (a combination of vertical retaining wall and a moderately-sloping landform) that functions as a buffer to storm waters.

These impacts, if required, can be allowed under the limited project provision cited at 310 CMR 10.24(7)(c)(1) of the WPA Regulations, which allows for maintenance and improvement of existing public roadways (including widening less than a single lane and adding shoulders). As required by the limited project provision, the proposed work will not adversely impact habitat of rare vertebrate or invertebrate species. If needed, the Proponent will consult with resource agencies regarding appropriate mitigation for any loss of Salt Marsh resulting from off-site roadway improvements proposed in this area. As the overall configuration of the coastal bank will not change, the work will not reduce the bank's capacity to function as a buffer to storm waters. The WPA regulations do not prescribe any performance standards for work in LSCSF. In compliance with the General Provisions cited in 310 CMR 10.24(1) of the WPA Regulations, erosion/sedimentation controls will implemented and a clear limit of work will be established to ensure that the construction of these improvements does not adversely impact the adjacent Coastal Bank and abutting Salt Marsh.

6.9.2.2 Roadway Improvements and Potential Wetland Impacts of OSW2

Off-site roadway improvements proposed in proximity to Off-site Wetland 2 include reconfiguring a cross walk and constructing a dedicated right hand turning lane from Revere Beach Parkway/Winthrop Avenue to Tomasello Drive. These improvements are expected to entail approximately 2,700 square feet of work in RFA associated with Sales Creek and approximately 35,000 square feet of work in LSCSF. As indicated earlier, work in LSCSF is not governed by any performance standards. The work in RFA can be permitted as a limited project for maintenance and improvement of existing public roadways (including correcting substandard intersections) cited at 310 CMR 10.53(3)(f) and/or as a redevelopment project (improvement of existing roads) as defined under 310 CMR 10.58(5). The reconfigured cross walk and proposed turning lane will be constructed in

portions of the RFA that currently consist of maintained lawn. The improvements will incorporate elements such as stormwater improvements and enhancing and/or restoring areas presently covered by lawn with native plantings to improve upon the capacity of the RFA to protect the interests of the WPA.

Work will also occur in the 100-foot buffer zone to BVW and Inland Bank. Erosion and sedimentation controls will be installed and maintained throughout the work period in order to comply with the requirements cited at 310 CMR 10.53(1).

6.9.2.3 Roadway Improvements and Potential Wetland Impacts of OSW3

The off-site roadway improvements planned at the intersection of Route 16 and Revere Beach Parkway/Winthrop Avenue will occur near but not in Off-site Wetland 3. This isolated wetland is not regulated under the WPA and does not have an associated 100-foot buffer zone.

6.9.2.4 Roadway Improvements and Potential Wetland Impacts of OSW4

Options to improve traffic circulation are being considered at the interchange of Route 1 and Route 16 in Chelsea and Revere. None of these potential off-site roadway improvements will entail work within salt marsh, coastal bank, LUW, inland bank or BVW. Work will occur in up to 220,000 square feet of LSCSF, which is not governed by performance standards. The off-site improvement could also entail the alteration of up to 18,000 square feet of RFA associated with Mill Creek.

All of this work will occur in areas occupied by existing roadways or maintained lawn areas. Accordingly, these improvements can be permitted under the provisions for the redevelopment of previously developed RFA contained in 310 CMR 10.58(5) (improvement of existing roads) of the WPA Regulations. The design of these improvements will incorporate stormwater management features and the restoration/enhancement of degraded areas (by planting native shrub and tree species) to improve upon the ability of the RFA to protect the interests of the WPA.

The off-site roadway improvements planned at this location will entail work within the 100-foot buffer zone to salt marsh, coastal bank, and BVW. In compliance with the General Provisions cited in 310 CMR 10.24(1) and 310 CMR 10.53(1) of the WPA Regulations, erosion and sedimentation controls and the above-described restoration/enhancement measures will be implemented to ensure that the work in buffer zone does not adversely affect the adjacent resource areas.

6.10 Geotechnical Impacts and Groundwater

This section addresses impacts of the below-grade construction activities anticipated for the proposed Project. Site soil and groundwater conditions, earthwork, and anticipated foundation construction methods, which are based on available subsurface information, are

all addressed herein. Below-grade construction will likely involve installation of deep foundation elements including driven piles, drilled piles, pressure-injected footings, utility relocations and installations, and roadway construction. Below-grade space is planned in the areas beneath Casino Area II, Hotel I, and the parking structure.

6.10.1 Subsurface Conditions

Based on the results of a recent test boring program completed at the site and borings previously completed by others, subsurface soil conditions underlying the proposed Project are expected to be characterized by the general soil profile described in Table 6-36.

Table 6-36 General soil profile at the Project site.

Generalized Description	*Approximate Thickness of Layer (ft)*
Fill	4 to 28
Estuarine/Organic Deposits	5 to 56
Marine Deposits	7 to 63
Glacial Deposits	1 to 26
Bedrock (Cambridge Argillite)	Depth to Rock of 50 to 138 ft

6.10.2 Groundwater Conditions

Per the *Geotechnical Investigation, Suffolk Downs, East Boston and Revere, Massachusetts*, report by GEI Consultants, Inc. dated February 12, 2007, historical measurements of observation wells have indicated groundwater levels ranging from 0.5 to 16 feet below site grades, although groundwater was generally observed on the order of 2 to 6 feet below grade (or approximately El 7 to 14 BCB). In recent test pit explorations, groundwater was typically observed at depths of 2.5 to 7 feet below site grades. Haley & Aldrich is currently obtaining groundwater measurements from an observation well on site. Seasonal fluctuations in groundwater levels can be expected.

The Project site is not located in Boston's Groundwater Conservation Overlay District (GCOD), which includes those areas in Boston having wood pile-supported buildings that are potentially susceptible to possible effects from depressed groundwater levels. Thus, the Project is not subject to the requirements of Article 32 of the Boston Zoning Code.

6.10.3 Excavation and Building Foundation Construction

Foundation support requirements for the new structures are currently being developed. The current level of design for building foundations is based on available information:

- The proposed Casino Area II, Hotel I, and parking garage structures will likely be supported on deep foundations consisting of either precast pre-stressed concrete piles or steel H-piles driven to end-bearing in either glacial deposits or bedrock. The foundation system for the new structures was selected by considering depth to suitable bearing, preliminary structural loading and column spacing, and the need to mitigate potential building settlement. Means and methods for installation of the deep foundation system will consider potential impacts to abutting facilities within the property limits (e.g., the grandstand). Vibration monitoring will be conducted during pile driving activities. It is not anticipated that vibrations will approach thresholds that could potentially impact existing facilities.

  The Casino Area II, Hotel I, and parking garage structures will include one level of below-grade space. Lowest-level floors are expected to consist of framed structural slabs. Small cuts and fills will be required to construct the new structures, but large-scale filling within the proposed building footprints is not expected to be necessary. However, grade raises of up to 10 feet outside Casino Area II, Hotel I, and the parking garage are planned.

- The existing grandstand building to be renovated into Casino Area I will likely be supported on its existing pile foundations coupled with new, supplemental deep foundation elements. It is expected that the lowest level slab for this building will be a reinforced structural slab bearing within a few feet of current existing grades. Supplementary foundation support required for the lowest level slab and possibly columns is expected to include a foundation system associated with low vibrations and low headroom requirements for installation, such as micropiles.

- The proposed maintenance building will likely be supported on pressure-injected footings (PIFs, also known as Enlarged Base Piles), bearing in the marine sand layer approximately 30 feet below ground surface. The proposed maintenance building is expected to bear on either a structural slab or a soil-supported slab-on-grade. Presently, no site filling is planned for this area.

- In an effort to control Project costs and lower the carbon footprint associated with the Project, the intent is to keep soils on-site to the extent possible, thus reducing the need for off-site disposal or transport of soil. Although local soil cuts will be required for building construction, deep excavations requiring extensive lateral earth support systems are not planned. Small excavation support systems may be

required locally for basement, elevator pit, or similar excavations and, given the relatively shallow depth to groundwater in some areas, temporary construction dewatering efforts may be required to allow for construction in-the-dry.

- The lowest-level floor slabs for the new buildings may have under-slab drainage systems and likely will need to be waterproofed.

6.10.4 Project Plans and Specifications

Project design and construction will incorporate measures to detect and avoid potential adverse impacts to nearby structures and facilities. The Proponent will coordinate with abutters prior to and during construction regarding construction methods, potential impacts, monitoring, communication, and mitigation.

Performance criteria will be established in construction contract documents relative to groundwater level maintenance, vibrations, dust control, noise, and other items. The contractor will be required to conform to the performance criteria outlined in the specifications and to take necessary steps during construction to protect nearby facilities and minimize impacts. The contractor will be required to submit reports documenting conformance with requirements to the Project team prior to work. Prior to construction, the contractor will be required to submit to the Project team contingency plans for remedial measures in the event that unacceptable performance occurs.

A monitoring program, including the following, will be performed to establish compliance with performance criteria:

- Groundwater level monitoring during construction dewatering;
- Vibration monitoring during pile driving activities;
- Noise monitoring;
- Dust monitoring; and
- On-site monitoring by the Owner's geotechnical consultant.

6.11 Hazardous Materials and Solid Waste

This section addresses the known existing environmental conditions and potential impacts of contamination on the proposed redevelopment activities. It also discusses management of construction and demolition debris.

6.11.1 Regulatory Status

The Project site was reported to MassDEP by its previous owner, Belle Isle Limited Partnership, on February 21, 1997 for a release in soil and groundwater related to heavy metals, petroleum, and polyaromatic hydrocarbons (PAHs). The reportable conditions were identified during a due diligence environmental investigation completed in association with a real estate transaction and the site was assigned Release Tracking Number (RTN) 3-14857.

Completion of a subsequent subsurface investigation, sampling and testing program of soil and groundwater media and a Method 3 Risk Characterization by Rizzo Associates, Inc. (Rizzo) found that a condition of No Significant Risk to human health or the environment exists at the release areas of the site, and No Significant Risk was identified both for current and future hypothetical residential uses. In February 1998, Rizzo closed the site under the Massachusetts Contingency Plan (MCP) with submission of a Class B-1 Response Action Outcome (RAO) supported by the risk characterization to MassDEP. No Activity and Use Limitation (AUL) has been placed on the property. Details regarding the release and subsequent site closure can be found in the RAO Statement, Suffolk Downs, East Boston and Revere, Massachusetts, RTN 3-14857, February 12, 1998, prepared by Rizzo.

Additional subsurface investigations with soil and groundwater sampling and testing were completed by GEI Consultants, Inc. in 2007. The Phase I/II report notes that chemical testing indicated the presence of low levels of VOCs, PAHs, petroleum hydrocarbons, metals, and cyanide in soil and/or groundwater, which is relatively common at urban sites. Based on the findings, GEI Consultants concluded that no new MCP reportable conditions exist with respect to soil or groundwater. Details from the study and investigation can be found in *Phase I/Phase II Environmental Site Assessment, Suffolk Downs, East Boston and Revere, MA*, GEI Consultants, Inc., February 14, 2007.

Haley & Aldrich has been engaged by the Proponent to provide environmental consulting services during Project design and construction. If contamination is identified in pre-construction sampling or during construction, a Licensed Site Professional (LSP) will provide services consistent with the MCP as required for regulatory compliance and close-out. The Project environmental consultant will ensure that the Project conforms to MCP regulatory requirements for construction of buildings in contaminated areas, and that all required submittals will be provided to MassDEP.

6.11.2 Project Health & Safety Plans

Project health and safety plans to protect worker safety will be created prior to construction and will be included as part of the Contract Documents. Health and safety plans will be detailed documents tailored to meet specific needs at the Project site.

6.11.3 Soil Management

Site-specific information regarding environmental conditions related to the presence of oil and hazardous materials was summarized in the above-referenced reports. Though the Proponent's intent is to limit off-site disposal or transport of excavated soils, foundation construction and associated earthwork activities for the new buildings will likely generate soil that may require off-site transport. The soil will likely consist primarily of urban fill materials generated from pile cap construction and installation of an on-site stormwater recharge system. Chemical testing of the material will be required for acceptance by receiving facilities to confirm chemical constituents and contaminants present. Additional testing of the specific soil material to be generated is planned. Chemical testing of the material will be conducted prior to construction in accordance with facility requirements.

Any material leaving the Project site will be required to be legally transported in accordance with local, state, and federal requirements. In addition, unanticipated conditions related to oil and hazardous materials will be managed in accordance with appropriate MassDEP regulatory requirements. In the event that potential contaminants are detected at levels above reportable concentrations, they will be compared with those previously observed in the historical release under RTN 3-14857. If the contamination is consistent with previous observations, there would be no new reporting obligation to MassDEP under the MCP and construction could be managed outside of the regulatory process as post-RAO construction. If this is not the case and there is evidence of new contamination that is not consistent with that previously observed, then a reporting obligation would exist and construction would need to be completed under a Release Abatement Measure (RAM) Plan within the regulatory process.

6.11.4 Vapor Intrusion

Indoor air quality will be evaluated and tested by the Project environmental consultant, as appropriate, in buildings that are to remain or be renovated. The need for protective measures such as vapor barriers will be determined during final design. The potential for methane migration (from organic deposits) will be assessed by the Project environmental consultant during final design.

6.11.5 Underground Storage Tanks

Based on existing information, one active underground storage tank (UST) exists on site. The existing UST is a 7,000-gallon partitioned gasoline and fuel oil tank located near the northwest corner of the existing building. During construction, the existing UST will be removed and a new UST will be installed near the proposed maintenance building. The Project LSP will ensure that tank removal and closeout is completed in accordance with the MCP and requirements for the city of Revere. In addition, previously-unknown USTs encountered during construction will be managed similarly, as needed.

6.11.6 Summary

Based on available subsurface data and proposed development plans, below-grade construction and earthwork activities are expected to be completed using conventional methods typical for similar construction projects in an urban environment. Appropriate controls and monitoring will be implemented to document compliance with Project requirements.

Based on available soil and groundwater analytical data, subsurface conditions on the Project site are typical of sites in urban environments. Appropriate measures including supplemental investigations, remediation if needed, soil and groundwater management during construction, as well as required regulatory compliance will be implemented if needed to perform the work in accordance with all applicable regulations.

6.12 Detailed Construction Schedule

The Project will be constructed in one continuous phase. Staging plans provided as Figures 6-40 through 6-46 illustrate the anticipated progress of construction throughout the Project site. In general, the stages of construction are divided into the following categories:

Months 1 to 5: Erosion control, perimeter fencing, and protection measures will be installed. Demolition will take place during this stage at the outbuildings, several dilapidated horse barns, administrative building, parking areas, and selective demolition of the grandstand; a demolition plan is provided as Figure 6-47. A crushing plant will be set up on site to reclaim concrete and asphalt materials for reuse at a later date. Initial work will commence to establish the site roadway system and site excavation. Pile driving for the grandstand, garage, CUP, and Casino Area II (partial) will commence. The construction site layout for months 1 through 5 is shown on Figure 6-40.

Months 5 to 8: Site excavation will continue, including pile driving for the grandstand, new maintenance building, and CUP. Work will continue to establish the site roadway system and required staging and laydown areas. The construction site layout for months 5 through 8 is shown on Figure 6-41.

Months 8 to 14: Foundation and superstructure construction will commence for Casino Area II, Hotel I, and the parking garage. Site work will continue on parking areas, and interior construction will be ongoing within the grandstand and clubhouse buildings. The patron parking area will be turned over for the racing patrons. Roadway and utility work will continue throughout the site. The new maintenance building will be completed. The construction site layout for months 8 through 14 is shown on Figure 6-42.

Months 14 to 17: The superstructure for Casino Area II, Hotel I, and the parking garage will be completed, and façade infrastructure will be ongoing. Fit-out of Casino Area I and the clubhouse will continue to completion during this stage. Patron parking areas will be

completed, as will the major roadway infrastructure, the latter of which will be landscaped and turned over for use. The construction site layout for months 14 through 17 is shown on Figure 6-43.

Months 17 to 20: Casino Area I and the clubhouse will be complete and fully operational at this time. The parking garage will be complete and in operation. Casino Area II and Hotel I will be fully enclosed, and finish operations within the buildings will be well underway. Reconstruction of Tomasello Drive, including landscaping, will be completed. The construction site layout for months 17 through 20 is shown on Figure 6-44.

Months 20 to 26: Final finishing activities will be ongoing in Casino Area II and Hotel I, and site finishes and landscaping will be completed for full Resort turnover at the end of the month 25. The construction site layout for months 20 through 25 is shown on Figure 6-45; site layout for month 26 is shown in Figure 6-46.

Route 1A Infrastructure Improvements: Construction of the Route 1 infrastructure improvements will be complete by month 26.

Off-site Roadway Improvements: The Project includes transportation improvements in both the Cities of Boston and Revere. Proposed improvements are memorialized in the HCAs and are described in detail in Section 5.0. Assuming all state and local permits and approvals have been received, construction of these improvements will be completed in accordance with those HCAs. Proposed improvements are shown in Attachment A.

Section 7.0

Greenhouse Gas Analysis

7.0 GREENHOUSE GAS ANALYSIS

7.1 Introduction

This section addresses GHG emissions generated by the Project and options that may reduce those emissions, in accordance with the MEPA Greenhouse Gas Emissions Policy and Protocol (GHG Policy). The GHG Policy requires that certain projects undergoing review by the MEPA Office quantify the project's GHG emissions and identify measures to avoid, minimize, or mitigate such emissions. In addition to quantifying project-related GHG emissions, the GHG Policy also requires proponents to quantify the impact of proposed mitigation in terms of energy savings and GHG emissions.

The analysis provided herein focuses on emissions of carbon dioxide (CO_2). As noted in the GHG Policy, there are other GHGs, but CO_2 is the predominant contributor to global warming. Furthermore, CO_2 is by far the predominant GHG emitted from the types of sources related to the Projects and CO_2 emissions can be calculated for these source types with readily available data.

7.1.1 GHG Policy Summary

The GHG Policy requires the Proponent to calculate and compare the GHG emissions in two cases, each of which incorporates both stationary source and transportation components:

Case 1 is the baseline from which progress in energy use and GHG emissions reductions are measured. The Baseline case would be buildings that are designed to meet the current Massachusetts Building Code (Code) 8th edition, which incorporates the building energy provisions of the International Energy Conservation Code (IECC) 2009. However, pursuant to the Green Communities Act, the Board of Building Regulations and Standards (BBRS) has recently adopted IECC 2012, which will be fully effective on July 1, 2014. In this analysis, as agreed upon with the MEPA Office and Massachusetts Department of Energy Resources (DOER) on May 22, 2013, the Proponent has voluntarily applied IECC 2012 to define the Baseline.

Off-site transportation-related emissions would be modeled for the "build condition", without improvements or mitigation measures proposed by the Project, developed using the standard methodology outlined in the EEA/EOT Guidelines for EIR/EIS Traffic Impact Assessment. Use of onsite fleet vehicles (maintenance, security and shuttle buses, for example) are also included in the analysis.

Case 2 represents the proposed Project, including measures incorporated into the building shell, its MEP systems, lighting design, and other factors that go above and beyond those required for Code compliance.

Boston has elected to include the state's optional Stretch (Energy) Code into its building requirements and the Proponent anticipates that a new Stretch Code (SCII) will be proposed sometime in 2013 and will likely be effective by mid-2014. Although SCII has not yet been proposed by the BBRS, it is anticipated that it will require energy use of new large buildings to be 12-15% below the baseline of IECC 2012. Therefore, since the Project is expected to seek building permits beginning about mid-2014, this analysis targets compliance with the expected SCII as the minimum criterion for energy, and hence GHG, performance.

Transportation analysis for Case 2 includes the effects of roadway modifications and signalization proposed by the Project, and also includes effects of the TDM program proposed as part of the Project. In addition, new or modified fleet vehicle inventory and use is included as a direct source of GHG emissions.

In addition to these two cases, the Policy requires that all feasible mitigation measures that could reduce GHG emissions be considered. The Proponent has evaluated numerous stationary source GHG mitigation techniques comprised of design parameters and applied technologies, and construction and operating parameters, which are **generally referred to herein as "technologies" for convenience**. Some have been adopted, some designated for later evaluation for possible incorporation into the Project as design progresses, and some have been eliminated from further consideration.

7.1.2 Mitigation Technologies

GHG mitigation techniques are a mix of design techniques, applied technologies and operating methodologies. The Proponent has examined approximately 40 mitigation technologies for application to one or both of the Projects. Each technology has been placed in one of four categories:

- "P" - Proposed as part of the Project (included in Case 2);
- "S" - To be studied at some time in the future as design progresses;
- "X" - Rejected or not applicable.

A matrix of the technologies and buildings, and which category a technology falls into, is presented in Table 7-1. This matrix is indicative of the extensive and detailed efforts the Proponent is using to consider, early in the design of each building, various methods to maximize energy efficiency and mitigate GHG emissions.

Technologies grouped under Building Envelope and MEP Systems are the heart of GHG mitigation measures. "Other Related" technologies include additional measures that may indirectly affect GHG emissions, although their primary purpose is to accomplish other goals. For these measures, the GHG emissions reduction potentials are difficult to quantify with any reasonable accuracy and are numerically expected to be a small part of the overall mitigation. They are, therefore, not quantified in this analysis.

7.1.3 GHG Analysis Organization

GHG emissions can be categorized into two groups: emissions related to activities that are stationary on the site and emissions related to transportation. Activities on the site can be further broken down into direct sources and indirect sources: direct sources include GHG emissions from fuel combustion and indirect sources include GHG emissions associated with electricity and other forms of energy that are used on the site and are imported from off-site power plants via the regional electrical grid or local steam distribution system.

Design of the Project and GHG mitigation features included are described in Section 7.2 and energy modeling and GHG emissions of Project buildings are presented in Section 7.3. Mitigation technologies not currently included in the design are discussed in Section 7.4, while emissions and mitigation measures related to transportation are discussed in Section 7.5. The stationary and transportation GHG impacts are combined into a summary GHG analysis in Section 7.6, which also includes a summary of GHG emissions mitigation commitments. Supporting technical analyses are presented in Attachment D.

Table 7-1 GHG Mitigation Technologies Matrix

KEY: P = Proposed (Case 2)
S = to be studied at later design phase
X = Not applicable or not feasible

Mitigation Measure/Technology	New Bldgs					Remarks
Building Use	Grandstand / Casino I	Casino II	Hotel I	Hotel II	Pkg Garage	
Type	repurpose	new	new	new	new	
Energy Use Reduction					na	
Building Orientation or differential facades	S	S	P	S	na	
High performance building envelope	P				na	
Green roof/podium areas ▲	X			S	na	
Light or reflective roof	P				na	
Exterior shading devices ▲	S				na	
MEP Systems						
High efficiency heating equipt.	P				na	Central utilities plant
High efficiency cooling equipment	P				na	
Cogeneration, CHP	P				na	
Thermal storage	P					
Demand controlled ventilation	P	P	X	X	na	
Room occupancy sensor, lighting	P				na	back-of-house, public bathrooms, offices, meeting rooms, hotel rooms
Natural lighting / Daylighting	P	P	X	X	na	
High performance lighting, exterior	S			S	S	lighting plan in development
Reduced LPD interior	P					
Energy-Star appliances	P			S	na	
Advanced elevators	P					
District heating/cooling connection	X				na	None locally
Fuel cell	X				na	
Solar hot water generation	X			S	na	competes w/CHP
PV - roof	P	X	S	S	P	
PV - ground	P (parking area covers) S (additional areas)					
3rd Party PV	P					
PV-ready construction	na	X	P	S	na	
Ground source heat pumps	X				na	
Wind turbines	X				na	Logan Airport nearby
Food waste-to-energy	P (separation)				na	to 3rd party off-site energy conversion
Kinetic Energy Recovery	X					
Purchased Green Energy	P					
Rainwater harvest	P				na	
Low flow fixtures, water conservation	P				na	
Other Related (not quantified)						
LEED target	Gold					
Influence with tenant (lease provisions, tenant manual)	P				na	
Recycling collection areas	P				na	
Enhanced refrigerant management	S			S	na	
Energy management system	P					
Enhanced building commissioning	P			S	na	
Construction waste recycling	P					
Recycled content materials	P			S	P	
Regional materials	P			S	P	

7.2 Project Design

7.2.1 Overview

This section describes the various energy efficiency/GHG mitigation technologies that are currently incorporated in the design. Design of the Project is currently in the design development stage for all but Hotel II, which may be designed and constructed by a third party, though, as noted in Section 7.2.8.1, design criteria will be tightly controlled by the Proponent. Assuming issuance of a Category I gaming license, construction of the Project is expected to begin in mid-2014.

At all of its casino resorts, Caesars Entertainment implements an Environmental-Social-Governance sustainability strategy. This strategy, Code Green, is committed to addressing critical issues of energy, waste, water, and carbon emissions and seeks to engage Caesars' employees, guests and suppliers in efforts to reduce natural resource use, conserve energy, and promote reuse and recycling. In the past nine years, Caesars has invested nearly $70 million on energy conservation projects alone and has invested in more than 162 retrofits involving, among others items, energy-efficient lighting, improved air-handling systems, upgraded thermostats, advanced energy-saving sensors, and low-flow water controls and fixtures. Annual savings from these retrofits include in excess of 208 million kWh in energy, over 3.3 million therms in natural gas, more than $24 million in annual resources, and 150,000 tons of GHG emissions.

Building on the Code Green program, the Project will be sustainably designed, energy efficient, environmentally conscious, and healthy for its employees and visitors. Innovative technologies are currently being explored to determine what works best with the Project as well as what might set a visible example for those visiting the site. The Project will become Caesars company-wide standard-bearer for Code Green, putting forward its design innovations as a template for future development projects, renovations and repairs.

At the start of the design process, Caesars implemented an integrated design approach to review and establish applicable sustainable design goals for the Project. To achieve these sustainable goals and commitment to the City of Boston and Revere and the surrounding communities, regular interdisciplinary team meetings have been held since Project inception to ensure a fully integrated approach to sustainability. An interdisciplinary "Green Team" was established to brainstorm, investigate, and recommend potential sustainable design solutions for the Project. The Green Team meets bi-weekly to collectively review research and discuss the viability of implementing the proposed sustainable design measures and energy efficiency building systems components into the Project design.

The Proponent met with MassCEC on February 11, 2013 to explore the Project's approaches to sustainability and the potential for integrating emerging energy technology in conjunction with the design of the Project. MassCEC recommended that the Project

maximize local partnerships and providers whenever possible, which the Proponent has done and is continuing to do. MassCEC also suggested investigating a kinetic energy conversion technology as a possible commercial demonstration of an emerging technology (see Section 7.4.2.9).

The Proponent will utilize the nationally recognized LEED program as administered by the USGBC. LEED for New Construction and Major Renovation 2009 will be utilized to quantify the Project's various metrics relating to sustainability and "green" design. The Project is committed to achieving LEED Gold certification, as described further in Section 2.0.

7.2.2 Building Envelope

7.2.2.1 Orientation

The orientation of a building can have an influence on its energy use. For example, a long wall facing south can increase solar heat gain and maximize the potential for use of natural lighting. However, existing buildings, functional orientation, and other factors may require deviation from an ideal. Some compensation may include use of differing materials on various facades; perhaps reduced glazing on the north side, for example.

Limiting development intensity through an outward-oriented approach and repurposing the historic grandstand building as a casino are central to the overall massing and building orientation. A significant portion of the Project will be renovation of the existing clubhouse, link and grandstand buildings. These existing buildings are located along the track and have a long east-west orientation for optimal viewing of the races. The west façade of the existing grandstand building will be reconstructed to allow for natural daylight to filter into both the ground and second level of Casino Area I. New high performance glazing will be installed to reduce heat loss while maximizing natural daylight.

One major factor in siting the new Casino Area II, Hotels I and II, and the parking garage is the location of the floodplain zone on the site. Given the floodplain and existing racetrack restrictions, the site selected for the new construction is located to the west of the existing grandstand building. A new street pattern grid organizes the site into blocks, arrival courts, plazas, creating an urban streetscape. The blocks establish a series of buildings beginning with Hotel I, Casino Area II, Hotel II, and the winter garden connecting Casino Area I (which is in the renovated grandstand and clubhouse), and a parking structure.

When considering the massing of Hotel I, the initial concept was to reduce the scale and articulate the form with a language appropriate for its urban context. The nine-story Hotel I will be approximately 130 feet tall and will be sited facing east/west, offering the narrowest profile to the Orient Heights neighborhood while providing the opportunity for the form to be self-shading from early morning to late evening. The scale of the massing will be further articulated with a modern tripartite organization of base, body, and top.

7.2.2.2 High Performance Shell

The key elements of the building shell and mechanical component characteristics and efficiencies are presented in Attachment D.1 for both the Baseline and the Proposed Project for comparison. The Proposed case represents the current Project design, including measures incorporated into the building and MEP systems above and beyond those required for Code compliance. The Project is entering the design development stage, so it must be realized that the design presented herein will evolve further with the development process.

High performance low-e glazing paired with enhanced thermal performance wall and roof assemblies will help reduce energy consumption for heating and cooling loads and thermal loss. Significant renovations are planned to the west façade of the grandstand building that will include new exterior wall assemblies with insulation and high performance glazing systems. In addition to the façade upgrades a new roof will be installed with high R-value insulation. The building envelopes of Casino Area I and Casino Area II will also be designed with high performance systems to maximize thermal performance and reduce thermal losses.

As indicated as in Attachment D.1, proposed wall sections insulation value and glazing insulating and heat gain properties all exceed Code requirements. Glazing has been kept to a minimum consistent with the uses of the building. As design is evolving, the hotel glazing has been reduced from the 95% indicated in Attachment D.1 to less than 80%; however, this recent change is not reflected in the modeling presented in Section 7.3.1.

7.2.2.3 Reflective Roofs

Reflective or high albedo roofing aids in minimizing summer urban heat island effects. Light colored or reflective roofing materials with minimum SRI of 78 will cover at least 75% of the Project roofs.

7.2.2.4 Shading Devices

Shading devices are used to screen windows from the direct sunlight and subsequent heat gain of summer days. While use of shading devices will be studied as the design develops, some shading is provided by roof overhangs. The curving southwest façade of Hotel I coupled with interior window control devices will provide shading benefits and help reduce energy consumption. Additional exterior shading devices along the south and east podium façades will control and filter natural light into the ground floor of the casino and retail spaces.

As design detail is not yet available, no credit for shading devices has been included in the building energy modeling reported in Section 7.3.

7.2.3 Energy Supply

The Project includes a CUP containing boilers, CHP units, and chillers that will supply all of the new and repurposed buildings with hot water for space heating, domestic hot water (DHW), chilled water for air conditioning, and electricity. Hot and chilled water will be generated and distributed from the CUP.

7.2.3.1 Space Heating

Hot water for building heating will be generated from excess thermal capacity from the CHP system and by using condensing gas-fired boilers. Condensing boilers are very high efficiency units operating at thermal efficiencies in the 90-95% percent range, compared to approximately 80% efficiency for conventional boilers, which are allowed by Code.

7.2.3.2 CHP and Thermal Storage

The CUP will include two CHP units to produce electricity and hot water. Each CHP unit is comprised of a gas-fired reciprocating engine-generator set that produces 100 kW of electrical energy and, together, will provide approximately 5% of the Resort's annual electricity. Whereas utility power plants generate electricity, primarily from fossil fuels, at approximately 35 to 55% thermal efficiency, rejecting the remaining heat value of the fuel used to the environment, a CHP unit, by recovering otherwise-wasted heat to provide useable thermal energy and thus displacing fossil fuel, can operate at thermal efficiencies on the order of 55 to 85% depending on the design and operating characteristics.

Heat from the engines is captured to generate hot water. The CHP units are capable of supplying all of the DHW needs of the Resort and a portion of the space heating hot water. During the heating season, when the Resort can absorb all of the thermal output of the CHP units, they will operate at full capacity. In the non-heating season, the CHP units will follow the thermal needs for DHW and will operate at part-load most of the time. DHW demand varies with time of day, day of the week and seasonally. To help smooth the load so that the CHP can operate most efficiently, hot water storage is included both in the CUP and at the individual buildings to buffer peaks and troughs in demand.

Annual capacity factor of the CHP units is expected to be approximately 77% and average thermal efficiency approximately 80%, based on preliminary calculations (see Attachment D.3.1). (See also Section 7.4.2.3 for a discussion of other CHP options that were examined.)

7.2.3.3 Domestic Hot Water

The CUP will also include dedicated gas-fired boilers to generate DHW. One or more of these boilers will operate when peaks of DHW demand exceed the CHP units' output, or when one or both CHP units are out of service for maintenance.

7.2.3.4 Chilled Water

High efficiency electrically-driven centrifugal chillers at the CUP, and associated high efficiency cooling towers, will produce chilled water for distribution throughout the Project for air conditioning. Cooling towers will reject excess heat from the chiller cycle to the atmosphere. By using oversized cooling towers, cycle efficiency is improved during part-load operations, reducing annual energy requirements.

The efficiency of electric chillers has improved substantially in the past decade and changes in the Code have required that higher and higher efficiency chillers be utilized. The full load Coefficient of Performance, a measure of chiller efficiency, for the proposed chillers is approximately 10% better than required by the latest version of the Code (see Attachment D.1).

Wintertime "free cooling" will be provided to efficiently serve winter cooling needs and a condenser heat recovery system will be used to preheat incoming potable water. Both measures further increase the efficiency of the chiller plant.

7.2.3.5 PV Electricity Generation

PV systems are being integrated to the largest extent economically feasible in the development of this Project. The goal with the design is to maximize the amount of solar resource deployed without placing an undue annual financial burden on the site with regards to cost of power from the PV system.

A number of options and locations were considered for the installation of the PV collector arrays and equipment. The system types included: ground-mounted systems, roof-top mounted systems, dedicated structures for mounting panels, and parking canopy-mounted systems.

- **Ground-mount:** Ground–mounted arrays consist of PV panels on a framework that sits directly on the ground. Large utility-scale PV installations and landfill applications of PV are examples. While more cost-effective than systems mounted on structures, ground mounted arrays are not currently proposed for the Project, although some areas are still under consideration. Limited availability and competing uses of unused open area and aesthetics are criteria being evaluated.

- **Roof-top:** The traditional PV installation on a building is an array of collectors mounted on a flat or sloped roof, angled to face generally southward and with inclinations from horizontal to a considerable elevation above horizontal. Given the size and configuration of the proposed buildings on this site, it was determined that maximizing the amount of PV that can be mounted on available open roof areas is desirable.

The useable open area on the Hotel I roof is very small due to mechanical penthouses, vents and the lack of parapet walls. Nevertheless, it is being examined further, but not committed to, for potential of approximately 100 kW array. Much of the Casino Area II roof is shaded by the hotel tower or otherwise taken up with mechanical equipment and a greenhouse and is, therefore, not available for PV installation. The Hotel II roof was not considered as that would be a decision to be made by the hotel developer at a later date. Given the small size of the roof and required roof equipment, it is expected to be cost prohibitive to deploy PV on this small footprint.

A small maintenance building is being relocated from the area of the horse barns to an area adjacent to the CUP. This building is being examined for the potential for a small amount of additional PV, but no commitment is being made at this time.

The open roof area on the existing grandstand building, clubhouse, and the link building complex has the capacity for approximately 515 kW of PV capacity.

- **Dedicated Structures for Mounting Panels:** It is increasingly common to mount PV panels on dedicated structures. These structures can be both ground-based "solar tree" or building–based such as structures mounted to the side or on top of buildings. This Project will include a dedicated structure mounted above the top level of the parking garage with a capacity of approximately 930 kW of PV panels.

- **Parking Canopy Systems:** An increasingly common approach to gain unobstructed areas is to install parking canopies with PV panels in parking lots. There are a few examples of this in the Boston area, including the parking lot of the REI store in Framingham. These structures also provide shaded areas for parking cars. This Project will utilize a large section of the north parking lot to install approximately 1,250 kW of PV capacity.

With the roof-mounted and parking garage PV arrays totaling 1,445 kW, this will be one of the largest private building-mounted PV installations in the northeast U.S. and will be the largest in the Commonwealth of Massachusetts.

Thus the Project is currently planning on approximately 2.7 MW of PV capacity on the site, and continues to examine the potential for additional arrays. This 2.7 MW size is used in the energy and GHG analyses in Section 7.3 where it is estimated to produce approximately 10.2% of the annual electricity needs of the Resort.

Owning and operating a large PV system presents many challenges to the Proponent. There are significant capital costs (approximately $13 million for a 2.7 MW system at $5/W), initial risks such as the pending changes in the Solar Renewable Energy Credits (SREC) pricing structure as well as market risk, regulatory reporting requirements, the ongoing process of managing and capitalizing on the SRECs, and continuous monitoring and

maintenance needs of the system(s). Therefore, the Proponent has determined that this Project will use the power purchase agreement (PPA) model. In such an arrangement, a PV specialty company will build, own and operate the PV systems at the facility and sell the electricity produced to the Resort under a long term PPA. This transfers the design, construction and operations to a company whose primary expertise is in the business of design and operation of PV systems, removes the capital and operating burden from the Proponent, and still provides a large quantity of renewable energy, reducing the GHG signature of the Project.

The Proponent solicited proposals from, and held discussions with, several well-established PV providers during the past several months and has recently entered into a Memorandum of Understanding with Tangent Energy Solutions to provide, own and operate the PV systems.

7.2.3.6 Uninterruptible Power Supply (UPS)

The casinos include two 1.5 MW high-efficiency UPS systems to prevent power interruptions from affecting the gaming machines. These inverter-based systems convert line AC power to DC for maintaining a battery system and DC to AC for distribution from the battery system. At 95% conversion efficiency, these units will be state-of-the-art; typical systems are approximately 92% efficient.

7.2.4 Ventilation

The majority of the spaces in the Resort (including gaming, lobbies, food service and back-of-house) will be conditioned via variable air volume air handling systems. Ventilation air preconditioning systems are being utilized for gaming areas (the major HVAC load source) to provide the bulk of the latent cooling/dehumidifying needs. This preconditioning system significantly increases the energy efficiency of the HVAC systems by removing largest source of latent heat gain (moisture in ventilation air) without the need to over-cool and then reheat the entire volume of HVAC supply air. The addition of enthalpy wheels (energy recovery of both latent and sensible heat) to the ventilation air pre-conditioning system further increases the system efficiency by recovering heat from HVAC exhaust air to pre-heat makeup air in the winter, thus decreasing the demand for natural gas for heating. This system also slightly cools and de-humidifies the makeup air during the summer months, thus further decreasing the demand for electricity for cooling/dehumidifying the HVAC ventilation air and natural gas for reheating.

High performance ductwork (ductwork larger than traditional HVAC design) will be used to decrease fan energy consumption by the HVAC system demand-controlled ventilation will be used in high occupancy areas.

The hotel rooms (both hotels) will be served by four-pipe fan coils with ECM motors - a high efficiency, high quality hospitality HVAC solution. Ventilation will be provided to rooms with a heat recovery system for increased efficiency. Retail spaces will also be served with fan coils.

Underground parking areas will be mechanically ventilated, with fan operation controlled by carbon monoxide detectors, greatly reducing fan energy over the course of a day. Above grade parking areas will generally be naturally ventilated.

Premium electric motors will be used for fan and pump drives and variable frequency drives (VFDs) will be used on motors over approximately 5 horsepower.

7.2.5 Lighting

7.2.5.1 Natural Lighting & Advanced Lighting Controls

Natural daylighting will be used throughout the facility, including in gaming spaces that are adjacent to exterior walls. This will allow the lighting control system (which uses photocells, occupancy sensors, and other systems) to dim and shut off artificial lights when they are not needed resulting in significant energy savings. The winter garden between Casino Areas I and II has been designed to maximize the use of daylight.

7.2.5.2 Room Occupancy Sensors

Sensors turn off the artificial lights when a space is unoccupied. Occupancy sensors will be used for the back-of-house spaces such as conference rooms, bathrooms, offices and storage areas. Hotel room occupancy sensors turn off the lights and also adjust the heating/cooling set point when rooms are unoccupied, thereby reducing the energy spent on unoccupied or vacant rooms.

7.2.5.3 High Performance Lighting

High-performance lighting (lower wattage per square foot than the Code minimum requirement) will be utilized. At least a 14% reduction in average lighting power density is expected to be achieved, reducing not only the amount of electricity consumed by the lighting system but also the corresponding energy used by the HVAC system to remove the heat generated by the lights. Lower lighting power levels will be achieved by use of high efficiency fluorescent and/or LED lighting fixtures and bulbs and by focused task lighting in office areas. A lighting plan has not yet been developed, but preliminary LPD values by use category are presented in Attachment D.1.

7.2.5.4 High Performance Lighting, Exterior and Signage

High performance lighting will be applied to exterior lighting and signage. Detailed lighting plans have not yet been developed; therefore, no reduction in exterior lighting energy is included in the modeling in Section 7.3.

7.2.6 Other Process Loads

7.2.6.1 Energy-Star Appliances

Energy Star appliances and electronics utilize less energy than other models of the same type, ranging from 10 to 40% or more depending upon the type of equipment and its use schedule. The Energy Star rating system does not extend to all forms of appliances found in the Project; however, Energy Star appliances and electronics (refrigerators, TVs and computers) will be utilized in the hotels, office areas, break rooms, and other places where rated equipment is available. However, no credit has been taken for this energy savings in the building energy modeling reported in Section 7.3.1.

7.2.6.2 Advanced Elevators

Machine-roomless elevators require less energy to operate than conventional tractor-type elevators. In some applications, programmed controllers reduce elevator trips. The Proponent expects to use machine roomless elevators throughout the Project. State-of-the-art elevators will be examined during design development based upon then-current offerings in the market. To be conservative, no credit for elevator energy reductions has been taken in the modeling reported in Section 7.3.1.

7.2.6.3 Gaming Machines

Gaming machines consume a large percentage of the total electricity use of the Project. The Proponent, together with similar companies in the industry, has been pressuring machine manufacturers to reduce the electrical demand of the machines. A number of advances have been made in recent years, at least in part due to the influence of the Proponent and other industry members on the manufacturers. Some of the advances include:

- Conversion to LED lighting technology that: a) reduces energy consumption per bulb by over 40%, b) reduces heat load per machine at an annual savings in HVAC energy of between $1-3/year per bulb, and c) increases service life per bulb, reducing waste.

- Conversion to coinless operation that: a) reduces energy consumption by elimination of internal coin sorting, and b) reduces mechanical components, thus reducing maintenance.

- Conversion to LCD screens which: a) greatly reduces energy consumption, b) reduces heat load per machine, and c) increased service life per monitor over conventional CRs.

- Adoption of computer-controlled machines and advancement of internal components, eliminating electric motors to spin reels and converting to more efficient computer controlled step motors.

The Proponent continues to challenge manufacturers to improve energy efficiency as well as service life of slot products as technology advances, and considers the energy use of machines when comparing competitive products.

7.2.7 Water Use Reductions

Several features of the Project will reduce water consumption, in turn reducing wastewater generation. Such reductions reduce indirect GHG emissions by reducing the MWRA's water treatment and wastewater treatment energy requirements. These reductions are estimated to reduce water use by more than 28 million gallons/year and wastewater discharge by approximately 4 million gallons/year (see also Section 7.3.2).

7.2.7.1 Low Flow Fixtures

Waterless urinals will be used in public spaces. Low flow (1.28 gpf) water closets and shower heads will be used in hotel rooms and public spaces. Low flow shower heads not only reduce water use but decrease the DHW heating load as well.

7.2.7.2 Condensate Recovery

Condensate from cooling coils will be collected through the rainwater harvesting system for use as cooling tower make-up and irrigation water.

7.2.7.3 Rainwater Harvesting

Rainwater will be collected from building roofs in three tanks totaling approximately 270,000 gallons for use in irrigation and for cooling tower makeup water. It is expected that approximately 4.5 million gallons/year will be recycled in this way, reducing the demand for fresh water from the MWRA system.

7.2.7.4 Drought Tolerant Landscaping

Use of drought tolerant plantings will reduce irrigation water use by an estimated 76% from a baseline of lawns.

7.2.8 Other Related

"Other Related" technologies are technologies that may indirectly affect GHG emissions, although their primary purpose is to accomplish other goals. For these measures, the GHG emissions reduction potentials are difficult to quantify with any reasonable accuracy and are numerically expected to be a small part of the overall mitigation. They are, therefore, described but not quantified in this analysis. They are divided into those that are associated with the operation of the buildings and those that are associated with the design and construction phases of the buildings.

7.2.8.1 Influence with Tenants

The Proponent will undertake several measures to influence restaurant and retail tenant's energy usage, including mandatory provisions in leases and tenant manuals, as well providing access to resources and Caesars' CodeGreen sustainability program. These measures will include, but are not limited to:

- Mandatory participation in food waste recycling program, outlined in all leases.
- Tenants will be automatically included in Caesars quarterly CodeGreen Scorecard that tracks and reports utility cost reduction targets on property in order to encourage GHG reduction.
- Standard language in tenant agreements that allows Caesars to charge tenant for utilities and requires sub-metering to encourage energy efficiency and conservation.
- Caesars will make its corporate resources available to assist tenants with needed support for efficiency projects they wish to pursue and will provide assistance with utility rebates and advice related to other sustainability initiatives upon request.
- Lease materials will include a tenant guide that will encourage LEED certification for tenant space build-outs.

Tenants and their customers are also exposed to CodeGreen collateral that exists at front-of-house locations at most properties as well as any special events that are publicized related to sustainability. In Las Vegas, for example, Caesars coordinates "Lights Out on the Strip" for the World Wildlife Fund's Earth Hour. Caesars also sponsors and hosts Dartmouth's "Big Green Bus" that travels across the country on waste cooking oil to promote sustainability at several properties. These examples expose tenants to actions Caesars is taking at a corporate level across multiple properties to promote a better environment in a visible way.

In addition to the items noted for restaurant and retail tenants, any potential third party developer of the second hotel will be required to build to LEED Gold standards. To further this objective, the second hotel will have the opportunity to connect to the property's CUP.

7.2.8.2 Recycling Areas

Recycling collection staging areas will be included throughout the Project area. The initial metric used to meet this requirement will be the LEED rating system, which requires the provision of collection facilities for paper, cardboard, metal, and plastic. Detailed discussions of recycling are provided in Section 2.2.4.

7.2.8.3 Organic Waste Separation

MassDEP is in the process of rolling out a program of regulations to:

1. require the separation of organic wastes, primarily food waste, from other waste streams at high volume producers such as hotels, conference centers, university cafeterias, and similar sources to keep these wastes out of landfills.

2. encourage the development of biomass-to-energy facilities such as facilities that will anaerobically digest the collected food and other organic waste, recovering methane-rich digester gas for use in small local power generation facilities.

The Project will have two major organic waste streams: horse manure and bedding from the horse barns and food waste from hotels and restaurants in the casino complex. The Proponent investigated the siting of an anaerobic digester within the Project and determined that it is not physically or economically feasible (see Section 7.4.2.8.)

Instead, the Project will incorporate food waste separation into the site collection design and has arranged with Harvest Power, a Massachusetts-based company that is developing an anaerobic digester facility in Massachusetts, to take that waste for processing and energy recovery. As the processing and energy recovery will occur at a third party facility, the GHG consequences are not considered to be part of this Project. Avoiding landfilling of the food waste will reduce fugitive methane emissions, but that is not accurately quantifiable.

The horse barn waste is currently shipped to a composting facility in New Hampshire. Onsite composting is not technically feasible (see Section 7.4.2.8.). As this New Hampshire facility is closer than any anaerobic digester facility anticipated to be in service in the near future, and composting leads to a beneficial product, it is expected that this method of disposal will continue into the intermediate future.

7.2.8.4 Energy Management System (EMS)

An EMS does not reduce the design energy utilization, but rather insures that actual operation comes as close to design optimum as practical. An EMS allows the building manager to monitor building energy performance, which aids in identifying maintenance needs to maintain optimum performance. An EMS should, therefore, be viewed as an insurance mechanism to aid the building manager in attaining the optimum efficiency inherent in the building design.

The facility will have a Direct Digital Control-based Building Management System to enable tracking of energy use and system performance.

7.2.8.5 Enhanced Building Commissioning

Enhanced Building Commissioning, as defined in LEED, begins the commissioning process earlier in the design stage, and also includes a post-occupancy follow-up visit to ensure that building systems have been operating properly in both the heating and cooling season. It, too, is insurance that the construction and operation of the Project and its systems is in accordance with the design.

7.2.8.6 Construction Waste Management

The Proponent will work with its Construction Manager to outline, develop, and implement a comprehensive construction staging and phasing plan. Part of this plan will involve the creation of a comprehensive construction waste management plan. The Proponent is currently anticipating at least a 75% reduction in construction debris diverted to landfill (by weight).

7.2.8.7 Recycled Content Materials

As part of the LEED effort, use of recycled-content materials will be studied during the Construction Documents stage of design. The Proponent desires sustainable design and will encourage the specification of recycled-content materials wherever practical. Concrete aggregate and cement, wood, glass and glazing products, metals, masonry, and drywall are typically evaluated for cost effectiveness of recycled-content alternatives. The Proponent expects to achieve at least 10% use of recycled materials, as defined by LEED.

7.2.8.8 Regional Materials

The Proponent and its Construction Manager will encourage the specification of regionally-sourced materials wherever possible. As part of LEED effort, the design team expects to achieve at least 10% regional materials content by overall construction materials cost per LEED definitions.

7.3 Energy Modeling

7.3.1 Stationary Sources

Building energy modeling was conducted by The Green Engineer, a regionally recognized engineering firm, using the Trane Trace 700 building design model, version 2.6.10. In accordance with the Stretch Code, ASHRAE 90.1 Attachment G protocol was applied in the modeling. As stated previously in Section 7.1, IECC 2012 (ASHRAE 90.1-2010) was used to define the Baseline.

The modeling was conducted for the Project without inclusion of either the CHP units or the PV systems. Building and system input parameters for each case are presented as a comparison table in Attachment D.1. Model output tables of monthly energy use by end user category and annual summaries (Project Cost Budget) for each case are provided in Attachment D.1. Performance of the CHP and PV systems were separately calculated. CHP performance was estimated using manufacturer's data and preliminary analyses of site thermal demands. This calculation is presented in Attachment D.3. PV performance was estimated using ORNL's PV Watts 2 model the output of which is presented in Attachment D.4.

In addition, electric losses due to onsite transformers and distribution and conversion losses of the casino UPS systems were estimated based on past experience and manually added to the model results. Although losses would be greater for the Baseline case, it was conservatively assumed that Baseline and Proposed case losses are the same.

As indicated in Section 7.2, the modeling does not include:

- reduction in glazing in Hotel I, which has been reduced from 95% (as modeled) to less than 80%. This evolution was made too late to include in the model.
- exterior shading devices. Although some shading is currently in the design (but not the model), the design has not fully examined the feasibility of further shading devices.
- use of Energy Star appliances and electronics
- high performance exterior lighting. Lighting design has not progressed sufficiently to include in the model.

Results of the Baseline and Proposed cases, combining the modeled output, CHP and PV performance, and loss estimates are presented in Table 7-2. Associated GHG emissions are calculated in accordance with the GHG Policy.

The energy efficiency and alternative and renewable energy technologies employed in the Proposed design will result in a 69% increase in natural gas use (largely to run the CHP units) which is more than offset by a 28% reduction in imported electricity compared to the Baseline. This results in an approximately 3,210 ton/year, 23% decrease in GHG emissions. Additional GHG emissions reductions are described in Sections 7.3.2 and 7.3.3.

Table 7-3 presents similar information to that in Table 7-2 but as source energy, using site/source conversion factors provided by DOER. Source energy, unlike site energy, takes into consideration that a Btu of electrical energy used onsite requires about 3 Btus to be expended at an off-site power plant due to power plant efficiency as well as transmission

losses. Similarly, a Btu of natural gas used onsite requires off-site supply of almost 1.1 Btus due to gas processing, transmission losses and gas transmission energy (compression) requirements. These conversion factors are not New England-specific.

Table 7-3 indicates that the proposed Project will require approximately 25% less energy use than the Baseline case, which is much better performance than is anticipated to be required by the next version of the Stretch Code, SCII (estimated to be 12-15% reduction from IECC 2012 Baseline).

Table 7-2 Modeling Results – GHG Emissions Reduction

		Site Energy		
		Case 1 Baseline	Case 2 Proposed	1–>2 Difference
DIRECT (NATURAL GAS)		MMBtu/yr	MMBtu/yr	
Space Heating and Domestic Hot Water		10,672	11,886	
CHP Engine Fuel Use		0	17,080	
CHP Thermal Credit		0	-10,916	
	subtotal	10,672	18,050	69%
INDIRECT (ELECTRICITY)		MWh/yr	MWh/yr	
Space Heating		6	4	
Space Cooling		3,069	1,793	
Pumps		54	400	
Cooling Tower (Heat Reject.)		217	256	
Fans - Conditioned		8,114	4,667	
Receptacles - Conditioned		12,916	12,870	
Lighting - Conditioned		5,655	4,969	
Stand-alone Base Utilities		740	740	
Transformer and distribution losses		1,458	1,458	
UPS conversion losses		1,314	1,314	
CHP Generation Credit		0	-1,353	
PV Generation Credit		0	-2,913	
	subtotal	33,537	24,200	-28%
GHG EMISSIONS		tons/yr	tons/yr	
Direct	Gas-burning	624	1,056	
Indirect	Imported Electricity	13,080	9,438	
	Total	13,704	10,494	**-23%**
			-3,210 ton/yr	

CO_2 Emission Factors:

Electricity [1]	780	lb/MWh
Natural Gas [2]	117	lb/MMBtu

[1] 2011 New England Electric Generator Air Emissions Report, Table 5.4, 2011 value

[2] EIA Fuel Emissions Factors, Weighted National Average (1029 Btu/scf)

Table 7-3 Modeling Results – Source Energy and EUI

	Source Energy		
	Case 1 Baseline	Case 2 Proposed	1–>2 Difference
DIRECT (NATURAL GAS)	MMBtu/yr	MMBtu/yr	
Space Heating and Domestic Hot Wate	11,632	12,956	
CHP Engine Fuel Use	0	18,617	
CHP Thermal Credit	0	-11,898	
subtotal	11,632	19,675	69%
INDIRECT (ELECTRICITY)	MMBtu/yr	MMBtu/yr	
Space Heating	58	45	
Space Cooling	32,131	18,411	
Pumps	555	4,105	
Cooling Tower (Heat Reject.)	2,231	2,624	
Fans - Conditioned	83,333	47,930	
Receptacles - Conditioned	132,654	132,181	
Lighting - Conditioned	58,073	51,032	
Stand-alone Base Utilities	7,596	7,596	
Transformer and distribution losses	13,780	13,780	
UPS conversion losses	12,419	12,419	
CHP Generation Credit	0	-13,891	
PV Generation Credit	0	-29,916	
subtotal	342,772	246,270	-28%
TOTAL	354,404	265,945	-25%
ENERGY USE INDEX	794,745 gsf conditioned space modeled		
	kBtu/sf/yr	kBtu/sf/yr	
	445.9	334.6	**-25%**

Source Energy Factors	Provided by DOER
Electricity	3.01 Btu source/Btu site
Natural Gas	1.09 Btu source/Btu site

7.3.2 Water and Wastewater-related Emissions Reductions

The Project estimates an daily average water use exceeding 300,000 gallons. For projects with this level of water use, the GHG Policy requires an analysis of the energy reductions, and associated GHG reductions, at MWRA water and wastewater treatment facilities that may accrue due to Project design features that minimize water use and wastewater production. This analysis is presented in Table 7-4.

Water uses can be grouped into two general categories:

- irrigation; and
- building uses (e.g., domestic water supply, utility cooling tower consumptive use).

There are a few minor uses of water that have not been included in the analysis, such as track maintenance, as they are relatively small and unaffected by Project development.

Irrigation water use for the proposed case is estimated based on preliminary planting schedules of drought-resistant plants in designated formal landscape areas and tree and plant beds. This analysis is very preliminary as planting schedules are typically not developed until much later in the design process. A baseline water use was estimated assuming that the same areas are grass lawns.

Building water use reductions arise from use of fixtures that use less water than Code-based fixtures, such as toilets and shower heads, as well as from reductions in utility water demands. Associated wastewater production is estimated to be 80% of water use.

In addition, the Project will practice rainwater harvesting, as described in Section 9.3.2. By collecting rainwater in tanks and using it for both irrigation and cooling tower make-up, water demand from the MWRA system is further reduced. It is estimated that approximately 4.5 million gallons/year will be supplied by this harvested rainwater.

As indicated on Table 7-4, total water use reduction of approximately 31%, or almost 29 million gallons/year and wastewater reduction of 7%, or 4 million gallons/year, will reduce MWRA utility requirements by approximately 10,900 MWh/year and reduce associated GHG emissions by 4,251 tons/year.

Table 7-4 Water Use and Wastewater Generation and Associated GHG Emissions

WATER DEMAND FROM MWRA		million gallons/yr			
		Baseline	Proposed	Difference	Remarks
Non-building uses		26.3	6.3		Irrigation (minor uses for track maintenance not included)
Building uses		66	62		Including domestic water, CUP and cooling towers, restaurants, etc.
Rainwater harvest		0	-4.5		
	Total	92.3	63.8	-28.5	
				-31%	

WASTEWATER TO MWRA		million gallons/yr		
		Baseline	Proposed	Difference
Non-building uses		0	0	
Building uses		57	53	
Rainwater harvest		na	na	
	Total	57	53	-4
				-7%

ASSOCIATED ENERGY			MWh/yr	
	Water	18,460	12,760	
	Wastewater	74,100	68,900	
	Total	92,560	81,660	-10,900

GHG EMISSIONS		tons/yr		
		Baseline	Proposed	Difference
	Water	7,199	4,976	
	Wastewater	28,899	26,871	
	Total	36,098	31,847	-4,251
				-12%

Conversion Factors			Sources
within MWRA Water Trtmt	0.2	kWh/kgal treated	MEPA website
within MWRA Wastewater Trtmt	1.3	kWh/kgal treated	
electricity to GHG	780	lbs CO_2/MWh	ISO New England

7.3.3 Other Stationary Source GHG Emissions Reductions

The Resort will acquire Green Energy equal to at least 35% of its electricity use for at least the first two years of operation, or approximately 9,965 MWh of Green Energy. This offsets a similar amount of grid-produced electricity, equivalent to a further 7,772 ton reduction in GHG emissions over the two years, calculated using ISO New England's conversion factor, as required by the GHG Policy.

7.4 Technologies Not Currently in the Design

7.4.1 Building Envelope

7.4.1.1 Green Roof/Podium Areas

With almost all of the available roof area being used to generate solar energy the remaining accessible roof areas will either be shaded, required for mechanical equipment, or occupied by the greenhouse.

7.4.2 MEP Systems

7.4.2.1 Solar Hot Water

Solar hot water (SHW) heating may be a supplement to a typical gas-fired DHW heating system, sometimes providing hot water directly and other times preheating water that is then brought to normal temperature by a gas-fired boiler. In this Project, however, the CHP units already provide essentially all of the DHW required for the Resort. SHW would be an expensive and redundant system and is not in the design.

7.4.2.2 Ground Source Heat Pumps

Ground-source heat pump (GSHP) technology takes advantage of the near-constant temperature of the earth and groundwater, usually at moderate depths below the surface, to provide a heat sink for heat extracted from a building in summer and a heat source when building heating is required in winter. By using a standard vapor-compression refrigeration cycle that is electrically driven, a GSHP system can, under the right circumstances, reduce the energy required to heat and cool a building and, although electricity is GHG intensive, possibly result in a GHG emissions reduction also. The main reason the GSHP systems are more efficient than small packaged DX air conditioning and air-source heat pumps is that they are generally working with a heat sink that is much cooler than most small DX systems in cooling mode and from a heat source that is warmer than an air-source heat pump in heating mode.

There are two distinct sub groups of GSHP systems – open loop and closed loop ground coupling. An open loop system draws in and returns groundwater from one or more wells and can use significantly more pumping energy than a closed loop system. Permitting of an open-loop system is also more intensive due to the potential for impacting groundwater quality. A closed loop system keeps the working fluid in a closed circuit of pipes, relying on heat transfer through the pipe walls to or from the ground and groundwater. In both cases, a large well field is required.

Large amounts of fill were placed on this site during the first half of the last century and the site is still experiencing settling of the upper layers. This settling is quite evident in the immediate vicinity of structural pilings, which do not experience the settling. This settling would create significant problems due to pipe breakage and strain at the well heads where the ground-coupled loop exits each well and travels between wells.

7.4.2.3 CHP

The Project currently includes a 200 kW of CHP units in the CUP with waste heat serving the DHW and some space heating loads.

In comments on the ENF, MassDEP suggested review of a study conducted for the U.S. EPA[1] and an EPA fact sheet related to the Casino market for CHP. MassDEP stated that CHP typically supplies 50-70 percent of the electricity at such facilities. While this may be true of one or more large casino resorts, this 8-year-old market sector study is largely based on hotel size and, in fact, recommends application of CHP in the size range of 90 to 380 kW for a project with less than 500 rooms, as in the case of this Project.

The Proponent investigated the potential for CHP combined with absorption chillers to utilize more thermal output from the CHP, hence potentially allowing use of a larger CHP. The absorption chiller could displace some of the chilled water production otherwise done by electrical centrifugal chillers. By expanding the thermal load served beyond DHW, larger CHP units might be feasible.

The installation of a larger cogeneration system coupled with an absorption chiller was considered; however, due to the high efficiency of the electric chillers selected for the central chiller plant combined with a very effective hydronic economizer (free-cooling) and full air-side economizer capability, the marginal benefits of using a larger CHP with absorption cooling are very small.

Veolia NA, a nationally prominent cogeneration and district heating company conducted a preliminary evaluation of CHP potential for the Project. A number of different configurations were considered, including 130 kW and 250 kW systems from MTU and 500 kW to 1.4 MW systems from GE/Jenbacher. Two large system configuration options incorporating absorption cooling were reviewed in detail:

- Single train of 1.4 MW engine-generator, waste heat boiler and 375-ton absorption chiller
- Two trains of the same configuration for 2.8 MW of electrical capacity and 750 tons of refrigeration

[1] CHP in the Hotel and Casino Market Sectors, Energy and Environmental Analysis, Inc., December 2005

The train configuration was selected because the commercial offerings of an engine and a chiller of these respective sizes match well, allowing most efficient operation.

It was determined that, with the relatively low heating loads, free winter cooling (little or no need for chiller capacity) and other HVAC efficiency concepts in the Project design, the single train would have to either shut down most of the winter or dump excessive amounts of unusable heat. Neither proposition favors implementation of a CHP unit. The two-train configuration extended the excess heat situation to the shoulder seasons and exceeded minimum electrical load often enough that the system would not operate at full capacity even during parts of the summer. Dumping waste heat is counter to the intent of CHP, which is to use the maximum amount of the fuel energy input, and operating below full capacity for extended periods, or shutting down, significantly and adversely affects economics.

Analysis of a 1.4 MW CHP system for this facility is outlined below. From a source-energy and GHG emissions perspective, the use of thermal energy from a CHP system to create cooling benefit has minimal positive impact unless it is compared to a base case of absorption equipment operating directly from a boiler fired with gas (no cogeneration) or a direct-fired absorption cooling unit. Straight installation of new absorption equipment without being combined with cogeneration is very rare due to very unfavorable economics (high first cost and high operating cost). When absorption cooling is compared to a base case of an efficient electric-driven centrifugal chiller system, the overall benefits become much smaller.

If one looks at the overall electric and thermal requirements of a cooling system using an absorption cycle, the 375 ton example below (with a coefficient of performance [COP] of 0.88, the thermal energy input to the absorption equipment is 5.1 MMBtu/hr) offsets the equivalent of 205 kW from a compressor motor in an efficient electric chiller plant but uses 70 kW of additional electric energy for the extra cooling tower capacity, condenser and chilled water pumping needs, hot water pumps, solution pumps, and a boiler feed pump. Thus, the net benefit of using a 375-ton absorption cycle compared to an electric centrifugal chiller is approximately 135 kW.

From a source energy standpoint, 135 kW of electric power uses 409 kW of thermal input (using a 0.33 conversion) or 1.4 MMBtu/hr of source energy. Based on the system sizes and configurations outlined above, the source energy and GHG avoided by using a cogeneration system coupled with an absorption system is a combination of the efficiency gains from the electrical generation efficiency improvement (if any) and the 1.4 MMBtu/hr of avoided electric chiller energy use and not the total thermal output from the cogeneration system (5.1 MMBtu/hr).

An economic analysis, along with details on the system configuration, the operation schedule, and efficiencies of a cogeneration system combined with absorption cooling are outlined below.

System Description

Baseline - electric chiller and condensing boilers

A) Electric chiller based chilled water plant with the following:

a. Chiller efficiency of 0.547 kW/ton (COP = 6.43)

b. Chiller NPLV (full year) = 0.346 kW/ton (COP = 10.16)

c. Chiller NPLV (when operated around hydronic economizer operation) = 0.435 kW/ton (COP = 8.09)

d. Hydronic Economizer (Water-side or plate-and-frame free cooling) for late fall, winter, and early spring cooling needs with an electric efficiency improvement of 0.035 kW/ton as compared to electric needs of an absorption cycle (chilled water and condenser water pumping will be similar to absorption cycle, tower fan energy is 0.018 kW/ton higher for hydronic economizer, and the solution pump, hot water pump, and boiler feed pump energy of 0.053 kW/ton is not needed with an hydronic economizer)

B) Condensing Boilers with 95% average efficiency

Output values from the cogeneration system are based on the following:

a. Full operation of generation and cooling output for 6 months per year

b. ½ of full output of generation and cooling for 1.5 months per year

c. Equivalent of ½ full output for 2 months per year for meeting space heating needs

d. Meets full DHW needs for 10 months per year (10/12 of the 7800 MMBtu/year)

e. Total run-time load profile is full load for 6 months and ½ load for 4.5 months per year (any additional run time will reduce AEC's and require that the additional thermal output be dumped to the atmosphere)

Alternative - 1.4 MW CHP with 375-ton absorption chiller

A) Jenbacher 420 Gas Engine generator set and waste heat recovery boiler

   a. 3,373 kW gas input (LHV) or 3,715 kW (HHV); 12.7 MMBtu/hr

   b. 1,350 kW gross generator output on gas; 1,280 kW net output after extra power requirements for an absorption cycle plant as compared to an electric chiller plant (cooling tower fans 20 kW, pumping increase of 30 kW, absorption solution pumps 5 kW, hot water pumps 8 kW, and boiler feed pump, 7 kW)

   c. net electrical efficiency of 34.5% (HHV-based)

B) Broad quasi-dual effect absorption chiller designed to match up to the two different temperature waste heat streams (steam & hot water) from a Jenbacher 420 engine and waste heat recovery boiler

   a. 375 tons cooling capacity

   b. Cooling COP from thermal use of 0.88

Economic Analysis

Value of Electricity:

At 1,280 kW generated for 6 months and 640 kW for 4.5 months, 7,600,000 kWh/yr are produced. At $0.0796/kWh, this is worth approximately $605,000 per year. If the operation of the cogeneration equipment is sustained throughout the entire peak period for each summer month, the value of the peak demand savings will be an additional $121,000 ($23.62/kW x 1280 kW x 4 months) for the 4 summer months and could be worth as much as $90,000 ($17.65 x 1280 x 4 months) for reducing demand in the winter months. Total Value = $816,000/yr (the $244,000 of demand charge benefit can easily be lost due to system operation interruptions)

Value of Cooling:

Since using the heat from the cogeneration for actual heating purposes is more valuable than using it to run an absorption cooling system, priority will be given to using the heat for heating domestic water and for space heating when heat is needed. Thus, the cooling generated by the absorption equipment will be less than the maximum possible of 375 tons for 6 months per year and 375/2 tons for 1.5 months per year. Of the total of 1,822,500 ton-hours possible with a 375 ton chiller, only 1,233,000 ton-hours will be produced to be able to use the heat for heating needs. This heat will be used in a chiller that will offset a

chiller with a NPLV of 0.435 kW/ton. This reduces the electric needs for the electric chillers by approximately 536,000 kWh/yr which is worth approximately $42,700/yr. Total heat used is 14,800 MMBtu or 4,340 MWh. Total Value = $42,700/yr

Value of Domestic Water and Space Heating:

The cogeneration system can meet approximately 83 percent of the approximately 7,800 MMBtu of domestic water heating needs for the site (due to limiting run-time to periods where more than a small portion of the thermal energy can be used). This will offset the need to purchase approximately 7,650 MMBTU of gas for water heating, which is worth approximately $61,200 per year (with gas at $8.00/MMBtu and 85% eff. boilers). The cogeneration system can also supply approximately 7,000 MMBtu of the projected 9,040 MMBtu of space heating needs for this site. This will offset the need to purchase approximately 7600 MMBtu of gas for space heating which is worth approximately $60,800 per year (with gas at $8.00/MMBTU and 95% eff. boilers for space heating). Total heat output is 14,600 MMBTU or 4,280 MWh. Total Value = $122,000

Value of Alternative Energy Credits from CHP System:

The Alternative Energy Credits (AEC's) for CHP will provide an annual revenue stream from the efficient use of natural gas to provide both heat and electricity. The credit is presently worth approximately $22/MWh and the AEC's are calculated as follows:

$$AEC's = E_{elect}/0.33 + E_{therm}/0.80 - E_{CHPin}$$

For this installation, the AEC's are expected to be:

$$AEC = 7,600/.33 + (4,340 + 4,280)/.8 - 22,070 = 23,030 + 10,775 - 22,070 = 11,735 \text{ MWh}$$

The 11,735 MWh of AEC's are worth approximately $258,000 per year in incentives from the state program.

Benefits Summary:

Electric output	$816,000
Cooling output	$42,700
DHW and Space Heat	$122,000
Value of AEC's	$258,000
Total	$1,238,700/yr

Cost of Natural Gas

Total run-time load profile is full load for 6 months and ½ load for 4.5 months per year. This will require 22,070 MWh of gas input per year (3,715 kW x 6 x 720 plus 3715/2 x 4.5 x 720), or 75,290 MMBtu/yr, which will cost approximately $602,000/year.

Cost of Operations and Maintenance:

The cost of operating and maintaining the engine/generator, the SCR for emissions control, the waste heat recovery boiler and associated equipment, and the absorption chiller is expected to be approximately $0.025/kWh of electrical output from the generator. Based on the load profile outlined above, the cost for operations and maintenance is expected to be $190,000/year.

Cost of Stand-by Electric Charges:

Stand-by charges for capacity for cogeneration are based on a flat monthly charge of $237/month plus $10.35/kW (rated output) per month for the four summer months and $6.25/kW per -month for the remaining eight months of the year. For a nameplate rated demand of 1415 kW, these standby charges would be $132,000 /year.

Cost Summary:

Gas input	$602,000
Maintenance	$190,000
Standby Charges	$132,000
Total Operating Cost	$924,000/yr

Net benefits = $1,238,700 – $924,000 = $314,000/yr.

Capital Costs:

Absorption Cooling Equipment	375 tons @ $2,000/ton	$750,000
Engine genset , waste heat boiler, APC	1,415 kW @ $1,750/kW	$2,476,000
Plant space, CHP and cooling equipt.	1,800 sf @ $400/sf	$720,000
	Subtotal	$3,946,000
Utility Rebate	1415 kW @ $750/kW	-$1,061,250
	Net installed cost	$2,884,750

Simple payback is then $2,884,750/$314,000 = 9.2 years (without financing costs or tax implications). With financing costs, the simple payback period is even greater. This is beyond the generally acceptable payback range for a commercial facility. A similar analysis for the proposed 200 kW CHP facility is presented in Attachment D.3.2 and demonstrates a simple payback period of 3.5 years before financing costs and tax implications.

7.4.2.4 Fuel Cells

Fuel cells use methane (natural gas) in an electro-chemical process operating at low temperature to generate electricity. High-grade or low-grade waste heat recovery, or both, can make these units into a CHP technology.

Fuel cells have been used in limited applications for continuous power generation, but they are very expensive. Although the cost has apparently decreased considerably in recent years, it appears to remain well above $5,000/kW. Even with tax incentives and the potential availability of Alternative Energy Renewable Energy Credits, the cost of fuel cells is considered to be too high for application to the Project. Fuel cells would be redundant to the CHP units.

7.4.2.5 District Heating/Cooling

If a district heating (and sometimes cooling) system is in the vicinity of a project, it may be feasible to take steam and chilled water from such a system, taking advantage of the scale of the source power plant, to obtain cogenerated energy without large capital outlays. This may or may not be a GHG reduction, depending upon the characteristics of the district system.

There is no district system in the vicinity of the Project. Developing the CUP within the Project is, in effect, developing the Resort's own district heating and cooling plant.

7.4.2.6 Wind Turbines

Large and Small Wind Turbines:

Large turbines (greater than 100 kW) are often sited in low-development density areas where a consistent wind resource, unaffected by the built environment, maximizes the payback rate for the installed equipment. Siting facilities in low density areas minimizes wind turbulence, a major contributor to reduced performance and longevity of large-scale wind turbines. The City of Boston and surrounding areas have several urban/suburban installations of larger turbines. Among these are: the Forbes Park complex in Chelsea; Medford Middle School; and the multiple utility-scale wind turbines in Hull. These projects are sited in relatively open areas without tall buildings in close proximity. Large turbines are typically 200-400 ft tall.

For this Project, there is no opportunity for large wind turbines on the site because of its proximity to Logan International Airport. FAA would deem such structure heights as being hazards to air navigation. The Project site is located directly along the centerline of Runway 04L-22R at Logan Airport and MassPort has indicated it does not want large scale turbines deployed at this location.

Small turbines (less than 100 kW), include pole-mounted units in the range of 100 ft tall (hub height – maximum blade tip height is somewhat higher) to modest tower-mounted units up to about 250 feet tall. Structures of that height would be limited to the corner of the site near Orient Heights and Rt 1. Placing a modest turbine close to a residential neighborhood is discouraged by MassDEP noise policy now in the making after citizen complaints about such a siting in southeastern Massachusetts. The Proponent does not believe that there is any suitable location on site for small turbines.

Building-Integrated Wind Turbines

Building-integrated turbines include very small turbines (generally less than 1 kW to about 5 kW) mounted on building roofs or parapets or otherwise attached to a building.

Building integrated turbines are still in the development phase. Most building-integrated turbines have been showplace installations. There a few in the Boston area, including Boston City Hall, MassPort Logan Office Center, and the Museum of Science wind turbine lab.

In general, building-integrated turbines are highly susceptible to performance degradation due to turbulent wind regimes around the buildings they are mounted on as well as nearby structures or topography. In spite of some manufacturers' claims that certain building-integrated designs, such as vertical turbines, are less sensitive to building wake turbulence, there is insufficient commercial experience with these units for most developers to have sufficient confidence that all such issues are resolved. A May 2009 article in *Environmental Building News* indicated that building-integrated turbines are not performing as predicted, have noise and vibration issues, and are a safety and insurance issue. Presentations at the Building Energy 2011 conference in Boston indicated that several types of wind turbines installed at the Museum of Science in Boston and in other southern New England locations have demonstrated similar performance issues.

Furthermore, small turbines within sight of the race track could be a distraction to the horses, inhibiting race operations and perhaps frightening the animals.

Therefore, building-integrated wind turbines are not deemed to be feasible for this Project.

7.4.2.7 Water Source Heat Pumps for the Hotels

Water source heat pumps (WSHP) were considered and not pursued in the hotel component of the Project for two reasons.

Heat pumps are generally considered to be of a lesser quality level than fan coils, in terms of the guest experience, due to their noise and vibration (both higher than a fan coil), as well as the cycling of the compressor (which results in poorer temperature control/stability relative to a fan coil). Heat pumps also have an increased maintenance burden than a fan coil - they are more prone to breaking (again due to the compressor) than a fan coil.

From an energy/infrastructure standpoint, WSHPs are not compatible with the high efficiency chilled water system that was determined to be the preferred (and sustainable) solution for the whole site because heat pumps do not use chilled water - the primary cooling energy transfer medium - as their cooling source. They use condenser water, which would not be available unless pumped a long distance from the cooling towers at the CUP to the hotel. Fan coils backed by a high efficiency chilled water system have comparable energy performance to heat pumps and often perform better. Preliminary modeling was conducted that indicated a performance deficit for WSHP compared to fan coils using source energy as the metric of comparison.

7.4.2.8 Anaerobic Digestion and/or Composting of Organic Waste

Anaerobic Digestion

Anaerobic digestion converts much of the carbon in the waste stream to methane gas, which can be recovered and used as a fuel. The Commonwealth is encouraging the development of anaerobic digestion facilities to process organic waste that will result from recent source separation rules. The Project was examined for its potential to utilize an anaerobic digestion facility to generate fuel for the CUP, displacing natural gas.

On-site anaerobic digestion was determined to be infeasible, as demonstrated herein. The food and food preparation waste stream from the restaurants and other food outlet operations is expected to produce between 2,500 and 3,100 tons of SSO per year when fully operational, and the volume of waste generated at the horse barns is highly seasonal, producing approximately 38,000 cubic yards of manure from the barns each year. The manure production ramps up starting 6 weeks before the start of the 22-week racing season and ramps back down to zero approximately 3 to 4 weeks after the season ends. Presently the leaves and grass clippings from the site are combined with the manure.

A digester cannot effectively process this variation in input volume and would result in the need to either:

- haul in from off-site additional waste for the winter and spring to augment the volume from the food outlets and offset the lack of barn waste, which would require that the site become a waste receiver with all the associated permits, regulations, and associated traffic on the local street, inconsistent with the nature of the Project; or

- supplemental heat would be needed to keep the digester operating in the colder months, reducing the efficiency of recovering energy from the waste.

Furthermore, there is significant need to add water to the material for effective processing and digesting. This water must then be removed after the material exits the digester and the remaining solids dried further. The initial dewatering equipment, further drying and

material handling equipment, and wastewater processing systems require significant additional space. A digester and pre/post processing systems would require three to five acres of space, which is not available at this site. In addition, an anaerobic digestion facility has an industrial appearance that would be inconsistent with the Resort.

Furthermore, the proclivity of waste handling and processing to attract birds could generate an unsafe condition with the close proximity to Logan Airport and aircraft flight paths.

The total annual quantity of waste from the restaurants and barns is between 1/8 and 1/4 of the volume needed for reasonably efficient and economical operation of an anaerobic digestion facility. Therefore, the Proponent sought to partner with 3rd parties developing off-site anaerobic digestion facilities that could take all or part of the Project's organic waste. After considering numerous approaches and entities, Harvest Power was chosen as the preferred provider to work with. Harvest Power is developing an anaerobic digestion facility of regional scale in southeastern Massachusetts that is currently in the permitting process. This facility will receive the separated food waste from the Project, as described in Section 7.2.

Composting

Composting would result in less GHG emissions than landfilling, converting some of the carbon to CO_2 instead of unrecovered or partially recovered methane.

At one time, the Proponent investigated a commercial, fully-enclosed, self-contained composting system (Green Mountain Technologies, Inc.) for the purpose of recovering usable bedding and reducing the volume of manure shipments. This was ultimately rejected because:

- the size and number of systems that would be needed was excessive; and
- it was recognized that the trend towards the use of pelletized bedding (fine sawdust compressed into pellets) is incompatible with the bedding recovery aspect of these types of composter systems.

During its investigation of off-site facilities to receive the Project's organic waste, several haulers and waste companies proposed composting all of the waste. However, the "cleanliness" of the waste stream is very particular for composting. Composting processors reject waste with plastic, glass, bones, or other non-compostable material in it as this material is not desirable in their finished product. Although onsite organic waste separation is designed to minimize plastics and glass, it may not be feasible to entirely eliminate them from the stream. This material is not detrimental, however, to an anaerobic digestor and is generally removed in the digester itself or in the post-digester dewatering and processing stages. Furthermore, sending food waste to an anaerobic digestion facility is desirable in furtherance of the Commonwealth's goal of energy recovery.

Therefore, composting of the food waste fraction of the Project's organic waste streams was rejected.

As described in Section 7.2.8.3, barn waste is currently sent to a composting facility in New Hampshire along with grass clippings and bedding material. As this facility is closer than any anaerobic digestion facility anticipated to be in service in the near future, and composting leads to a beneficial product, it is expected that this method of disposal will continue into the intermediate future.

7.4.2.9 Kinetic Energy Recovery from Vehicle Traffic

In a meeting with MassCEC on February 11, 2013, MassCEC suggested investigating a kinetic energy conversion technology as a possible commercial demonstration of an emerging technology being developed by KinergyPower USA, an affiliate of KinergyPower, a Canadian company.

KinergyPower has a product, patented in the U.S. in 2009, that is designed to recover energy from moving vehicles to run a small generator for producing electric power. The device/process uses a series of movable bars or pads that are connected to short vertical hydraulic cylinders. As a vehicle passes over the pads, the cylinders are pressed down forcing the hydraulic fluid to flow under pressure to a hydraulic motor. With an assembly of hydraulic accumulators, valves, reservoirs, etc., the hydraulic motor can operate, at least for short periods of time, at a constant enough speed and torque to run a small generator for generating electricity. The action of a vehicle rolling over these devices causes a braking or slowing of the vehicle.

Various links to articles regarding KinergyPower include:

http://www.niagarathisweek.com/news-story/3307099-kinergy-power-rolls-forward/
http://www.linkedin.com/company/kinergypower
http://futuristictechnology.page.tl/12-k2--Kinergy-Power.htm
http://masschallenge.org/profile/kinergypower
http://www.zoominfo.com/p/Stefanos-Horianopoulos/1149128573

Research indicated that there are other companies with kinetic energy conversion technologies.

Pavegen – based in England - uses an approximately 4" tall assembly that can be incorporated into a floor system that, when stepped on, generates a small amount of electrical energy. A footfall compresses the slab by approximately 0.2 inches. The technology by which it functions is not disclosed by Pavegen. Pavegen claims to use what it calls a "hybrid black box" to convert the energy of a footstep into electricity, with a mechanism that includes both a piezoelectric effect and induction. The power generated

can be used to run very low power-draw, low-voltage devices. The tiles are reportedly made of recycled polymer, with the surface made from recycled tires. http://www.pavegen.com/

New Energy Technologies MotionPower - Similar to Kinergy Power concept for roadways, this company is based in Columbia, Maryland. The product appears to be in a prototype/development stage and is not commercially available.
http://www.newenergytechnologiesinc.com/technology/motionpower/motion

Kinergy's concept was selected for analysis. This type of device needs to be placed in a location that extracts energy from moving vehicles that need to be either slowing down or descending an incline and would otherwise need to be applying brakes. In effect, the device acts as an external brake, slowing the vehicle. Theoretically, the device will absorb some of the vehicle's kinetic energy and convert it to electricity, reducing the amount of friction braking done by the driver, which results only in waste heat.

An examination of the physics of this device and the potential energy generation from a 100-foot roadway demonstration project is presented in Attachment D.5. The conclusion is that, under an extremely optimistic scenario, approximately 63,500 kWh/year might be generated.

At $0.12/kWh, the electricity generated would be worth approximately $7,500, excluding impact on utility demand charges, if any. These devices are projected to cost between $10,000 and $25,000 per meter of length for the hardware (estimate provided by KinergyPower USA). Additional costs would include mechanical and electrical installation and the cost of facility or roadway modifications required to install the device. For a 100-foot system, the equipment cost alone would be a minimum of $300,000. The payback from energy savings would be that least 40 years. Since the device is projected to have a service life of 10 to 15 years, and the installed cost will likely be a multiple of the equipment cost, the technology does not appear to be economically feasible.

7.4.3 Other Related

7.4.3.1 Enhanced Refrigerant Management

Refrigerants, typically various compounds classified as hydrofluorocarbons (HFCs), are greenhouse gases of stronger effect than CO_2. Releases of HFC, however, are due to leaks or equipment failure and are not routine emissions. Nevertheless, use of low-CO_2e HFCs is beneficial, providing that the functionality of the refrigeration equipment is maintained.

LEED certification requires adopting a refrigeration management system that allows no chloro-fluorocarbon (CFC) use. The Project will be able to achieve this LEED refrigerant management criterion through the appropriate selection of refrigerants and efficient refrigeration systems.

Enhanced Refrigerant Management involves selection of refrigerants with the least combined impact from ozone depletion potential and global warming potential. It includes refrigerant use for commercial refrigeration as well as base building mechanical equipment. Inclusion of the most appropriate refrigerants with a reduced contribution to ozone depletion and reduced GHG-equivalent concentrations will be evaluated throughout the design process with an eye to select the most appropriate, least impactful refrigerant for each piece of equipment based on the specific equipment considered.

7.5 Transportation

This section considers the various categories of vehicles and traffic associated with the project and the effect of mitigation measures to reduce their GHG emissions. Three general categories are examined: fleet vehicles associated with daily operations, including onsite maintenance and security vehicles as well as shuttle services between the Project and off-site locations; traffic generated by the Resort; and diversion of customer trips from Connecticut and Rhode Island casinos to Suffolk Downs.

7.5.1 Fleet Vehicles

Suffolk Downs currently owns and maintains a large number of maintenance fleet vehicles ranging from golf carts to large landscaping trucks. The casino operations will add to this existing fleet with site security vehicles and shuttle buses. The direct GHG emissions from each of these fleets are discussed in detail below.

Maintenance Fleet

Suffolk Downs currently maintains a diverse fleet of more than 30 vehicles which support the maintenance of existing track operations. The age and usage of these vehicles vary widely. The current fleet consists of electric golf carts, general purpose vans and pickup trucks to large specialized vehicles including tractors, a grader, rollers, etc.

The fleet is generally specialized low-use equipment and is in adequate operating order. Their limited use makes it economically unjustifiable to replace them prior to the end of their service lives. As older vehicles are retired or new equipment added, the Proponent will replace them with alternative fuel or fuel-efficient vehicles that are able to perform the necessary operations.

As there are no near-term projections of vehicle replacements, no attempt has been made to quantify potential GHG emissions reductions.

Security Vehicles

Site security at the Resort will require the purchase of security vehicles. The Proponent has committed to purchase all-electric vehicles (Nissan Leaf or equivalent) for this purpose. By purchasing all-electric vehicles instead of conventional gas vehicles the Proponent is eliminating direct emissions of GHG's from the Project, substituting a smaller off-site emission from generation of the electricity to recharge the vehicles.

The U.S. Department of Energy Alternative Fuels Data Center has developed a tool that will compare direct and indirect GHG emissions among electric vehicles and conventional gas vehicles based on the source of the electrical power. This tool estimates that in East Boston substituting all-electric vehicles for conventional gasoline vehicles for site security will reduce GHG emissions by 67%.[2]

The number of site security vehicles has not been determined, nor has the extent of use (vehicle miles) per vehicle been estimated; therefore, the annual reduction in GHG emissions has not been quantified.

Shuttle Buses

Plans for the Resort include establishing a ground shuttle service to bring patrons and employees to and from the MBTA, nearby business districts, cultural and tourist attractions, area hotels, and parking locations. The plan advances the goal of minimizing the impact of Resort traffic on local roads. In furtherance of the City's long-standing commitment to improving air quality through the promotion of public transit and the utilization of clean fuel technologies, the Proponent expects to use a fleet comprised mostly of CNG, LNG, or other alternative fuel buses in the provision of this service. Use of fuel-efficient and alternative fuel vehicles in this shuttle service can lead to significant GHG emissions savings as well as reductions in other pollutant emissions. The precise type and number of bus to be used is dependent on negotiations with the ground shuttle operator, which are ongoing. Routes and schedules will be developed over time to meet actual demand for these services.

The majority of the shuttle fleet is expected be powered by CNG, rather than traditional diesel power. To estimate the GHG reductions achievable compared to a baseline of traditional diesel buses, a preliminary route map and schedule was analyzed, which resulted in an estimated annual 846,000 VMT. Efficiency and emissions factors were

[2] http://www.afdc.energy.gov/vehicles/electric_emissions.php, based on zip code 02128, which corresponds to East Boston.

derived from EPA publications and from a published test report of CNG bus fuel efficiency. CNG combustion produces 27% less GHG than diesel fuel for an equivalent amount of energy[3]; however, differences in fuel efficiency also enter the calculation.

Table 7-5 presents a summary of the calculations, indicating a 254 ton/year reduction in GHG emissions associated with shuttle operations and attributable to the use of this alternative fuel.

This analysis conservatively assumes that all buses are typical large city buses. To the extent that portions of the shuttle service may utilize smaller buses or vans, emissions will decrease. *These numbers will, of course, vary as the variables of bus type, number, route and schedule change with Project development.*

Table 7-5 Shuttle Bus GHG Emissions

	Diesel Bus	CNG Bus
Estimated VMT	845,879 miles/yr [1]	
Fuel Efficiency	5 miles/gal [2]	32.5 scf/mile [3]
Emission Factors [4]	10.15 kg CO_2/gal	0.054 kg CO_2/scf
GHG Emissions	1,889 tons/yr	1,635 tons/yr
	difference	-254 tons/yr

[1] Based on Shuttle Transportation Plan and MBTA Schedule

[2] Table Ia. Number, Fuel Source, and Efficiency of Transit Buses by Mode, 2002 (http://www.epa.gov/climateleadership/documents/resources/transit_protocol.pdf)

[3] http://146.186.225.57/buses/414/fuel/data_summary (Altoona Bus Research and Testing Center, Operated by Penn State, for a 40' CNG Low Floor New Flyer Bus)

[4] Table B-1 & B-3, Climate Leaders GHG Inventory Protocol, Direct Emissions from Mobile Combustion Sources (http://www.epa.gov/climateleadership/documents/resources/mobilesource_guidance.pdf)

7.5.2 Traffic-related

In accordance with the GHG Policy, GHG emissions were estimated for mobile sources within the transportation study area (see Section 5.0 for the transportation analysis; the study area is illustrated in Figure 5-1). For mobile source GHG emissions, the methodology is outlined in MassDEP guidance for mesoscale analyses.[4] The analysis includes a comparison of the future Build conditions to the No-Build condition. If emissions are

[3] U.S. Energy Information Agency, Fuel Emission Factors, http://www.eia.doe.gov/oiaf/1605/excel/Fuel%20Emission%20Factors.xls

[4] MassDEP, Guidelines For Performing Mesoscale Analysis Of Indirect Sources, May 1991.

greater for the Build conditions, reasonable and feasible mitigation measures will be evaluated. The methodology and parameters for the mesoscale analysis follow methodology approved by MassDEP.

The mesoscale analysis predicts the change in regional GHG emissions due to the proposed Project. The total vehicle pollutant burden was estimated for the 2012 existing conditions and the No-Build and Build conditions for year 2022. Traffic conditions are described in more detail in Section 5.7.

The EPA's MOBILE6.2 computer program was used to estimate motor vehicle emission factors on the roadway network in the Project area. Conservatively, emission factors derived from MOBILE6.2 are based on the worst case of either wintertime or summertime conditions. Daily and yearly emission estimates were calculated using the vehicle count data, mileage between intersections, modeled signalized intersection delay times, and emission factors.

The traffic volumes provided in Section 5.0 form the basis of the study. Peak hour traffic volumes were provided by the transportation consultant. Estimates of Average Daily Trips (ADT) were made from the peak hour volumes assuming a 10% K-factor. Average speeds were assumed for all roadways. Distances for the links were estimated with mapping software.

Average per-vehicle idle times were based on delay times reported in the SYNCHRO intersection modeling output reports provided in Section 5.0 and Attachment A to calculate emissions from idling vehicles.

Case 1, Baseline is intended to represent the difference between the No-Build case and the Build-without-mitigation case. In fact, because of the way in which traffic planning is integrated in the development of the Project, a Build-without-mitigation case does not exist. That is, the overwhelming majority of improvements are so integral to the Project itself that it is not feasible to distinguish between without- and with-mitigation cases as the Project would not exist in the absence of the majority of the improvements already negotiated with city and state agencies.

The Proponent has committed to an extensive program of traffic and roadway improvements under the cities of Boston and Revere HCAs, including the Route 1A flyover over Boardman Street, or other alternatives identified by MassDOT. These improvements are considered to be integral parts of the Project, rather than mitigation per se.

Traffic signal timing and phasing reports will be developed by the Proponent in collaboration with MassDOT, DCR and BTD to define signal timing and phasing improvements, if required. The Proponent will implement the approved traffic signal timing and phasing recommendations prior to receiving a Certificate of Occupancy, if appropriate

In addition, the Proponent has developed a comprehensive TDM program presented in Section 5.9. The proposed TDM program includes the following:

- Designating a Transportation Coordinator;
- Providing bicycle amenities in the form of bicycle storage and bicycle parking;
- Establishing a vehicle management and operations strategy which includes providing electric car charging stations; and
- Promoting travel alternatives.

All but a small portion of the HCA improvements is already reflected in the Traffic Analysis, and hence in the Baseline GHG analysis.

Table 7-6 presents the results of the transportation GHG source analysis for the Project. Baseline results are presented for the study year 2022. All related calculations, including the 2012 and 2022 emissions estimates, are presented in Attachment H.

The Baseline case shows a net reduction in intersection GHG primarily due to the reconfigured intersection of Route 1A and Boardman Street (along with improvements to the intersections of Route 1A with Waldemar Avenue and the North Site Driveway (Tomasello Drive).

As no additional mitigation is included in Case 2, the GHG emissions are the same as Case 1. In fact, there will continue to be adjustments to the traffic planning as work continues, but no additional substantial mitigation measures are expected.

Table 7-6 Transportation-Related GHG Emissions

	Case 1 - Baseline Build w/o mitigation - No Build	Case 2 - Proposed Build with mitigation - No Build
Net VMT, miles/day	37,255	37,255
Net Delay, hrs/day	-18	-18
GHG Emissions, tons/year		
Roadway	7,312	7.312
Intersection	-9	-9
Total	7,303	7,303

7.5.3 Redirected Customers

The Proponent anticipates that some portion of the Resort patrons traveling to Suffolk Downs will be people who are currently patrons of casinos in Rhode Island or Connecticut that instead will travel to Suffolk Downs due to its closer proximity. A third party consultant estimated the revenue that would be recaptured from out-of-State under the Proposed Build case. Caesars then used its proprietary gravity model to estimate the number of trips and distribute those trips geographically by distance rings in order to calculate the net difference in distance traveled in the Proposed Build case over and above the No Build case.

Results presented in Table 7-7 indicate almost 56,000 tons/year of avoided GHG emissions due to an expected reduction of more than 137 million vehicle miles travelled.

Table 7-7 Trip Diversion-related GHG Reduction

Trips to RI/CT Casinos, Origin Distance from Suffolk Downs	# of Trips Diverted	VMT reduction (miles/yr)	Avoided GHG Emissions (tons/yr)*
< 5 miles	78,964	13,792,358	5,607
5- 35 miles	1,030,375	117,691,667	47,846
> 35 miles	142,616	6,116,649	2,487
total	1,251,955	137,600,674	55,939

*Emission factor: 2012 gasoline vehicles, Mobile6 368 gr/mi

7.6 Summary and Mitigation Commitments

7.6.1 Project GHG Summary

Table 7-8 presents a composite of the building and transportation GHG emissions profiles of the Baseline and Proposed cases.

Table 7-8 Project GHG Emissions Summary

	Baseline	Proposed	Difference	
	tons/yr			%
Stationary Sources				
Buildings	13,704	10,494	-3,210	-23%
MWRA energy	36,098	31,847	-4,251	-12%
subtotal	49,802	42,341	-7,461	-15%
Green Energy purchases further reduce GHG emissions by 7,772 tons in the first two years of operation				
Transportation				
Fleet Vehicles	1,889	1,635	-254	-13%
Traffic	7,303	7,303	0	0%
Trip Diversion	na	-55,939	-55,939	
subtotal	9,192	-47,001	-56,193	-611%
Total	58,994	-4,660	-63,654	-108%

Trip diversion savings overwhelm all other Project emissions combined.

7.6.2 Proponent's Commitments to GHG Reduction

The Proponent's commitments to mitigate Project GHG emissions from the stationary sources are extensive, as indicated in Sections 7.2 and 7.3. Numerous additional mitigation measures have not been quantified, primarily because the degree of accuracy or the reliability of the quantification method is uncertain or the Project development has not reached the stage where the item can be adequately defined for quantification.

Designs for the buildings are in the design development stage and will continue to evolve. As the Project develops, the Proponent expects that additional technologies described previously, or possibly new technologies developed in the interim period, will be adopted that will further decrease GHG emissions, but these are not yet ripe for selection. The Proponent will continue to evaluate energy efficiency measures as the design develops.

The Proponent is committed to the following mitigation elements for the entire Resort or for individual buildings:

- High performance building envelopes;
- Light or reflective roofs;

- High-efficiency HVAC equipment;
- 200 kW CHP in the central utilities plant
- approximately 2.7 MW of PV arrays
- Energy recovery ventilation;
- Room occupancy sensors in the appropriate spaces, including hotel rooms;
- High-efficiency interior lighting and reduced lighting power density wherever feasible;
- High-performance exterior lighting;
- Low-flow or waterless plumbing fixtures and water conservation measures;
- Energy Star appliances and electronics;
- Tenant lease provisions that will involve and incentivize tenants directly in energy efficiency design and operations programs.
- Energy management systems;
- Recycling collection areas;
- Construction waste recycling;
- Extensive TDM program as described in Section 5.9;
- Shuttle bus fleet that will utilize alternative fuel vehicles to the maximum extent practicable
- Electric-powered site security vehicles.

The Proponent is committed to implementing the energy efficiency and GHG emission reduction measures presented in this analysis, but must retain an amount of design flexibility to allow for changes that will inevitably occur as design progresses. Case 2 includes a comprehensive estimate of the anticipated GHG reductions that can be achieved based on building energy modeling with preliminary design information. If, during the course of design for an individual building, a specific combination of design strategies proves more advantageous from an engineering, economic, or space utilization perspective, the design may vary from what has been described herein. Energy performance minima (and associated GHG emission reductions), as shown in Tables 7-2 and 7-3 will be adhered to on an overall Project basis.

The Proponent will submit a post-construction self-certification to the MEPA Office that will identify the GHG mitigation measures incorporated into the as-built Resort. Details of the Proponent's implementation of operational measures will be included.

Section 8.0

Historic and Archaeological Resources

8.0 HISTORIC AND ARCHAEOLOGICAL RESOURCES

This section identifies historic resources within and in the vicinity of the Project. A review of the State and National Registers of Historic Places and the survey files of the MHC and Boston Landmarks Commission (BLC), as well as a field review of the areas in the vicinity of the Project, was undertaken to identify historic resources. This section also describes potential direct and indirect impacts to historic resources associated with the Project.

8.1 Historic Resources

8.1.1 Historic Resources within the Project Site

The Project site encompasses the **Suffolk Downs racetrack**, connected **clubhouse** and **grandstand buildings**, **administration building**, **barns**, and ancillary **support buildings**, which are included in the Inventory of Historic and Archaeological Assets of the Commonwealth (Inventory) (MHC No. 209). Constructed in 1935, the facility was the first major racetrack in New England. Originally designed in the International Style, the property has undergone substantial renovations through the years, including enclosure of the grandstand in 1945, major renovations and modifications in 1962 with a new grand entrance and the joining and complete enclosure of the grandstand and clubhouse, a major renovation in 1992, and a series of updates and improvements over the past five years.

The MHC, in their ENF comment letter dated March 26, 2013, requested an updated MHC Form A (Area Form) be submitted prior to the filing of the DEIR. An updated MHC Form A was submitted to the MHC and BLC on July 2, 2013. A copy of the inventory form is included with this DEIR/EPNF in Attachment J.

8.1.2 Historic Resources in the Vicinity of the Project Site

The Project site is located in the cities of Revere to the north and East Boston's Orient Heights neighborhood to the south. A review of the State and National Registers, Inventory, and MHC databases revealed that there are limited previously identified historic resources in the vicinity of the Project area. Directly to the north of the Project site is the Revere Beach Parkway, which is listed in the National Register of Historic Places. To the east of the site in Revere's Beachmont neighborhood is the Our Lady of Lourdes Roman Catholic Church Complex. South of the Project site is the Madonna Queen Shrine and Don Orione Rest Home complex on Orient Avenue in East Boston. In addition, there are two residences on Orient Avenue included in the Inventory. These historic resources are described below.

Table 8-1 lists State and National Register-listed and inventoried properties located within a quarter mile radius of the Project site. The resources are keyed to Figure 8-1.

Table 8-1 Historic Resources within and in the Vicinity of the Project Site

Map No.	*Name*	*Address*
Properties listed in the State and National Registers of Historic Places		
1	Revere Beach Parkway	
Properties included in the *Inventory of Historic and Archaeological Resources of the Commonwealth*		
2	Suffolk Downs	111 Waldemar, Boston
3	Our Lady of Lourdes Complex	1, 2 Endicott Avenue, Revere
4	Residence	54-56 Orient Avenue, East Boston
5	Residence	75-79 Orient Avenue, East Boston
6	Don Orione Complex	111, 120, 150 Orient Avenue, East Boston

Revere Beach Parkway is a curvilinear, 5.3-mile, heavily traveled boulevard that runs between Wellington Circle in Medford and Eliot Circle in Revere. Designed by Olmsted, Olmsted and Eliot, and its successor firm, Olmsted Brothers for the Metropolitan Park Commission, Revere Beach Parkway was originally built in 1896-1905. Throughout its history, the parkway has undergone changes, including having been widened to accommodate increased traffic and to improve crossings and intersections.

Revere Beach Parkway was listed in the National and State Registers of Historic Places in 2007. The National Register boundaries include the parkway corridor and adjacent planted strips and sidewalks, where they exist. Where they do not exist, the boundary is ten feet back from the current edge of the parkway. The National Register nomination identifies original features that contribute to the historic character of the parkway including sidewalks, planted strips, medians, curbs, parking, Boston-type pipe rails, and scenic vistas.

The **Our Lady of Lourdes Roman Catholic Church Complex** is comprised of the Church, Rectory, Garden with Shrine, and Garage (MHC Nos. REV.G, REV.7, REV.83, REV.84, Rev.958). The complex was designed by Maginnis, Walsh and Sullivan in the Neoclassical style in 1907. It is associated with the development of the Beachmont section of Revere in the early twentieth century. The complex was surveyed in 2005 and recommended eligible for inclusion in the National Register of Historic Places.

The **Don Orione Complex** at the top of Orient Heights in East Boston is the national headquarters for the Don Orione religious order. The **Madonna Queen National Shrine** (MHC No. BOS.902), constructed in 1954, features a full-size replica of the statue at the Don Orione Center in Rome, Italy. It was constructed in 1954 by Jewish-Italian sculptor Arrigo Minerbi to show his gratitude to the Catholic Church for having protected him and

his family during World War II. Across the street from the Shrine is the **Don Orione Nursing Home** (MHC No. BOS.113), a nursing home which was also founded by the Don Orione order. The complex includes the **Mother Queen Shrine Chapel** (BOS.114), **Don Orione Rest Home** (BOS.110) and the **Franciscan Sisters of Mary Convent** (BOS 111).

In addition to the Don Orione complex, two nearby properties at **54-56 and 75-79 Orient Avenue** (MHC Nos. BOS.109 and 112) are included in the Inventory. Both are Colonial Revival residences constructed ca. 1915.

8.2 Archaeological Resources

There are no known archaeological resources listed in the State and National Registers of Historic Places or included in the Inventory of Historic and Archaeological Assets of the Commonwealth within the Project site. New construction associated with the proposed Project will be sited on a previously developed parcel consisting of filled land. It is not anticipated that the Project site will impact archaeological resources.

8.3 Impacts to Historic Resources

8.3.1 Construction

Suffolk Downs – Clubhouse, Grandstand, Racetrack, Maintenance Facility, Administration Building, Barns and Ancillary Buildings

The Suffolk Downs racetrack, clubhouse and grandstand buildings will be retained for continued use, supporting the casino and horse racing program. The overall Project is described in Sections 1.1 and 4.3. Specific impacts to Suffolk Downs buildings include renovation of the clubhouse and grandstand buildings, construction of a new maintenance garage and shop building, and retention and repair of the majority of the horse barns. Buildings proposed to be demolished include the administration building, the maintenance building, and four barns.

The clubhouse and grandstand buildings west elevations, facing the new casino and hotel, will be renovated and include a porte cochere at the main entry, the addition of a one-story restaurant retail bay, a one-story glass addition, and winter garden which links Casino Area I and Casino Area II.

The west facade of the existing grandstand building will be reconstructed in an Art Deco style. The facade design will incorporate vertical towers with sculpted geometric pattern motifs.

The grandstand interior will undergo a substantial renovation to accommodate the Casino Area I at the ground floor and the horse racing program at the second and third floors. Existing finishes will be updated and new mechanical systems will be installed. The existing service kitchens and bars will be renovated. The existing elevators and stairs will

be retained throughout the building. Access to the racetrack apron area for viewing live racing events will be provided through existing and new doors located on the track side of the building and a new accessible ramp and elevator at the north end of the clubhouse space.

The existing tiered grandstand building will be retained for viewing of live racing events. The building will undergo a substantial renovation to update interior finishes. Grandstand seating will be a combination of standard stadium seating, enhanced stadium seating, box seating areas, and terraced seating.

The existing maintenance building is in poor condition and cannot meet the existing or projected needs of the horse racing program and resort. The existing building will be demolished and replaced with a new 12,000-square-foot combination maintenance garage and shop building. The building will be a pre-engineered metal building with insulated metal roof and wall panels, structural concrete slab, insulated doors and windows. The building will accommodate multiple functions, including a track superintendent and support staff offices, staff break room and locker room, carpenter shop, plumber shop, electrician shop, upholstery shop, tool rooms, vehicle repair and storage area, and storage.

Now referred to as the office building, the two-story steel frame concrete clad former administration building is situated on the east side of Tomasello Drive, surrounded by surface parking. The flat roof of the building collapsed during a heavy rainstorm in late 2012 and is now vacant, with considerable structural and water damage. The building is proposed to be demolished.

Four dilapidated barns will be demolished. The remaining 25+ barns will be retained and repaired, as needed.

Impacts to the extant buildings, with the exception of the maintenance building, administration building, and dilapidated barns, which are proposed to be demolished, will be positive. The proposed renovations will largely preserve the existing buildings, most importantly the clubhouse and grandstand buildings and barns, as well as the racetrack. The preservation and renovation will allow Suffolk Downs to continue to operate as a premier New England horse racing facility.

Existing conditions site plans and proposed site plans, plans, and elevations for the Project are included in Volume II, Project Figures.

Revere Beach Parkway

As detailed in Section 1.1.1.7 and Section 5.0, the Project includes conceptual improvements at various locations along Revere Beach Parkway to address traffic issues and improve traffic flow. Improvements to Revere Beach Parkway are proposed to address existing traffic, pedestrian, and safety issues and are limited in scope. Transportation improvements are confined to three intersections:

- Route 1 / Revere Beach Parkway (Route 16)
- Revere Beach Parkway (Route 16) / Winthrop Avenue (Route 145) / Harris Street
- Revere Beach Parkway (Route 145) / Tomasello Drive / North Shore Road

Revere Beach Parkway is under the jurisdiction of the Department of Conservation and Recreation (DCR). Route 1, Route 16 northeast of Revere Beach Parkway (Route 145), and North Shore Road are under the jurisdiction of MassDOT. Harris Street is City of Revere jurisdiction as are other local roads. Tomasello Drive is a private way.

The MHC, in their ENF comment letter dated March 26, 2013, requested the DEIR identify any potential alterations to the Parkway associated with the Project. The proposed improvements, while not technically a part of the Project, are proposed as measures to address regional and historic traffic issues required by the Revere and Boston HCAs, and they are described in Sections 1.0 and 5.0. They are further described below, with emphasis on the potential impacts that these proposed improvements may have on Revere Beach Parkway at each of the locations noted above.

Route 1 / Revere Beach Parkway (Route 16)

The proposed conceptual design includes a reconfiguration of the Route 1 southbound off-ramp to Route 16 westbound, construction of a new traffic signal system on Route 16 (southwest of Route 1) which will allow Route 1 southbound traffic to travel Route 16 eastbound (something that is now permitted only by executing a U-turn at Webster Avenue in Chelsea), construction of a new traffic signal system (northeast of Route 1) which will allow Route 16 westbound traffic to travel Route 1 northbound and construction of a new ramp connection from Route 16 to the Route 1 northbound on ramp, a traffic movement that is not currently possible. The existing Route 16 median will be removed at both new traffic signal locations to accommodate the new turning maneuvers. The travel lanes on Route 16 westbound will be revised from two to three lanes within the existing pavement by reducing the width of the existing left shoulder. Finally, an exclusive left turn lane is proposed for Route 16 westbound traffic to travel onto Route 1 northbound.

The conceptual design requires the development of an exclusive left turn lane to accommodate Route 16 westbound vehicles to access Route 1 northbound. To achieve the left turn lane, two alternatives have been developed (see Figures 5-23A and 5-23B). The

figures depict proposed new DCR pavement, new MassDOT pavement, Revere Beach Parkway median modification, and new landscaped areas. Figure 6-23A depicts Alternative 1, which proposes to develop the left turn lane by narrowing the existing Route 16 median. In this alternative the median is narrowed from approximately 10 feet to 6 feet for a length of 630 feet. The total length of median break is 45 feet (new pavement area is 450 square feet) and the total length of median narrowing is 630 feet (new pavement area is 1,260 feet). Figure 5-23B depicts Alternative 2, which proposes to develop the left turn lane by reconfiguring the pavement lane markings further to the east to take advantage of the available pavement width and right shoulder area. The total length of median break is 40 feet (new pavement area is 400 square feet) and there is no median narrowing.

Character-defining elements of Revere Beach Parkway at the Route 1 interchange include:

- Alan J. O'Brien Bridge;
- Sidewalk with planted grass strips;
- Paved median with metal guardrail;
- Cobra head lights; and
- Curvilinear roadway pattern.

As described above, proposed improvements at the Route 1 interchange will require two curb cuts to accommodate the new Route 1 southbound off-ramp and new Route 1 northbound on-ramp. The curbing in this area is replacement bituminous curbing. In addition, the replacement concrete median with modern metal guardrails will require two cuts to accommodate the new Route 1 southbound and northbound ramps. A small amount of new pavement will be acquired from the westbound median to accommodate a westbound left turn lane to access the Route 1 northbound ramp. The improvements have been specifically designed to minimally impact the Parkway.

The Route 1 intersection has been heavily altered since the Parkway was originally constructed. The curbing and median at the Route 1 intersection are not original to the parkway. The proposed improvements will have no impacts to character-defining elements of the parkway at this interchange, including the Alan J. O'Brien Bridge, sidewalks and planted grass strips, cobra head lights, and curvilinear roadway pattern. In addition, the Project will add new landscaped areas north of the Parkway at the reconfigured Route 1 southbound off ramps.

Revere Beach Parkway (Route 16) / Winthrop Avenue (Route 145) / Harris Street

The proposed conceptual design includes improvements to the existing traffic signal system, construction of a second right turn lane from Route 16 eastbound to Winthrop Avenue southbound, and pedestrian safety improvements throughout the intersection.

Three alternatives for this intersection have been developed with variations at Harris Street and Route 16 northeast of Revere Beach Parkway (see Figures 5-24A, 5-24B, and 5-24C). Final determination of the preferred alternative requires further engagement by the City of Revere, DCR and MassDOT. However, in all three alternatives, development of an additional Route 16 eastbound through lane is proposed.

The development of the Route 16 eastbound through lane will require the narrowing of the existing median. The median will be narrowed between 0 and 13 feet for a length of approximately 650 feet. The area of new pavement is approximately 6,100 square feet.

Character-defining elements of Revere Beach Parkway at the Winthrop Avenue/Harris Street intersection include:

- Roadway alignment with marked turn at the intersection;
- Sidewalks with planted grass strips;
- Grassed median east and west of the intersection;
- Cobra head lights; and
- MBTA Bridge No. 4, immediately east of the intersection.

As described above, proposed improvements at the Winthrop Avenue/Harris Street intersection will create a new Route 16 eastbound lane. The improvements have been designed to minimally impact the Parkway, and the widening required to create the new lane will largely utilize existing paved areas that exist within the narrow breakdown lanes, as well as a reduction in the width of the median in the immediate vicinity west of the intersection.

The proposed improvements will have no impacts on character-defining elements of the parkway at this interchange, including the road alignment, sidewalks and planted grass strips, the median east of the intersection, cobra head lights, and the MBTA railroad bridge.

Revere Beach Parkway (Route 145) / Tomasello Drive / North Shore Road

The proposed conceptual design includes improvements to the existing traffic signal systems at North Shore Road and at Tomasello Drive, construction of an exclusive right turn lane from Revere Beach Parkway eastbound to Tomasello Drive and pedestrian safety improvements throughout the intersection (see Figure 5-25).

The conceptual design requires the improvement of the existing left turn lane from Revere Beach Parkway eastbound to North Shore Road. The existing left turn is proposed to be lengthened by approximately 160 feet and the median in this area will be narrowed between 0 and 10 feet. The area of new left turn lane is approximately 800 square feet. The development of the exclusive right turn lane from Revere Beach Parkway eastbound to Tomasello Drive requires approximately 55 feet of new pavement. The area of new right turn lane is approximately 275 square feet. Finally, the improvement of the existing pedestrian crossing on Revere Beach Parkway west of Tomasello Drive and the additional

pedestrian crossings east of Tomasello Drive require addition new pavement as shown in Figure 5-25. The total length of new pedestrian crossing within existing median or grass areas is approximately 47 feet. The area of new pavement for pedestrian crossings is approximately 282 square feet. The existing pedestrian crosswalk to the east of Tomasello Drive will be returned to approximately 270 square feet of landscaped area.

Character-defining elements of Revere Beach Parkway at the Tomasello Drive and North Shore Road interchange include:

- Grassed median east of Tomasello Drive;
- Narrow concrete median east of North Shore Drive, which expands to a wider grassed median further to the west of the intersection;
- Cobra head lights;
- Vertical granite curbing; and
- Sidewalks with grass strips.

As described above, proposed improvements at the Tomasello Drive and North Shore Road intersection are proposed to improve pedestrian safety and lengthen the existing left turn lane onto North Shore Road. The improvements have been designed to minimally impact the Parkway. Minor curb cuts are required to accommodate barrier-free access across the parkway at the Tomasello Drive intersection. The existing paved walkway will be removed and the median restored to landscaped areas.

The proposed improvements will have no impacts on character-defining elements of the parkway at this intersection, including the road alignment, sidewalks and planted grass strips, the median east of the intersection, the grassed median west of North Shore Road, cobra head lights, and granite curbing.

8.3.2 Design and Visual Impacts

Section 4.0 describes urban design goals for the Project. As noted, a master plan for the site establishes a spatial hierarchy of streets, open space, and buildings that bring a human scale to the development. A street pattern grid will be established that organizes the site into blocks, arrival courts, and plazas, creating an urban streetscape. The blocks establish a series of buildings, which include the renovated clubhouse and grandstand buildings, hotels and casinos. Preservation and reuse of the original Suffolk Downs buildings and racetrack is central to the overall massing and organization of the Project program. The new construction has been designed to complement the existing Suffolk Downs facilities and allow for its preservation and continued use.

8.3.3 Shadow Impacts

The Proponent conducted a shadow impact analysis to assess potential Project-related impact that is summarized in Section 6.2 and depicted in Figures 6-3 through 6-17. The shadow analysis focuses on extant buildings, open spaces, residential areas, major pedestrian areas, and plazas in the Project vicinity.

The shadow analysis demonstrates that new shadow impacts from the Project will be minimal, and will not affect any sensitive areas off-site. Likewise, the network of pathways throughout the entry landscape will be unaffected by new shadow, as will most of the open spaces on the Project site.

Shadow impacts to the adjacent clubhouse and grandstand buildings will be limited to late afternoon hours. There will be no shadow impacts to the barns and other ancillary buildings.

Section 9.0

Infrastructure

9.0 INFRASTRUCTURE

9.1 Wastewater

This section describes existing and proposed wastewater management conditions on the Project site.

9.1.1 Existing Wastewater System

Sanitary sewer mapping obtained from City records and on-site field surveys indicates an existing on-site sanitary sewer system in the area of the grandstand and clubhouse. All sanitary sewage generated by the existing buildings flows to a 12-inch gravity sewer line that runs north-south and connects to a private sewer pump station on the south side of the property. This pump station pumps sanitary sewage via a 12-inch force main to an existing Boston Water and Sewer Commission (BWSC) 12-inch sanitary gravity sewer in Waldemar Avenue. This gravity sewer runs easterly in Waldemar Avenue until it ultimately discharges into a 24-inch sanitary sewer main at the end of Waldemar Avenue.

Wastewater is also generated by the existing stable area. The stable area, which is classified as a Concentrated Animal Feeding Operation (CAFO), contains an existing wastewater system that collects stormwater that falls on the ground surface and conveys it to a settling pond in the racetrack infield where it is allowed to settle before being pumped to an existing BWSC sanitary sewer line at the east end of Waldemar Avenue. From there, the CAFO wastewater flows easterly via a BWSC 24-inch sanitary main in Leverett Avenue. Flow is eventually transported by the BWSC sewer system to the ultimate discharge point at the MWRA Deer Island Waste Water Treatment Plant for treatment and disposal.

Existing wastewater flows at the Project site are primarily generated by the CAFO. Since these wastewater flows are generated by storm events, there is no reliable measure of these flows on a daily basis. However, flows discharged to the BWSC system are estimated to be approximately 150,000 gallons per day. No changes are proposed to the existing discharge from the stable area to the BWSC sanitary sewer at the easterly end of Waldemar Avenue. However, the Project will reduce flows from the CAFO since it will convert approximately 2.3 acres of the CAFO into a parking area. The remaining wastewater flow is generated by the existing grandstand and clubhouse buildings. Estimates of daily wastewater flow for the existing Project site were developed by examining two years of water use records (June 2010 to May 2012) provided by Suffolk Downs. Daily water use multiplied by 90% to determine the wastewater estimate of 16,020 gallons per day. Suffolk Downs also provided water use records for water purchased from the City of Revere; however, water purchased from the City of Revere is used in the maintenance areas and for racetrack irrigation. Therefore, these flows are not collected by the on-site sewer system and are therefore not included in the wastewater discharge estimates.

9.1.2 Estimated Wastewater Generation

Wastewater generation estimates for the Project were developed based on wastewater generation rates from MassDEP (310 CMR 15.2), Title V of the State Environmental Code. There are no flow factors for casino uses in 310 CMR 15.2. Therefore reasonable assumptions for flow rates were made for gaming uses based on similar types of uses. For instance, Project engineers assumed that a wastewater flow factor for gaming positions was most similar to the wastewater flow factor for a Lounge or Tavern as described in Title V. Therefore, a wastewater flow factor of 20 gallons per seat was used for gaming positions. Wastewater flow factors for other uses within the Resort were applied to the size of the different uses to develop the following estimates.

These rates represent maximum daily flows, while in reality, actual flows from the Resort are expected to be considerably lower due to the inclusion of efficient design features (e.g., low-flow water fixtures and equipment). The maximum daily discharge for the proposed Resort is estimated as 321,834 gpd (see Table 9-1). The maximum hourly wastewater discharge generated by the Resort is estimated as 1,006 gallons per minute (gpm). These flows do not include any flows for laundry facilities; all laundry for the proposed Resort will be performed off site.

Table 9-1 Anticipated Sewage Generation from the Resort

Project Element	*Size*	*Wastewater Discharge*	*Total Sewer Discharge (gpd)*
Gaming positions (Lounge, Tavern)	7,564 seats	20 gpd/seat	151,284
Office Building	85,083 sf	0.075 gpd/sf	6,381
Function Hall	1,090 seats	15 gpd/seat	16,350
Fast Food Restaurant	568 seats	20 gpd/seat	11,360
Restaurant	1,269 seats	35 gpd/seat	44,415
Factory, Industrial Plant, Warehouse or Dry Storage Space without Cafeteria	60 people	15 gpd/person	900
Motel, Hotel, Boarding House	452 rooms	110 gpd/room	49,720
Country Club, Lockers and shower	530 lockers	20 gpd/locker	10,600
Theater, Auditorium	9,776 seats	3 gpd/seat	29,328
Retail Store	30,000 sf	0.05 gpd/sf	1,500
total			**321,834**

Hourly estimates of sewer discharges from the proposed Project were also developed. Daily sewer flow estimates were converted to gallons per minute flow rates and applied to Merrimack peak wastewater curves developed in Technical Release 16. These curves suggest applying a peaking factor of 4.5 to the gallons per minute sewer flow rate estimate

to determine the instantaneous peak flow rate generated by the facility. The peak flow rate derived from the Merrimack Curves is estimated to be 1,009 gallons per minute. This peak is expected to occur between 9:00 p.m. and 10:00 p.m. on Saturday evenings, when peak occupancy of the Resort is expected to occur. Daily peak flow estimates for the Resort were evaluated on an hourly basis for a typical week based on anticipated occupancy levels and anticipated parking occupancy. Table 9-2 contains a list of expected daily peak flow rates and the related hours of their occurrence.

Table 9-2 Expected Daily Peak Wastewater Flow Rates for the Project.

Day	*Daily Peak Flow Wastewater (gpm)*	*Anticipated Hour of Daily Peak Flow*
Monday	594	7-8 p.m.
Tuesday	599	7-8 p.m.
Wednesday	612	7-8 p.m.
Thursday	619	7-8 p.m.
Friday	907	9-10 p.m.
Saturday	1009	9-10 p.m.
Sunday	785	5-6 p.m.

All Project-generated wastewater will ultimately be conveyed into the BWSC sewer system. Flow generated by Casino Area I, a portion of Casino Area II, the maintenance building, and the parking garage will be conveyed via gravity to a proposed pump station (Pump Station 1) on the northern side of the grandstand building in the vicinity of the CUP. Flow from the remainder of the facility will flow via gravity to a second proposed pump station (Pump Station 2) in the vicinity of the existing pump station on the south side of the site. Pump Station 1 will convey flow via force main to Pump Station 2. All of the existing gravity sewer servicing the existing grandstand building on site will be abandoned and new gravity sewer will be installed.

The existing pump station on the southern side of the Project site will be replaced with Pump Station 2, which will pump directly to the BWSC system. However, the new force main will pump to a sewer manhole located near the MBTA Suffolk Downs pump station at the end of Waldemar Avenue. This configuration differs from the current configuration, whereby the new connection will be downstream of the current connection.

The Proponent will work closely with the BWSC to design the proposed sewer connection to avoid any negative impacts to the existing BWSC 12-inch sanitary sewer main or any sewer lines downstream. In addition, the Proponent will submit a General Service Application and site plan for review as the Project progresses.

The Resort will generate new wastewater flows greater than 50,000 gallons per day; therefore, a Sewer Extension Permit BRP WP 74 will be required from MassDEP. Any wastewater generated from the parking garage via floor drains will utilize sanitary

connections per State Plumbing Code requirements. Any wastewater collected from the garage (e.g., snow melt) will be collected in a plumbing waste system, pass through an approved oil/sediment trap, and then discharge to the sanitary system.

In addition to installing on-site sanitary sewer services for the proposed buildings, the Project will coordinate any necessary sewer main upgrades, improvements, or relocations. If sewer upgrades are necessary, the Proponent will coordinate any necessary design process with BWSC. All new sanitary sewer work will be completed in accordance with the latest local, state, and federal codes and standards.

The Project has been designed to reduce wastewater flow to the extent practical. Plumbing fixtures will be low-flow or waterless: low-flow fixtures will be used in the hotel guest bathrooms; waterless urinals will be used throughout. Cooling tower make-up water and irrigation demand for potable water will be reduced by using captured rainwater for these purposes, thus reducing demand for potable water as well as the amount of wastewater discharged from the Project. Water-efficiency measures are described in Section 9.2.3.

9.1.3 Sanitary Flow Routes

All wastewater generated by the Resort will ultimately be discharged to the MWRA system. Wastewater will discharge to a 24 inch sewer near the MBTA station that is part of the East Boston Low Level Sewer (EBLLS). The EBLLS becomes a 30 inch sewer on Leverett Avenue before expanding to a 36 inch sewer as it flows easterly in Bennington Street. This sewer increases in size to 39 inch by 54 inch sewer that ultimately discharges to the Caruso Pump Station located near the Chelsea Street Bridge. The Caruso Pump Station lifts wastewater flows into the MWRA's North Metropolitan Trunk Sewer which conveys flows to the Deer Island Wastewater Treatment Plant.

9.1.4 Infiltration and Inflow

The Project is proposing all new sanitary sewer lines on the Project site, since the existing sanitary sewer line was installed in the 1930s when the site was initially developed. Due to the age of this line, it is anticipated that a significant amount of infiltration and inflow (I/I) is collected by the existing sewer line. The Proponent has been measuring flows carried by the existing line in an effort to quantify the amount of I/I it conveys. These flows will be reconciled with water meter records as well as precipitation data.

With Project development, a new wastewater collection system will replace the existing sewer line, thus significantly decreasing the amount of I/I conveyed to the BWSC system.

The Proponent acknowledges the BWSC policies regarding offsetting flow increases with reductions in nearby I/I. The Proponent is committed to working closely with the BWSC to provide appropriate mitigation consistent with BWSC goals and policies. Furthermore, the

Proponent acknowledges Boston's 4:1 mitigation requirements as well as fees associated with that requirement, and will work with BWSC to identify projects or incur the appropriate fees.

The Project is not anticipating any additional wastewater connections to the City of Revere system.

9.2 Water Supply

Potable water supply for the Project site is currently provided by the City of Boston, and the Resort will receive water service from the City. The City of Revere provides a daily water supply that is used by the stable, racetrack, and maintenance areas.

9.2.1 Existing Water Supply System

There are five different water systems within the City of Boston that provide service to portions of the City based on ground surface elevation. The five BWSC water systems are southern low (commonly known as low service), southern high (commonly known as high service), southern extra high, northern low, and northern high. There is an existing 8-inch northern high water main beneath Waldemar Avenue.

The Project proposes an upgrade to the existing connection in Waldemar Avenue to serve the proposed Resort. A new water service will be provided in generally the same location as the existing service to the site. The Project will also provide a second looped connection to the existing line in Waldemar Avenue which will be installed close to the Resort entrance from Route 1A.

As described in Section 9.1, Suffolk Downs provided water use records for two years beginning in June 2010 and ending in May 2012 that provide a reasonable estimate of existing water use for the Project site. These monthly records were converted to daily flow estimates, and they indicate the existing flow from the grandstand and clubhouse buildings is approximately 17,800 gallons per day. Records from the City of Revere indicate that water use for the stable, racetrack, and maintenance areas is approximately 22,400 gallons per day.

BWSC record flow test data containing actual flow and pressure for a hydrant in the vicinity of the Project site was not available. BWSC performed flow tests at two hydrants along Waldemar Avenue, results from which are provided in Table 9-3. Additional testing will be required once Project design progresses, as hydrant flow data should be less than a year old when used as a design tool.

Table 9-3 BWSC Hydrant Flow Test Results in Waldemar Avenue.

Flow Hydrant Number	*Date of Test*	*Static Pressure (psi)*	*Residual Pressure (psi)*	*Total Flow (gpm)*	*Flow (gpm) at 20 psi*	*Flow (gpm) at 10 psi*
H128- H130 Waldemar Ave	6/29/2012	102	65	792	2434	2590

9.2.2 Estimated Water Use

The Project design includes installation of a new looped water line, and the existing on-site water line will be abandoned. A new 8-inch CLDI water line will connect to the existing 12-inch water line in Waldemar Avenue, and the new water line will enter the site in generally the same location as the existing line. The water line will be generally contained in the Tomasello Drive alignment and will provide service to Casino Area I, Casino Area II, Hotel I, and the maintenance building (as well as the future Hotel II). Proposed hydrants will be located throughout the site, with the specific locations to be coordinated with the appropriate City of Boston departments.

Section 9.1 describes the methodology used for estimating wastewater flows using Title V flow factors. Estimates of potable water demand for the Resort were derived from the Title V wastewater estimates by adding 10% to the wastewater demands (see Table 9-4). This calculation results in a projected potable water demand of 354,017 gallons per day for water use inside the proposed buildings. Hourly estimates for water demand were also calculated. These estimates were developed from the hourly wastewater demands described in Section 9.1.2.

Table 9-4 Estimated Resort Water Demand.

Day	*Daily Peak Water Flow (gpm)*	*Anticipated Hour of Daily Peak Flow*
Monday	653	7-8 p.m.
Tuesday	659	7-8 p.m.
Wednesday	673	7-8 p.m.
Thursday	681	7-8 p.m.
Friday	998	9-10 p.m.
Saturday	1110	9-10 p.m.
Sunday	864	5-6 p.m.

All new domestic water services will be installed in accordance with current local, state, and federal codes and standards. Backflow preventers will be installed on service connections to prevent backflow contamination of the City's supply system, and water metering will be installed in accordance with BWSC regulations. In addition, since some of

the Project will be located within the floodplain, and floodwaters could conceivably inundate the Project site, domestic water supply utilities will be installed in accordance with local codes and National Flood Insurance Program (NFIP) regulations.

The Proponent will coordinate with the BWSC on the design and capacity of proposed connections to the water system. In addition, the Proponent will submit a General Service Application and site plan for review as Project design progress.

Since potable water for the maintenance building will be supplied by the City of Boston, there may be a decrease in water needs from the City of Revere. All existing connections to the stable area will be maintained, and water use in the stable areas is expected to remain similar to current usage patterns. Outdoor water use related to the racing and stable operations is expected to be similar to current water usage levels. The Project does not anticipate an increase in overall water use for the stable and racetrack operations. Due to the installation and use of the rainwater harvesting tank east of Casino Area I, there may be a decrease in water use from municipal supplies for racetrack watering.

The Proponent will continue to coordinate with the MWRA. Research and review of MWRA plans indicates that there is 30-inch ductile iron water main owned by the MWRA in Winthrop Avenue north of the Project. The Project is proposing to obtain water service from the BWSC lines in Waldemar Avenue, and does not anticipate performing water or sewer work near the MWRA line. Therefore, the Proponent does not anticipate the need for an 8(m) permit from the MWRA at this time.

The irrigation demand for the Resort is estimated to be approximately 34,000 gallons per day, some of which will be supplied from rainwater harvesting and other water conservation measures (see Section 2.0).

9.2.3 Water Conservation

Water conservation measures are incorporated into the Project design to reduce potable water demands on the BWSC water supply system. These measures include rainwater harvesting and reuse, low-flow or waterless plumbing fixtures, and public education. Relative to normal plumbing fixtures, the use of low-flow fixtures and equipment in Resort buildings is expected to reduce water use by approximately 30%, resulting in an annual water use reduction of approximately four million gallons.

The average annual rainfall for the City of Boston is 42 inches, and the Project includes plans to harvest stormwater from building roofs and the parking garage, storing the water in three large cisterns. This harvesting program should be capable of significantly reducing the amount of potable water needed for irrigation. Tank 1 will be located near the front of Casino Area II and will be sized to collect up to 80,000 gallons from the roof of Casino Area II for irrigation use. Tank II will be located in the plaza between the proposed parking garage and Casino Area I, and will be sized to collect up to 130,000 gallons from the

garage and approximately half of Casino Area I roof; this water supply cooling tower water as well as irrigation water. Tank III will be located between Casino Area I and the racetrack where it will collect up to 60,000 gallons to supply water for irrigation water and racetrack watering. The proposed rainwater harvesting tanks will have a collective capacity of approximately 270,000 gallons, and rainwater harvesting activities are expected to reduce potable water demand by up to 4.5 million gallons per year.

Several landscaped areas proposed adjacent to Resort buildings will have moderate irrigation demand, and harvested rainwater will be a principal source of irrigation water, supplemented by potable water when necessary. The Project will further reduce irrigation water demand by planting native and/or drought-tolerant plant species in landscaped areas; in keeping with the restorative site concepts, use of native drought-resistant plants will contribute to reducing potable water use for irrigation by approximately 50%. Although the Proponent intends to maximize the use of rainwater for irrigation, the proposed irrigation system will also be connected to the BWSC potable water supply system. When rainwater harvesting tanks are empty, the proposed irrigation system will draw water from the BWSC system.

Collectively, Project strategies to harvest rainwater, employ low-flow and waterless technologies, and use restorative site concepts in landscaping will reduce potable water use by approximately 8.5 million gallons annually.

9.3 Stormwater Management

This section describes existing and proposed stormwater conditions on the Project site.

9.3.1 Existing Conditions

The existing site is developed, consisting of: one main building that contains the grandstand, clubhouse, and simulcast operations as well as other smaller outbuildings; five parking lots and other paved areas totaling approximately 92 acres of impervious area; a horse racing track; and a CAFO area. The hydrologic analysis excludes a large portion of the ground surface area within the CAFO since this flow is directed to the sanitary system; the roofs of the CAFO area, however, are included in the analysis since they generate stormwater runoff that flows to Sales Creek. Therefore, the total analysis area for the site is 153.51 acres.

The existing Project site does not discharge stormwater to any of the BWSC sanitary or storm sewers. Most stormwater flows from the site discharge either directly or indirectly to Sales Creek, which flows to the Belle Isle Marsh.

9.3.1.1 Existing Drainage Infrastructure

Stormwater generated by the existing Suffolk Downs site is collected using catch basins and is then piped via a closed drainage system to three general design point locations. The design points, which remain consistent in the post-development stormwater design, are a drainage channel along the western property line, Sales Creek, and a wetland located east of the horse track. Most of the existing stormwater management system was constructed in the 1930s prior to the promulgation of MassDEP Stormwater Management Standards. The majority of the stormwater management system provides negligible peak flow attenuation, water quality treatment, and groundwater recharge. Recent improvements to the existing CAFO system included collecting stormwater that falls in the barn and stable area, conveying it to a settling pond within the racetrack infield, and then pumping this water directly to the BWSC sanitary sewer system.

9.3.1.2 NRCS Soil Designations

The Soil Classification Summary outlines the Natural Resources Conservation Services (NRCS) designation of the soil series at the Project site. The majority of soils are classified as Udorthents, wet substratum without a hydrologic soil group (HSG) rating, indicating that the soils are comprised of loamy fill soils likely from the general vicinity. Soils located southeast of the horse track in the wetland are classified as Ipswich mucky and are HSG D (minimal infiltration). Upland soils in the vicinity of the Project site include Newport silt loam and Newport-Urban land complex, which are classified as HSG C.

The on-site wetlands are considered HSG D, and the upland areas are considered HSG C in the HydroCAD calculations. The HSG C designation of the Udorthents was confirmed during on-site soil investigations.

9.3.1.3 On-Site Soil Investigations

Approximately 30 test pits were excavated on the Project site in 2012 by Haley and Aldrich, Inc. Depth of the test pits ranged from 4 to 13 feet, with most being excavated to a depth of 6 feet. Results of the test pits were generally consistent throughout the site. Soil test pit logs indicate the soil classification based on the Unified Soil Classification System (USCS). Throughout the entire site, soil in the test pit logs is considered fill. Generally, the top 24 inches of soil are classified as either poorly graded sand (SP) or silty sand (SM). Below 24 inches, the soil is mostly unclassified fill, SP, SM, or clayey sand (SC). In test pits close to Route 1A, silt (ML) and organic silt (OL) was found below 24 inches.

Historical measurements of observation wells have indicated groundwater levels at the Project site are 0.5 to 16 feet below ground surface, and are generally on the order of 2 to 6 feet below grade. In recent test pit explorations completed for this Project, groundwater was typically observed at depths of 2.5 to 7 feet below site grades. Seasonal fluctuations in groundwater levels can also be expected.

9.3.1.4 Total Maximum Daily Load

Stormwater from the Project site discharges primarily to Sales Creek and secondarily to wetlands or drainage channels on the east and west sides of the Project site, which are located within the Boston Harbor watershed. MassDEP has issued a Draft Pathogen Total Maximum Daily Load (TMDL) for the Boston Harbor Watershed (excluding the Neponset River) to address bacterial and other fecal-related pollution. The proposed stormwater management system and long-term pollution prevention measures will minimize the discharge of pathogens to adjacent resource areas. The Project will reduce impervious area on the site and will not have any illicit sewer or septic discharges, thereby minimizing potential pathogen sources. To reduce pathogens in stormwater discharging from the Project site, a reduction in impervious area, bioretention basins, biofiltration swales, pervious pavers, and rainwater harvesting tanks are proposed. The Project meets the intent of the Draft TMDL to reduce pathogens discharging within the Boston Harbor Watershed.

9.3.1.5 Concentrated Animal Feeding Operation

Stormwater from the ground level in the CAFO area is collected by a closed drainage system that is routed to a settling pond located in the racetrack infield, where water is then pumped to a sewer manhole located near the Suffolk Downs MBTA station. The Project will convert approximately 2.3 acres of CAFO to parking, so stormwater flow from that area will be removed from the CAFO system and will no longer flow to the settling pond and sanitary sewer system. To represent this in the pre-development calculations, a 2.3-acre area of the CAFO ground surface is included in pre-development catchment areas. This 2.3 acre area does not tie into the site stormwater runoff discharge in the pre-development calculations. In the post-development calculations, the runoff from this area will be incorporated into the stormwater management system.

Reducing the size of the CAFO ground surface will reduce the sanitary flows generated at the ground surface, effectively increasing the capacity of the existing CAFO treatment system. This will contribute to the improvement of the Sales Creek water quality.

9.3.2 Proposed Stormwater Management

The Project includes installation of a stormwater management system that is being designed to meet and exceed MassDEP Stormwater Management Standards, City of Boston stormwater requirements, and City of Revere stormwater requirements. As a redevelopment project, the Project is required to improve existing conditions to the maximum extent practicable. The Project will reduce peak stormwater flows, remove a minimum of 80% of TSS from stormwater flows, and collect and infiltrate the equivalent of the one-inch storm event over the proposed impervious area. The Project will reduce impervious area by approximately 14 acres on site, which is perhaps the most significant improvement to the

stormwater system relative to existing conditions. In addition, the stormwater management system will incorporate water quality treatment and infiltration facilities that are not currently present on the Project site.

The Project has been designed using environmentally sensitive site design and LID techniques. This design prevents the generation of stormwater and non-point source pollution by reducing impervious surfaces, disconnecting flow paths with biofiltration swales, treating and infiltrating stormwater at bioretention basins, and protecting natural processes taking place in surrounding resource areas. Stormwater systems have been designed to model natural hydrologic features, including promoting infiltration throughout the site.

The proposed stormwater management system for the Project site includes three sizable rainwater harvesting cisterns capable of collecting up to 270,000 gallons of water, porous pavers, deep sump and hooded catch basins, infiltrating bioretention basins with sediment forebays, biofiltration swales, and proprietary water quality structures. Overflow from the proposed BMPs will discharge to the existing design points via stormwater outfalls. Stormwater outfalls that discharge to Sales Creek will include rip rap aprons to prevent erosion, and outfalls at the wetland design points will use level spreaders to promote sheet flow between the outfall and wetland resource area.

Deep Sump and Hooded Catch Basins

Deep sump and hooded catch basins are proposed to provide pretreatment in impervious areas of the parking lot and roadway. Catch basins will also be installed within the bioretention areas as overflow devices.

Stormceptor® Water Quality Structures

Stormceptor® water quality structures will be used for water quality pretreatment in areas of the site where space is limited or additional pretreatment is required prior to discharge. These BMPs are designed to remove a minimum of 80% TSS. Generally, Stormceptor water quality units will be used to treat runoff generated by the parking area that discharges directly to Sales Creek.

The existing drainage system in the CAFO area will be protected and maintained. Recent stormwater improvements associated with the site, including the racetrack improvements and the sediment sump parallel to Sales Creek north of the racetrack, will be protected and maintained.

All stormwater generated by the Project will either be infiltrated into the ground or discharged directly or indirectly to Sales Creek or existing wetlands or drainage channels on the west side of the Project site. There will be no direct discharges to the BWSC sanitary or

storm sewers. Stormwater will not be discharged to the City of Revere sanitary or storm sewers. All discharged water will be of a much higher quality than the stormwater currently discharged from the Project site due to BMPs incorporated into the design.

Tables 9-5 through 9-9 summarize the reduction in peak flow rates from the Project for the three design points used in the drainage analysis.

Table 9-5 Peak Rates of Runoff for Design Point DP1 – Culvert invert west side (cfs)

Storm Event	*2-year*	*10-year*	*25-year*	*100-year*
Existing	73.89	121.60	152.44	190.04
Proposed	68.42	117.74	150.10	189.78

Table 9-6 Peak Rates of Runoff for Design Point DP2 – Stream contributing to Sales Creek (cfs)

Storm Event	*2-year*	*10-year*	*25-year*	*100-year*
Existing	39.20	63.60	79.30	98.42
Proposed	37.67	61.99	77.71	96.88

Table 9-7 Peak Rates of Runoff for Design Point DP3 – Sales Creek (cfs)

Storm Event	*2-year*	*10-year*	*25-year*	*100-year*
Existing	238.91	387.62	483.35	599.88
Proposed	225.67	371.69	465.58	580.40

Table 9-8 Peak Rates of Runoff for Total Site (cfs)

Storm Event	*2-year*	*10-year*	*25-year*	*100-year*
Existing	351.99	572.82	715.10	888.34
Proposed	331.75	551.12	693.38	867.05

Table 9-9 Volumes of Runoff for Total Site (acre-feet)

Storm Event	*2-year*	*10-year*	*25-year*	*100-year*
Existing	25.32	41.82	52.74	66.28
Proposed	23.82	40.00	50.78	64.19

Both the peak rates and volumes shown in the tables above are conservative. For purposes of this document, the drainage analysis was performed without taking into account any infiltration or any stormwater retention/detention in the bioretention basins. As Project design progresses, the infiltration and retention/detention effects of these bioretention basins will be incorporated into the calculations. In addition, reductions in flows resulting from the rainwater harvesting tanks are not accounted for. Therefore, all the figures shown above are conservative in nature. Actual figures will result in greater reductions in peak flows and volumes.

9.3.2.1 Low-Impact Design

An important principle of LID is minimizing impervious area to manage stormwater as close to the source as possible. The Project will reduce impervious area on the site by approximately 14 acres, thereby restoring a significant portion of the existing site to permeable ground covers which help treat stormwater as a resource rather than a waste product. The primary treatment BMPs used to treat stormwater runoff from the proposed impervious area are bioretention basins, which treat stormwater closer to the source than other treatment options and use designed soil media to mimic the natural movement of water within the soil profile for treatment and groundwater recharge. Other elements of the stormwater management design that treat runoff close to or at the source are porous pavers and biofiltration swales.

LID is recognized as an effective method for mitigating the effects of climate change, which is discussed in greater detail in Section 2.0.

Reduction in Impervious Area

By reducing impervious area on the Project site, the Project will reduce the rate and volume of stormwater runoff leaving the Project site while promoting groundwater recharge. Annual recharge from the post-development site will exceed the annual recharge from pre-development conditions solely by reducing impervious area. By reducing runoff volume and increasing recharge volume, there will be more infiltration which will provide water quality treatment, improving the quality of water entering Sales Creek. In other words, in the post-development condition, there will be more groundwater base flow entering Sales Creek and less surface-generated runoff.

Biofiltration Swales

Biofiltration swales (or grassed channels) will be used to break up the impervious area and provide pretreatment in the north parking lot. Due to the level of expected activity in this parking lot, the biofiltration swales will be lined to prevent infiltration. Therefore, the biofiltration swales will provide water quality treatment only.

Porous Pavers

Porous pavers are proposed in areas that will not be highly trafficked, but instead will be used as pedestrian areas with minimal vehicle activity. Porous pavers are not proposed in parking areas where high-intensity use is anticipated. The porous pavers will replace traditional impervious concrete and allow runoff to be treated and infiltrated within the pavement section.

9.3.2.2 On-Site Stormwater Retention

Bioretention Basin with Sediment Forebay

Six bioretention basins are proposed to treat stormwater runoff where feasible on the proposed site, including the southern half of the proposed Tomasello Drive, South Lot, drop-off circle near the entrance to Casino Area II, and surrounding walkways and plaza areas. The bioretention basins will include a minimum 30-inch media filter to provide TSS and nutrient pollutant removal and will provide infiltration.

Pretreatment for the bioretention basin will be provided by deep sump and hooded catch basins and a sediment forebay. The sediment forebays are designed in accordance with the MassDEP Stormwater Management Handbook to provide a water quality volume equivalent to 0.1 inches per impervious acre.

Consistent with BWSC requirements, the bioretention basins have been designed to store and infiltrate a volume of stormwater equal to one inch from all proposed impervious areas associated with the Resort. Given the proposed site design, 203,800 cubic feet must be stored and infiltrated on-site. Table 9-10 describes the volume of stormwater that will be stored and infiltrated on the Project site by each bioretention basin.

Table 9-10 Proposed Recharge Volumes for Stormwater BMPs

Infiltration BMP	*Recharge Volume (cf)*
Bioretention Basin 1	52,219
Bioretention Basin 2	50,614
Bioretention Basin 3	15,247
Bioretention Basin 4	29,414
Bioretention Basin 5	49,160
Bioretention Basin 6	26,004
Total	**222,658**

Calculations for the proposed infiltration include the proposed buildings. Stormwater generated from those building rooftops will be collected and stored in rainwater harvesting tanks. Therefore, the calculated volume is conservative and the amount of storage provided in the bioretention basins exceeds the City of Boston requirements.

Rainwater Harvesting

Stormwater runoff from the roofs of the buildings and approximately half of the parking garage areas will be collected and stored in three large rainwater harvesting tanks. Rainwater harvesting tanks will be located in three areas. Tank I will be located to the front of Casino Area II/Hotel I and will be sized to collect up to 80,000 gallons. This tank will collect stormwater generated from the roof of Casino Area II and be used for irrigation water. Tank II will be located in the plaza area between the garage and Casino Area I and will be sized to collect up to 130,000 gallons. It will collect stormwater generated by the proposed garage and approximately half of Casino Area I. This water will be used to supply cooling tower water as well as irrigation water. Tank III will be located between Casino Area I and the racetrack. Tank II will collect up to 60,000 gallons per day and will supply water to be used for irrigation water and track watering. The proposed tanks will be capable of storing up to 270,000 gallons, and harvesting rainwater is expected to reduce potable water demand by up to 4.5 million gallons per year.

The volumes that will be retained on the Project site by the rainwater harvesting tanks have not been included in the overall infiltration calculations. However, water collected in these tanks represents a significant amount of water that will not be discharged off-site during storm events.

9.3.3 Compliance with MassDEP Stormwater Management Policy Standards

The Project is a located on a previously-developed site and will result in a *decrease* in impervious area, and therefore is considered a "redevelopment" as defined in the MassDEP Stormwater Management Standards. Since the Project is a redevelopment project, it is required to meet the following Stormwater Management Standards to the maximum extent practicable: 2, 3, and the pretreatment and structural BMP requirements of Standards 4, 5, and 6. Existing stormwater discharges will comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

The Project site will be designed to meet and exceed MassDEP Stormwater Management Standards as summarized below:

Standard 1: *No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.*

Compliance: The Resort will not discharge any untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth. Stormwater from the site will be collected and treated in accordance with MassDEP Stormwater Management Standards, and stormwater outfalls will be stabilized to prevent erosion. This is a significant improvement over existing conditions.

Water quality treatment BMPs have been incorporated into the stormwater management system to provide increased TSS removal relative to existing conditions. Bioretention basins, deep sump and hooded catch basins, proprietary hydrodynamic separators, and biofiltration swales have been incorporated into the design and sized to provide at least 80% TSS removal. The BMP sizing calculations are included with the Stormwater Report. Rip rap at the new outfalls will be designed to avoid erosion or scour at the outfall or into the wetlands or Sales Creek.

Standard 2: *Stormwater management systems shall be designed so that the post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.*

Compliance: The proposed stormwater management system will be designed so that the post-development peak discharge rates do not exceed pre-development peak discharge rates at the design points and for the site as a whole. To prevent storm damage and downstream flooding, the proposed stormwater management practices will mitigate peak runoff rates for the 2-, 10-, 25-, 50- and 100-year 24-hour storm events. The reduction in impervious area in the post-development condition will also reduce the volume of stormwater being discharged from the site for the 2-, 10-, 25-, 50-, and 100-year 24-hour storm events, exceeding the requirements of Standard 2.

Standard 3: *Loss of annual recharge to groundwater shall be eliminated or minimized through the use of environmentally sensitive site design, low impact development techniques, stormwater BMPs, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.*

Compliance: The Project will comply with this standard. Site design has been environmentally-sensitive, using LID techniques and stormwater BMP treatment trains to improve groundwater recharge. Annual recharge from the post-development site will exceed the annual recharge from pre-development conditions based on soil type using guidelines provided in the MassDEP Stormwater Management Handbook.

The Project will improve groundwater recharge on site. Since the Project will actually *reduce* impervious area on site, no groundwater recharge is required based on the MassDEP Stormwater Management Standards. However, the use of LID techniques will provide groundwater recharge. Also, the bioretention basins are designed to retain and infiltrate a volume equivalent to one inch of water from the on-site impervious area to meet the City of Boston Stormwater requirements. Proposed recharge volumes for the bioretention basins are quantified in the Stormwater Report.

Standard 4: *Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This standard is met when: Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained; Structural stormwater BMPs are sized to capture the required water quality volume as determined in accordance with the Massachusetts Stormwater Handbook; and Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.*

Compliance: The proposed stormwater management system will be designed to remove at least 80% of the average annual post-construction load of TSS. Structural stormwater BMPs including deep sump and hooded catch basins, bioretention basins, porous pavers, water quality swales, biofiltration swales and Stormceptor® water quality units are sized to capture the required water quality volume (1 inch over the Project site impervious area) and remove a minimum of 80% of TSS.

Proposed water quality treatment BMPs are subject to the 44% TSS removal pretreatment requirement and the one-inch rule for calculating water quality volumes because the site is considered a land use with higher potential pollutant loads (see Standard 5).

Pretreatment for all infiltration BMPs will meet or exceed the 44% TSS removal requirement. The treatment train for runoff that is not directed to an infiltration BMP will include at a minimum deep sump hooded catch basins, and a proprietary treatment device

to remove at least 80% TSS prior to discharge to Sales Creek. Lined biofiltration swales will also be used in parking lot islands prior to the deep sump hooded catch basins where enough space is available. TSS removal calculation spreadsheets and Stormceptor® sizing calculations are provided in the Stormwater Report (see Attachment F).

Source control and pollution prevention measures such as vacuum cleaning, street sweeping, proper snow management, and stabilization of eroded surfaces are included in the Long-Term Pollution Prevention Plan and Operation and Maintenance Plan located in the Stormwater Report.

Standard 5: *For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If, through source control and/or pollution prevention, all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L.c. 21, §§ 26-53 and the regulations promulgated there under at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.*

Compliance: The parking lots associated with the site are considered high-intensity-use and Land Uses with Higher Potential Pollutant Loads (LUHPPLs) as defined by MassDEP. These areas are classified as a LUHPPL based on average daily vehicle trips anticipated to be generated by the proposed Resort.

The Project is a redevelopment and therefore the pretreatment and structural BMP requirements of Standard 5 are required to be met to the maximum extent practical. However, the proposed design meets this requirement. The treatment train for the portions of the parking lot that do not flow to the bioretention areas include Stormceptor proprietary treatment devices which capture sediments as well as free oil. Treatment trains for the remaining parking lot areas include deep sump hooded catch basins and sediment forebays prior to the bioretention areas.

Standard 6: *Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and*

best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1. or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00.[1] *Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of the public water supply.*

Compliance: The Project primarily discharges to Sales Creek, which is part of the Rumney Marshes ACEC. The Project is a redevelopment and therefore the pretreatment and structural BMP requirements of Standard 6 are required to be met to the maximum extent practical. Pretreatment BMPs were selected from Table CA 2: Standard 6 of the Massachusetts Stormwater Handbook and include deep sump hooded catch basins, sediment forebays, and biofiltration swales in selected portions of the Project. Table CA 2 indicates appropriate BMPs for use on sites with stormwater discharges to Outstanding Resource Waters. The main treatment BMPs are exfiltration bioretention basins, which are included in Table CA 2. Although the Project is only required to meet this Standard to the maximum extent practicable, this Standard is met fully by the proposed design.

Standard 7: *A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.*

Compliance: Since the Project is a redevelopment project, the following Stormwater Management Standards are required to be met to the maximum extent practicable: 2, 3, and the pretreatment and structural BMP requirements of Standards 4, 5, and 6 (see compliance narrative for Standards 2, 3, 4, 5, and 6). However, this Project will comply with all of the requirements of the Stormwater Management Standards and improve existing conditions (see compliance narratives for Standards 8, 9, and 10).

Standard 8: *A plan to control construction-related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.*

Compliance: The Project will comply with this standard. Sedimentation and erosion controls will be incorporated as part of the design and will be employed during site construction. Land disturbance will be kept to a minimum and the phasing of work will be planned so only areas being developed are exposed. All other areas should have natural vegetation preserved, good temporary cover, or permanent vegetation established. Permanent structures, temporary or permanent vegetation, and mulch/erosion netting

should be employed as quickly as possible after land is disturbed. Disturbed areas will be protected from stormwater runoff by installing erosion control or stormwater management measures to prevent water from entering and running over disturbed areas and to prevent erosion damage to downstream facilities. Perimeter control practices will be installed to isolate the construction site from surrounding areas. Siltation fence, temporary covers for drainage structures, and temporary settlement basin will be utilized where applicable.

Since the Project will disturb more than one acre of land, a Notice of Intent will be submitted to the U.S. EPA for coverage under the NPDES CGP. As part of this application the Applicant is required to prepare a SWPPP and implement the measures in the SWPPP. The SWPPP, which is to be kept on site, includes erosion and sediment controls (stabilization practices and structural practices), temporary and permanent stormwater management measures, Contractor inspection schedules and reporting of all SWPPP features, materials management, waste disposal, off-site vehicle tracking, spill prevention and response, sanitation, and non-stormwater discharges. A draft SWPPP is provided in the Stormwater Report (see Attachment F).

Standard 9: *A Long -Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.*

Compliance: A post-construction operation and maintenance plan has been prepared and will be implemented to ensure that stormwater management systems function as designed. Source control and stormwater BMP operation requirements for the academic campus are summarized in the Long-Term Pollution Prevention Plan and Operation and Maintenance Plan provided in the Stormwater Report.

Standard 10: *All illicit discharges to the stormwater management system are prohibited.*

There will be no illicit discharges to the stormwater management system associated with the Project. An Illicit Discharge Compliance Statement is provided in the Stormwater Report.

9.3.4 Consistency with NPDES General Permit

The site contractor will be responsible for stormwater management of the active construction site and will be required to adhere to the conditions of the 2012 Construction General Permit under the U.S. EPA. A draft SWPPP has been prepared in accordance with MassDEP Stormwater Management Standards and the 2012 Construction General Permit (see Attachment F).

9.4 Anticipated Energy Needs

9.4.1 Natural Gas Service

Natural gas will provide energy for heating (both space heating and domestic hot water generation), cooking, and power generation via a gas-fired reciprocating engine that will be the basis of a CHP cogeneration installation. Space heating will be generated via high-efficiency (condensing) boilers. Domestic hot water will be generated via the CHP system, supplemented and backed up by boilers.

9.4.2 Electrical Service

Electrical power will be provided to the Project from a local utility company and distributed throughout at 13.8 kV. Power will be transformed and further distributed within the building, powering lighting, equipment, and plug loads.

Emergency, life safety, and standby power will be provided via two diesel-powered standby generators (expandable to five generators in the future).

9.4.3 Telecommunications

Telecommunications service will be provided by Verizon and distributed throughout the site.

9.5 Energy Conservation

Multiple energy conservation strategies will reduce Project energy consumption, including:

- PV arrays will generate approximately 2.7 MW;
- A CHP installation will provide heat and power to the Resort while producing fewer GHGs than the equivalent utility-fed system;
- High efficiency mechanical equipment will be used to provide heating and cooling;
- Advanced lighting controls and architectural daylighting strategies will take advantage of natural light and reduce artificial lighting;
- Heat recovery devices will reduce the amount of waste heat (including moisture) that leaves the facility;
- High performance air system design will reduce the energy required to move heating and cooling energy around the facility;
- High efficiency plumbing fixtures (low flow and waterless fixtures) will reduce the consumption of domestic hot water, reducing heating energy consumption;

- Economizer cycles (using air and water) will use outside, untreated air to cool the space when possible;
- A high performance envelope will reduce envelope heat gain and loss; and
- Metering provisions will allow the owner to monitor and improve building operations to reduce energy consumption.

Section 10.0

Proposed Section 61 Findings and Mitigation

10.0 PROPOSED SECTION 61 FINDINGS AND MITIGATION

In accordance with M.G.L. c. 30, Section 61 and 301 CMR 11.12(5), any State Agency that takes Action on a project for which the Secretary required an EIR shall determine whether the project is likely, directly or indirectly, to cause Damage to the Environment and shall make a finding describing the Damage to the Environment and confirming that all feasible measures have been taken to avoid or minimize the Damage to the Environment.

Contents of Section 61 Findings (301 CMR 11.12(5)(a)): In all cases, the Agency shall base its Section 61 Findings on the EIR and shall specify in detail: all feasible measures to be taken by the Proponent or any other Agency or Person to avoid Damage to the Environment or, to the extent that Damage to the Environment cannot be avoided, to minimize and mitigate Damage to the Environment to the maximum extent practicable; an Agency or Person responsible for funding and implementing mitigation measures, if not the Proponent; and the anticipated implementation schedule that will ensure that mitigation measures shall be implemented prior to or when appropriate in relation to environmental impacts.

Section 61 Findings and Agency Action (301 CMR 11.12(5)(b): Provided that mitigation measures are specified as conditions to or restrictions on the Agency Action, the Agency shall:

1. make its Section 61 Findings part of the Permit, contract, or other document allowing or approving the Agency Action, which may include additional conditions to or restrictions on the Project in accordance with other applicable statutes and regulations; or

2. refer in its Section 61 Findings to applicable sections of the relevant Permit, contract, or other document approving or allowing the Agency Action.

Subject Matter Jurisdiction Limitations (301 CMR 11.12(5)(c)): In the case of a Project undertaken by a person that requires state permits or land transfers, but no funding, the Scope of any EIR is limited to those aspects of the project that are within the subject matter of the permit(s) or within the area subject to a land transfer that are likely, directly or indirectly, to cause damage to the environment. Any Participating Agency shall limit its Section 61 Findings, or any mitigation measures specified as conditions to or restrictions on the Agency Action, to those aspects of the Project that are within the subject matter of any required Permit or within the area subject to a Land Transfer. In the words of the MEPA statute (M.G.L. ch. 30, sec. 62A), "Any finding required by section sixty-one shall be limited to those matters which are within the scope of the environmental impact report, if any, required by this section."

State Agencies that will be required to make Section 61 Findings for the Project prior to issuing permits for, funding, or otherwise implementing the Project include or may include MassDEP, MassDOT, DCR, MWRA, and the Massachusetts Gaming Commission.

Depending on agency procedures, as described above, the various Section 61 Findings may be part of permits or agency actions, or may be stand-alone documents. Moreover, agencies will generally limit Section 61 Findings to impacts and mitigation within the scope of the subject matter of their permits (e.g., MassDEP Section 61 Findings will address wastewater, if the project requires a permit related to wastewater).

The Proposed Section 61 Findings below and the subsequent sections contain commitments the Proponent has made as a basis for respective agency Section 61 Findings. These commitments include mitigation measures for potential impacts related to transportation, air quality, wetlands, GHG emissions, wastewater, water use, and stormwater. See also the Summary of Impacts and Mitigation Measures, Table 10-1.

10.1 MassDEP Proposed Section 61 Finding

Project Name:	Caesars Resort at Suffolk Downs
Project Location:	East Boston and Revere
Project Proponent:	Sterling Suffolk Racecourse, LLC
EOEA Number:	15006
Date Noticed in Monitor:	

These Findings for Caesars Resort at Suffolk Downs (EEA #15006) have been prepared in accordance with the provisions of M.G.L. c. 30, Section 61 and 301 CMR 11.00. On [DATE] the Secretary of Energy and Environmental Affairs issued a Certificate stating that the Project's Final Environmental Impact Report (FEIR), dated [DATE], adequately and properly complied with the Massachusetts Environmental Policy Act and its implementing regulations.

Caesars Resort at Suffolk Downs presents a unique opportunity to re-energize the Project area with a mixed-use urban resort casino development. The Project program includes two distinct gaming areas (referred to herein as Casino Area I and Casino Area II), up to 450 guestrooms in two hotels, a multi-purpose meeting/entertainment space, dedicated structured parking, fine dining, retail space, and sports bars as well as surface parking and a maintenance building. The Proponent proposes to construct substantial infrastructure improvements on Route 1A in the vicinity of the Project site as an integral part of the Project, and the Project also includes a number of other transportation-related improvements.

As this Project is currently described, the following permits will be required from the Department:

- Sewer Connection Permit;
- Plan Approval or Environmental Results Program Certification;
- Demolition Permit;
- Asbestos Removal Permit (if required); and
- Superseding Order of Conditions (only upon appeal of local Order).

Based upon its review of the MEPA documents, the permit applications submitted to date, and the Department's regulations, the Department finds that the terms and conditions to be incorporated into the permit required for this Project will constitute all feasible measures to avoid damage to the environment, including consideration of the potential effects of climate change, and will minimize and mitigate such damage to the maximum extent practicable for those impacts subject to the Department's authority (see the appended Mitigation Table). Implementation of the mitigation measures will occur in accordance with the terms and conditions set forth in the permit.

_____

Department of Environmental Protection

_____

By

_____

[Date]

10.2 MassDOT Proposed Section 61 Finding

Project Name:	Caesars Resort at Suffolk Downs
Project Location:	East Boston and Revere
Project Proponent:	Sterling Suffolk Racecourse, LLC
EOEA Number:	15006
Date Noticed in Monitor:	

These Findings for Caesars Resort at Suffolk Downs (EEA #15006) have been prepared in accordance with the provisions of M.G.L. c. 30, Section 61 and 301 CMR 11.00. On [DATE] the Secretary of Energy and Environmental Affairs issued a Certificate stating that the

Project's Final Environmental Impact Report (FEIR), dated [DATE], adequately and properly complied with the Massachusetts Environmental Policy Act and its implementing regulations.

Caesars Resort at Suffolk Downs presents a unique opportunity to re-energize the Project area with a mixed-use urban resort casino development. The Project program includes two distinct gaming areas (referred to herein as Casino Area I and Casino Area II), up to 450 guestrooms in two hotels, a multi-purpose meeting/entertainment space, dedicated structured parking, fine dining, retail space, and sports bars as well as surface parking and a maintenance building The Proponent proposes to construct substantial infrastructure improvements on Route 1A in the vicinity of the Project site as an integral part of the Project, and the Project also includes a number of other transportation-related improvements.

As this Project is currently described, the following permits will be required from the Department:

- Vehicular Access Permit (Category III); and
- Non-Vehicular Access Permit.

Based upon its review of the MEPA documents, the permit applications submitted to date, and the Department's regulations, the Department finds that the terms and conditions to be incorporated into the permit required for this Project will constitute all feasible measures to avoid damage to the environment, including consideration of the potential effects of climate change, and will minimize and mitigate such damage to the maximum extent practicable for those impacts subject to the Department's authority (see the appended Mitigation Table). Implementation of the mitigation measures will occur in accordance with the terms and conditions set forth in the permit.

_____

Department of Transportation

_____

By

_____

[Date]

10.3 DCR Proposed Section 61 Finding

Project Name:	Caesars Resort at Suffolk Downs
Project Location:	East Boston and Revere
Project Proponent:	Sterling Suffolk Racecourse, LLC
EOEA Number:	15006
Date Noticed in Monitor:	

These Findings for Caesars Resort at Suffolk Downs (EEA #15006) have been prepared in accordance with the provisions of M.G.L. c. 30, Section 61 and 301 CMR 11.00. On [DATE] the Secretary of Energy and Environmental Affairs issued a Certificate stating that the Project's Final Environmental Impact Report (FEIR), dated [DATE], adequately and properly complied with the Massachusetts Environmental Policy Act and its implementing regulations.

Caesars Resort at Suffolk Downs presents a unique opportunity to re-energize the Project area with a mixed-use urban resort casino development. The Project program includes two distinct gaming areas (referred to herein as Casino Area I and Casino Area II), up to 450 guestrooms in two hotels, a multi-purpose meeting/entertainment space, dedicated structured parking, fine dining, retail space, and sports bars as well as surface parking and a maintenance building The Proponent proposes to construct substantial infrastructure improvements on Route 1A in the vicinity of the Project site as an integral part of the Project, and the Project also includes a number of other transportation-related improvements.

As this Project is currently described, the following permits will be required from the Department:

- Access Permit.

Based upon its review of the MEPA documents, the permit applications submitted to date, and the Department's regulations, the Department finds that the terms and conditions to be incorporated into the permit required for this Project will constitute all feasible measures to avoid damage to the environment, including consideration of the potential effects of climate change, and will minimize and mitigate such damage to the maximum extent practicable for those impacts subject to the Department's authority (see the appended Mitigation Table). Implementation of the mitigation measures will occur in accordance with the terms and conditions set forth in the permit.

_____

Department of Conservation and Recreation

_____

By

_____

[Date]

10.4 MWRA Proposed Section 61 Finding

Project Name:	Caesars Resort at Suffolk Downs
Project Location:	East Boston and Revere
Project Proponent:	Sterling Suffolk Racecourse, LLC
EOEA Number:	15006
Date Noticed in Monitor:	

These Findings for Caesars Resort at Suffolk Downs (EEA #15006) have been prepared in accordance with the provisions of M.G.L. c. 30, Section 61 and 301 CMR 11.00. On [DATE] the Secretary of Energy and Environmental Affairs issued a Certificate stating that the Project's Final Environmental Impact Report (FEIR), dated [DATE], adequately and properly complied with the Massachusetts Environmental Policy Act and its implementing regulations.

Caesars Resort at Suffolk Downs presents a unique opportunity to re-energize the Project area with a mixed-use urban resort casino development. The Project program includes two distinct gaming areas (referred to herein as Casino Area I and Casino Area II), up to 450 guestrooms in two hotels, a multi-purpose meeting/entertainment space, dedicated structured parking, fine dining, retail space, and sports bars as well as surface parking and a maintenance building. The Proponent proposes to construct substantial infrastructure improvements on Route 1A in the vicinity of the Project site as an integral part of the Project, and the Project also includes a number of other transportation-related improvements.

As this Project is currently described, the following permits will be required from the Authority:

- Sewer Use Discharge Permit (or waiver); and
- Dewatering Permit (if required).

Based upon its review of the MEPA documents, the permit applications submitted to date, and the Authority's regulations, the Authority finds that the terms and conditions to be incorporated into the permit required for this Project will constitute all feasible measures to avoid damage to the environment, including consideration of the potential effects of climate change, and will minimize and mitigate such damage to the maximum extent practicable for those impacts subject to the Authority's oversight (see the appended Mitigation Table). Implementation of the mitigation measures will occur in accordance with the terms and conditions set forth in the permit.

_____

Massachusetts Water Resources Authority

_____

By

_____

[Date]

10.5 Massachusetts Gaming Commission Proposed Section 61 Finding

Project Name:	Caesars Resort at Suffolk Downs
Project Location:	East Boston and Revere
Project Proponent:	Sterling Suffolk Racecourse, LLC
EOEA Number:	15006
Date Noticed in Monitor:	

These Findings for Caesars Resort at Suffolk Downs (EEA #15006) have been prepared in accordance with the provisions of M.G.L. c. 30, Section 61 and 301 CMR 11.00. On [DATE] the Secretary of Energy and Environmental Affairs issued a Certificate stating that the Project's Final Environmental Impact Report (FEIR), dated [DATE], adequately and properly complied with the Massachusetts Environmental Policy Act and its implementing regulations.

Caesars Resort at Suffolk Downs presents a unique opportunity to re-energize the Project area with a mixed-use urban resort casino development. The Project program includes two distinct gaming areas (referred to herein as Casino Area I and Casino Area II), up to 450 guestrooms in two hotels, a multi-purpose meeting/entertainment space, dedicated structured parking, fine dining, retail space, and sports bars as well as surface parking and a maintenance building. The Proponent proposes to construct substantial infrastructure

improvements on Route 1A in the vicinity of the Project site as an integral part of the Project, and the Project also includes a number of other transportation-related improvements.

As this Project is currently described, the following licenses will be required from the Commission:

- Category 1 Gaming License.

Based upon its review of the MEPA documents, the permit applications submitted to date, and the Commission's regulations, the Commission finds that the terms and conditions to be incorporated into the license required for this Project will constitute all feasible measures to avoid damage to the environment, including consideration of the potential effects of climate change, and will minimize and mitigate such damage to the maximum extent practicable for those impacts subject to the Commission's authority (see the appended Mitigation Table). Implementation of the mitigation measures as memorialized in the HCAs with Boston and Revere will occur in accordance with the terms and conditions set forth in the permit.

_____

Massachusetts Gaming Commission

_____

By

_____

[Date]

10.6 Summary of Mitigation Measures

Mitigation measures related to the categories associated with permits the Project requires from State agencies are summarized below and in Table 10-1.

10.6.1 Transportation

The numerous transportation improvements to be constructed in connection with the Project are described in Section 5.0 (and are set forth as requirements in the HCAs [see Attachment B]).

10.6.2 Air Quality

Pollutant emissions from the Project will be reduced in a variety of ways. Stationary sources will be required to comply with applicable emission regulations promulgated for the specific sources. Diesel emergency generators will be required to meet emission performance standards as specified in 40 CFR 89 and/or 310 CMR 7.26(42). Heating boilers subject to ERP will be required to meet emissions limits specified in 310 CMR 7.26(33)(b). Sources not meeting these emission limits will require aftermarket pollution control.

Curbside vehicle idling of taxis, shuttle buses, and private vehicles will be limited to 5 minutes. Massachusetts state laws (M.G.L. Chapter 90, Section 16A and M.G.L. Chapter 90, Section 16B) and MassDEP regulations (310 CMR 7.11(1)(b)) limit vehicle idling to no more than five minutes in most cases. A vehicle may idle longer only if absolutely necessary. There are exceptions for vehicles being serviced, vehicles making deliveries that need to keep their engines running (to power refrigerators, for example), and vehicles that need to run their engines to operate accessories (such as power lifts). MassDEP provides tools for both facilities and fleets to use to discourage curbside idling.

10.6.3 Greenhouse Gas Emissions

The Proponent is committed to the following mitigation elements for the entire Resort or for individual buildings, as applicable:

- High performance building envelopes;
- Light or reflective roofs;
- High-efficiency HVAC equipment;
- 200 kW CHP in the CUP;
- approximately 2.7 MW of PV arrays;
- Energy recovery ventilation;
- Room occupancy sensors in appropriate spaces, including hotel rooms;
- High-efficiency interior lighting and reduced lighting power density where feasible;
- High-performance exterior lighting;
- Low-flow or waterless plumbing fixtures and water conservation measures;
- Energy Star appliances and electronics;

- Energy management systems;
- Recycling collection areas;
- Construction waste recycling;
- Extensive TDM program (see Section 5.9);
- Shuttle bus fleet that will be CNG-powered; and
- Electric-powered site security vehicles.

The Proponent will submit a post-construction self-certification to the MEPA Office that will identify the GHG mitigation measures incorporated into the as-built buildings. Details of the owner's implementation of operational measures will be included.

10.6.4 Wastewater

The Project is proposing all new sanitary sewer lines on the Project site, since the existing sanitary sewer line was installed in the 1930s when the site was initially developed. With Project development, a new wastewater collection system will replace the existing sewer line, thus significantly decreasing the amount of I/I conveyed to the BWSC system. The Proponent acknowledges the BWSC policies regarding offsetting flow increases with reductions in nearby I/I. The Proponent is committed to working closely with the BWSC to provide appropriate mitigation consistent with BWSC goals and policies. Furthermore, the Proponent acknowledges Boston's 4:1 mitigation requirements as well as fees associated with that requirement, and will work with BWSC to identify projects or incur the appropriate fees.

10.6.5 Water Use

Water conservation measures are incorporated into the Project design to reduce potable water demands on the BWSC water supply system. These measures include rainwater harvesting and reuse, low-flow or waterless plumbing fixtures, and public education. Relative to normal plumbing fixtures, the use of low-flow fixtures and equipment in Resort buildings is expected to reduce water use by approximately 30%, resulting in an annual water use reduction of approximately four million gallons. Proposed rainwater harvesting tanks will have a collective capacity of approximately 270,000 gallons, and rainwater harvesting activities are expected to reduce potable water demand by up to 4.5 million gallons per year. The Project will further reduce irrigation water demand by planting native and/or drought-tolerant plant species in landscaped areas; in keeping with the restorative site concepts, use of native drought-resistant plants will contribute to reducing potable water use for irrigation by approximately 50%. Collectively, Project strategies to harvest rainwater, employ low-flow and waterless technologies, and use restorative site concepts in landscaping will reduce potable water use by approximately 8.5 million gallons annually.

10.6.6 Stormwater

The Project includes installation of a stormwater management system that is being designed to meet and exceed MassDEP Stormwater Management Standards, City of Boston stormwater requirements, and City of Revere stormwater requirements. As a redevelopment project, the Project is required to improve existing conditions to the maximum extent practicable. The Project will reduce peak stormwater flows, remove a minimum of 80% of TSS from stormwater flows, and collect and infiltrate the equivalent of the one-inch storm event over the proposed impervious area. The Project will reduce impervious area by approximately 14 acres on the Project site, which is perhaps the most significant improvement to the stormwater system relative to existing conditions. In addition, the stormwater management system will incorporate water quality treatment and infiltration facilities that are not currently present on the Project site.

The Project has been designed using environmentally sensitive site design and LID techniques. This design prevents the generation of stormwater and non-point source pollution by reducing impervious surfaces, disconnecting flow paths with biofiltration swales, treating and infiltrating stormwater at bioretention basins, and protecting natural processes taking place in surrounding resource areas. Stormwater systems have been designed to model natural hydrologic features, including promoting infiltration throughout the site.

The proposed stormwater management system for the Project site includes three sizable rainwater harvesting cisterns capable of collecting up to 270,000 gallons of water, porous pavers, deep sump and hooded catch basins, infiltrating bioretention basins with sediment forebays, biofiltration swales, and proprietary water quality structures. Stormwater management is discussed in further detail in Section 9.3.

10.6.7 Construction-Period Considerations

Proper signage will direct pedestrians safely around the site and construction activities. Suffolk Construction Company will work to minimize impacts to both pedestrian and vehicular flow. As pedestrian access changes with the progression of construction, all changes will be submitted to BTD and the City of Revere prior to implementation. Fire department access as well as access to the fire hose connection will be continuously maintained at all times as shown in the attached construction phasing plans.

The Proponent will prepare a SWPPP and submit a Notice of Intent to the U.S. EPA for coverage under EPA's NPDES CGP. The SWPPP will detail methods for preventing soil erosion and pollution of downstream receiving waters due to stormwater runoff from construction zones, and will include both structural and non-structural BMPs to be used during and construction.

Construction operations at the site, including earthwork, will generate dust. All demolition and construction work will be performed in accordance with applicable sections of the MassDEP Air Pollution Control Regulations at 310 CMR 7.02 and 310 CMR 7.09. Specific construction-period air quality mitigation measures are identified in the Draft CMP provided in Attachment L. Every reasonable effort will be made to minimize the noise impact of construction activities, and specific mitigation measures are identified in the Draft CMP.

Because the construction workforce will arrive prior to peak traffic periods, these trips are not expected to impact traffic conditions. In addition, jobsite personnel will be encouraged to utilize public transportation. Personal vehicles will be allowed to park within designated areas at the Project construction site, and no construction vehicle parking will be allowed in adjacent neighborhoods. It is expected that truck traffic will average 15-20 trucks daily spread evenly throughout the day. Specific truck routes will be identified and described to BTD and the City of Revere, and will be clearly delineated on site logistics drawings. Construction contracts will include clauses restricting truck travel to BTD- and Revere-approved routes. Anti-tracking stone pads will be placed at each access point to the work area. Off-site traffic improvements will require close coordination with the cities of Boston and Revere as well as MassDOT and DCR. The construction manager will develop a construction-period traffic management plan for review and approval by the cities and state. Signage, traffic cones, drums, and other traffic control measures will be employed during construction to provide positive guidance for traffic near the work zone (see the Draft CMP in Attachment L for additional details).

10.7 Mitigation Table

Table 10-1 summarizes potential Project impacts and related mitigation measures. Costs are included in the overall Project costs.

Table 10-1 Summary of Impacts and Mitigation Measures

Subject Matter	*Impact*	*Mitigation Measure and Cost*	*Schedule*
Transportation	The Project will generate 21,434 net new average vehicle trips per weekday, and 33,038 net new average vehicle trips on Saturdays.	See Attachment B, Host Community Agreements	As described in HCAs.
Air Quality	Stationary sources and Resort-related traffic will generate regulated pollutant emissions.	Stationary sources will be required to comply with applicable emission regulations promulgated for the specific sources. Diesel emergency generators will be required to meet emission performance standards as specified in 40 CFR 89 and/or 310 CMR 7.26(42). Heating boilers subject to ERP will be required to meet emissions limits specified in 310 CMR 7.26(33)(b). Sources not meeting these emission limits will require aftermarket pollution control. Curbside vehicle idling of taxis, shuttle buses, and private vehicles will be limited to five minutes. Transportation related mitigation measures will be implemented to reduce vehicle trips and miles traveled in addition to intersection delay times.	During construction and occupancy.
Greenhouse Gas Emissions	The Proponent will incorporate all feasible measures within its control to minimize and mitigate GHG emissions associated with the Project.	The Proponent is committed to the following mitigation elements for the entire Project or for individual buildings, as applicable: ♦ High performance building envelopes; ♦ Light or reflective roofs; ♦ High-efficiency HVAC equipment; ♦ 200 kW CHP in the CUP; ♦ approximately 2.7 MW of PV arrays; ♦ Energy recovery ventilation; ♦ Room occupancy sensors in appropriate spaces, including hotel rooms; ♦ High-efficiency interior lighting and reduced lighting power density where feasible; ♦ High-performance exterior lighting; ♦ Low-flow or waterless plumbing fixtures and water conservation measures;	During construction and occupancy.

Table 10-1 Summary of Impacts and Mitigation Measures (Continued)

Subject Matter	*Impact*	*Mitigation Measure and Cost*	*Schedule*
Greenhouse Gas Emissions (continued)		♦ Energy Star appliances and electronics; ♦ Energy management systems; ♦ Recycling collection areas; ♦ Construction waste recycling; ♦ Extensive TDM program (see Section 5.9); ♦ Shuttle bus fleet that will be CNG-powered; and ♦ Electric-powered site security vehicles. The Proponent will submit a self-certification to the MEPA Office at the completion of construction that will identify the incorporated GHG mitigation measures and illustrate the degree of GHG reductions from the Baseline case.	
Wastewater	321,834 gallons per day	The Proponent will provide infiltration and inflow mitigation equivalent to four times the amount of wastewater generated, consistent with MassDEP and BWSC standards.	During construction and occupancy.
Water Use	354,017 gallons per day	The Proponent will install water conservation measures, including use of low-flow plumbing fixtures, water-conserving landscaping, and rainwater harvesting tanks to reduce potable water demand consumption.	During construction and occupancy.
Stormwater Management	The Project will decrease the amount of impervious area on site and will significantly improve stormwater management. The Project will have no adverse impacts related to stormwater.	The Project will significantly improve the quality of water leaving the site by installing a stormwater management system that will be fully compliant with MassDEP Stormwater Management Guidelines. This system will include a mix of conventional and LID BMPs. The reduction in impervious surface on the site will reduce the rate and volume of stormwater leaving the site.	During construction and occupancy
Construction-Period	Temporary impacts on traffic, air quality, noise, water quality	Public safety will be maintained throughout the construction period through techniques such as: ♦ Barricades, defined temporary walkways, and signage; ♦ Designation of a truck route for access to the Project site; ♦ Construction personnel will not be permitted to park personal vehicles in the adjacent neighborhood; ♦ Implementation of air quality and dust control measures such as wetting agents, truck covers, use of ultra low-sulfur diesel fuel, vehicle tracking pads, and street cleaning;	During construction.

Table 10-1 Summary of Impacts and Mitigation Measures (Continued)

Subject Matter	*Impact*	*Mitigation Measure and Cost*	*Schedule*
Construction-Period (cont'd)	Temporary impacts on traffic, air quality, noise, water quality	♦ Implementation of noise control measures, include screenings, adherence to schedule restrictions, and use of mufflers; ♦ Installation of construction-period erosion and sediment controls; and ♦ Use of solid waste reduction measures including recycling, when possible. A Stormwater Pollution Prevention Plan will detail methods for preventing soil erosion and pollution of downstream receiving waters, using both structural an non-structural BMPs. Construction-related impacts to traffic will be minimized by having workers arrive on site during non-peak hours, designating particular truck routes in conjunction with the Cities of Boston and Revere, and prohibiting construction vehicle parking in adjacent neighborhoods. Methods to minimize dust generation will include: ♦ Use of appropriately designed construction entrances and wheel wash facilities to prevent off-site migration of soils; ♦ Mechanical street sweeping of construction areas and surrounding streets and sidewalks; ♦ Encapsulation of demolition sites as necessary where hazardous materials such as asbestos or lead paint are identified; ♦ Removal of demolition and construction waste in covered or enclosed trailers; ♦ Wetting of exposed soils and stockpiles to prevent dust generation; ♦ Minimizing stockpiling of materials on site; ♦ Turning off construction equipment when not in use and minimizing idling times; ♦ Minimizing the storage of demolition and construction wastes on site; and ♦ Minimizing the duration that soils are left exposed. ♦ of highest ambient noise levels, and to maintain relatively uniform noise levels. ♦ Turning off idle equipment.	During construction.

Table 10-1 Summary of Impacts and Mitigation Measures (Continued)

Subject Matter	*Impact*	*Mitigation Measure and Cost*	*Schedule*
Construction-Period (cont'd)		Measures to minimize noise generation will include: ♦ Scheduling work during daytime hours. If nighttime or Sunday work is proposed, it will be coordinated with BTD and the City of Revere. ♦ Using appropriate mufflers on all equipment and providing ongoing maintenance of intake and exhaust mufflers. ♦ Maintaining muffler enclosures on continuously operating equipment, such as air compressors and welding generators. ♦ Replacing specific construction operations by less noisy ones where feasible and practical. ♦ Selecting the quietest practicable equipment (e.g., electric instead of diesel-powered equipment). ♦ Selecting equipment operations to keep average noise levels low, to synchronize the noisiest activities with times	
Massachusetts Gaming Commission		See Attachment B, Host Community Agreements	As described in HCAs.

Section 11.0

Response to Comments

11.0 RESPONSE TO COMMENTS

The DEIR/EPNF is structured in response to the EEA Secretary's Certificate on the ENF. A copy of the Certificate is included in this section.

In addition to addressing the scope in the Certificate, this section responds to comment letters submitted on the ENF. Each letter has been assigned an abbreviation, as listed in Table 11-1. The comment letters are reprinted in this section, and specific comments within each letter are noted in the margin with this abbreviation and sequential numbering. Following the letter is a listing of the comments accompanied by a response to each.

Table 11-1 Certificate and Comment Letters

Commenter	*Abbreviation*
Agencies and Elected Officials	
Secretary's Certificate	MEPA
Massachusetts Department of Environmental Protection	DEP
Massachusetts Department of Transportation	DOT
Massachusetts Office of Coastal Zone Management	CZM
Massachusetts Department of Energy Resources	DOER
Massachusetts Historical Commission	MHC
Massachusetts Water Resources Authority	MWRA
Massport	MPT
Massachusetts Department of Conservation and Recreation	DCR
Massachusetts Division of Marine Fisheries	DMF
Metropolitan Area Planning Council	MAPC
City of Boston – Environmental and Energy Services	BOS
City of Boston – Stantec letter	STAN
Boston Transportation Department	BTD
Boston Water and Sewer Commission	BWSC
City of Revere	REV
State Senator Anthony Petruccelli; State Representative Carlo Basile; Boston City Councilor Salvatore LaMattina	PBL
Mayor Christenson, Malden	MLD
Host Community Advisory Committee	HCAC

Interested Parties	
Antonellis, John	ANT
Baxter, Lois	BAX
Bike to the Sea, Inc.	BS
Blustein, Daniel	BLU
Boston Harbor Islands Alliance	BHIA
Burrell, Jason	BUR
Clean Water Action	CWA
First Bristol Corporation	FBC
Forsyth, Ryan	FOR
Friends of Belle Isle Marsh	FBIM
Holt, Steve	HLT
Hunt, Andrew	HNT
Mass Audubon	AUD
Mystic River Watershed Association	MRWA
No Eastie Casino	NEC
Purvis, Jesse	PUR
Saugus River Watershed Council	SRWC
The Boston Harbor Association	TBHA
Walk Boston	WB

In addition to the letters contained herein for which responses are provided, numerous letters of support for the Project were sent to the Secretary. The Proponent would like to acknowledge and thank the letter-writers for their support, including but not limited to:

- State Senator Jennifer L. Flanagan;
- State Representative Kathi-Anne Reinstein;
- Mayor Daniel Rizzo, City of Revere;
- East Boston Chamber of Commerce;
- Revere Chamber of Commerce;
- Local workers unions, including:
    - Carpenters Local Union 218;
    - Greater Boston Labor Council, AFL-CIO;

- IATSE Local #11 Stagehands;
- International Brotherhood of Electrical Workers Local 103;
- Laborers' Local 22;
- New England Regional Council of Carpenters;
- Plumbers & Gasfitters Local 12 Boston;
- Sheet Metal Workers' International Association Local 17;
- Teamsters Local Union No. 25;

- Massachusetts Thoroughbred Breeders Association;
- New England Horsemen's Benevolent and Protective Association, Inc.;

The Commonwealth of Massachusetts

Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114

Deval L. Patrick
GOVERNOR

Timothy P. Murray
LIEUTENANT GOVERNOR

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SECRETARY

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April 5, 2013

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS
ON THE
ENVIRONMENTAL NOTIFICATION FORM

PROJECT NAME	: Caesars Resort at Suffolk Downs
PROJECT MUNICIPALITY	: Boston and Revere
PROJECT WATERSHED	: Boston Harbor
EEA NUMBER	: 15006
PROJECT PROPONENT	: Sterling Suffolk Racecourse, LLC
DATE NOTICED IN MONITOR	: February 6, 2013

Pursuant to the Massachusetts Environmental Policy Act (MEPA) (M.G. L. c. 30, ss. 61-62I) and Section 11.03 of the MEPA regulations (301 CMR 11.00), I hereby determine that this project **requires** the preparation of a Mandatory Environmental Impact Report (EIR).

Project Description

As described in the Environmental Notification Form (ENF), the project consists of redevelopment of the Suffolk Downs racetrack as a destination resort casino. The Proponent is seeking a Category 1 gaming license pursuant to Chapter 194 of the Acts of 2011: An Act Establishing Expanded Gaming in the Commonwealth and M.G.L. Chapter 23K, Section 19, as amended by Section 16 of the Expanded Gaming Act, which authorizes the Massachusetts Gaming Commission (MGC) to license three casinos. The Act identifies three regions of the state (Region A, Region B and Region C) and authorizes MGC to permit one casino in each region. This project is the first project in the Central Boston Region to undergo MEPA review.

The proposed resort casino includes the following elements:

- two distinct gaming areas providing 200,000 square feet of gaming space containing 4,000-5,000 slot machines, 200 table games and a World Series of Poker™ room;
- two hotels providing 450 rooms;
- meeting/entertainment space;
- approximately 16 restaurants including fine dining concepts, casual dining and a marketplace;
- approximately 30,000 sf of retail;
- a seven-story parking garage with 2,600 spaces, valet parking for 450 (located below grade under Casino Area II) and 2,100 surface parking spaces; and
- a Central Utility Plant.

The project will include a combination of new construction, redevelopment of existing buildings, retention of existing infrastructure and facilities, and demolition. The ENF identifies continued operation of the Suffolk Downs thoroughbred racetrack facility as an important long-term development goal and indicates that gaming and racing components will be operated jointly. New construction consists of a 470,965 square foot (sf) building that will include Casino Area II and a 300-room hotel (Hotel II), a 110,000 sf 150-room hotel (Hotel I), a glass pavilion to connect the casino areas, the parking garage, and the utility plant. Hotel I is identified as a 135-foot tall building and Hotel II is identified as a 166-foot tall building. The Suffolk Downs Grandstand Building will be redeveloped to support Casino Area I on the first floor of the building and the existing clubhouse will be renovated. To support the racing facility, the existing horse barn area will be retained and the barns may be repaired or replaced as necessary. An existing office building, maintenance building, paved driveways, parking lots, sidewalks and some utilities are slated for demolition.

The project includes construction of access drives, extensive landscaping, construction of a new stormwater management system and other associated infrastructure. Vehicular access to and circulation within the site is proposed through a reconstructed Tomasello Drive, a privately-owned roadway that extends from Route 1A to Route 145. Primary access is proposed at its intersection with Route 1A. Secondary access will continue from Route 145 to Tomasello Drive and from Furlong Drive (a public way that extends through the retail development at the northwest corner of the site) to Tomasello Drive.

The project schedule is dependent upon the MGC schedule for reviewing projects and issuing licenses. The ENF indicates that Casino Area I will be completed within approximately 15 months from construction commencement and the remainder of the project will be completed within 30 months. It indicates that proposed off-site improvements may take up to two years to complete.

Project Site

The 161-acre site is located within a densely developed urban area in East Boston (116 acres) and Revere (45 acres) and in close proximity to transit and the regional traffic network. It is bordered to the west by Route 1A and fuel storage tank farms; to the northwest by a shopping plaza; to the north by Route 145 (Revere Beach Parkway/Winthrop Avenue) and the Crescent Heights neighborhood; to the northeast and east by the MBTA Blue Line tracks, Bennington Street, the Beachmont neighborhood and Belle Isle Marsh; and, to the south by Waldemar Avenue and the Orient Heights neighborhood.

The site includes access drives, a grandstand and clubhouse buildings, a one-mile racetrack for thoroughbred racing, stables to accommodate approximately 1,000 horses, surface parking and other associated infrastructure. The site contains approximately 405,480 sf of buildings (not including the horse barns), the tallest of which is 88 feet high. Two previous projects associated with the site have undergone MEPA review. These include the Sales Creek Culvert Emergency Repairs (EEA#13437) and the Suffolk Downs Stabling Area and Racecourse Stormwater Improvements (EEA #14747). The latter consisted of a stormwater separation project to secure an Individual NPDES Permit for the Concentrated Animal Feeding Operations (CAFO).

A portion of the project site is located within the Rumney Marshes Area of Critical Environmental Concern (ACEC), including Sales Creek which flows through the site and discharges into the Belle Isle Inlet. The Belle Isle Marsh, located to the southeast of the project site, is a 241-acre marsh that includes a 28-acre landscaped park owned by the Department of Conservation and Recreation (DCR). On-site wetland resource areas include Bordering Land Subject to Flooding (BLSF),[1] Riverfront Area, Bordering Vegetated Wetlands (BVW), Inland Bank, and Land Under Water Bodies and Waterways (LUW). In addition, the project site includes landlocked, filled tidelands.

According to the Massachusetts Historical Commission (MHC), the Suffolk Downs Clubhouse, Grandstand and Racetrack (BOS.209) are included in the MHC Inventory of Historic and Archaeological Assets of the Commonwealth and may be eligible for listing in the State and National Registers of Historic Places.

Environmental Impacts

Potential environmental impacts are associated with land alteration, alteration of wetland resource areas (including 480,000 sf of BLSF, 1,100 sf of RA and 40,000 sf of LSCSF), generation of an additional 24,600 unadjusted average daily trips (adt) for a total of 40,500 unadjusted adt,[2] an additional 379,910 gallons per day (gpd) of water use for a total of 435,810 gpd, an additional 307,080 gpd of wastewater generation for a total of 473,100 gpd of wastewater, construction of additional water and sewer infrastructure, and generation of Greenhouse Gas (GHG) emissions.

Measures to avoid, minimize and mitigate environmental impacts include, but are not limited to, redevelopment of an existing site in close proximity to transit, a nine-acre reduction in impervious surfaces, roadway and signal improvements (including off-site improvements), implementation of a Transportation Demand Management (TDM) program to limit single-occupancy-vehicle (SOV) trips, improved bicycle and pedestrian access, construction of a new stormwater management system[3] and continued maintenance of the existing stormwater system associated with the CAFO. In addition, the project will include measures to reduce GHG emissions including use of high efficiency chillers, condensing boilers, water-and air-side economizers, heat recovery, high-efficiency lighting and controls, and water conserving plumbing fixtures. The project will be designed to be certifiable by the U.S. Green

[1] The ENF indicates that the 100-year floodplain could be classified as BLSF or Land Subject to Coastal Storm Flowage (LSCSF). It indicates that BLSF was selected for planning purposes as a conservative approach because BLSF requires compensatory flood control whereas there are no performance standards for LSCSF.

[2] Based on a week of Automatic Traffic Recorder (ATR) counts performed on each access roadway in July 2012 which may include pass-through trips not destined for the racetrack facility.

[3] Stormwater management systems will be installed to support new development and redevelopment. No changes are proposed at this time to the stormwater system associated with the CAFO.

Building Council's (GBC) Leadership in Energy and Environmental Design (LEED) at the Gold level.

Permits and Jurisdiction

The project is subject to MEPA review and requires the preparation of a Mandatory EIR pursuant to 301 CMR 11.03 (1)(a)(1) and (6)(a)(6) because it requires a State Agency Action and it will include direct alteration of 50 or more acres of land and generation of 3,000 or adt on roadways providing access to a single location. The project requires a Category 1 Gaming License from the MGC, a Vehicular Access Permit from the Massachusetts Department of Transportation (MassDOT), a Construction and Access Permit from DCR, and Airspace Review by the Massachusetts Aeronautics Commission (MAC). It requires a Sewer Use Discharge Permit (or waiver) from the Massachusetts Water Resources Authority (MWRA) and it may require a 8(M) Permit from MWRA. It requires a Sewer Connection Permit from the Massachusetts Department of Environmental Protection (MassDEP) and it may also require an Air Plan Approval from MassDEP. The project may require Federal Consistency Review by Coastal Zone Management (CZM). The project is subject to the May 5, 2010 MEPA GHG Emission Policy and Protocol (GHG Policy).

It will require multiple permits and approvals from the City of Boston, including a Planned Development Plan and/or Zoning Amendment Approval and Large Project Review pursuant to Article 80B of the Boston Zoning Code, approval of a Construction Management Plan (CMP) and a Transportation Access Plan Agreement (TAPA), and an Order of Conditions from the Boston Conservation Commission (or a Superseding Order of Conditions (SOC) from MassDEP in the event a local Order is appealed).

It may require a Special Permit/Overlay District Approval from the Revere City Council, it will require Site Plan Review and it will require an Order of Conditions from the Revere Conservation Commission (or a Superseding Order of Conditions (SOC) from MassDEP in the event a local Order is appealed).

As part of the gaming process, the Proponent will develop Host Community Agreements with the City of Boston and the City of Revere and the agreements will be subject to a local referendum in each community. In addition, the ENF indicates that the Proponent will enter into Surrounding Community Agreements with Chelsea and Winthrop.

Federal permits appear to be limited to a National Pollutant Discharge Elimination System (NPDES) Construction General Permit. In addition, the project will require a Part 77 Airspace Review from the Federal Aviation Administration (FAA).

Because the Proponent is not requesting State Financial Assistance, MEPA jurisdiction is limited to the subject matter of required or potentially required permits; however, the subject matter of the Gaming License confers broad scope jurisdiction and extends to all aspects of the project that may cause Damage to the Environment, as defined by the MEPA regulations.

Comments on the ENF

Comments from State Agencies, municipalities, and some residents highlight the Proponent's willingness to consult with them and to provide useful information regarding the development of the project and project design. Many comments are very supportive of the proposed project and opportunities for improving environmental site conditions. Other comments express significant concern with the addition of a casino resort at Suffolk Downs, as well as associated environmental impacts. Several comments received on the ENF focus on non-environmental or non-jurisdictional impacts with regard to the MEPA process and/or suggest that adequate information was not provided in the ENF. MEPA is an environmental impact disclosure process; MEPA does not approve or deny a project, but serves as a public forum for a project proponent to identify potential project-related impacts and propose mitigation measures to offset these potential impacts prior to the separate State Agency individual permitting processes. A key purpose of MEPA is to "assist each Agency in using (in addition to applying any other applicable statutory and regulatory standards and requirements) all feasible means to avoid Damage to the Environment or, to the extent Damage to the Environment cannot be avoided, to minimize and mitigate Damage to the Environment to the maximum extent practicable" (301 CMR 11.01(1)(a)).

The majority of comments, whether supportive of the proposed use or not, identify the challenge posed by existing congestion of the local and regional roadway system and the additional traffic generated by the project. Comments on the ENF identify other environmental concerns as well as societal impacts associated with gaming. I have received comment letters from elected officials, municipal officials, State and regional agencies, from environmental advocacy groups, from businesses, and from residents, including abutters. The MEPA process has provided, and will continue to provide, a valuable forum for public input; however, the Scope is limited to identification and analysis of environmental impacts associated with the proposed development. The MEPA process occurs early in the design process to identify key environmental concerns and challenges, prior to final project design. It does not generally address issues at a level of detail commensurate with those often reviewed at the local level. Information provided in the ENF regarding the project, project elements, potential impacts and potential mitigation supports the development of a Scope for this project and in many instances provides a greater level of detail than is typically required.

While several of the issues identified in comment letters are beyond the scope of review under MEPA, the Scope issued today ensures that the environmental impacts of the proposed project will be thoroughly disclosed and evaluated and that thoughtful mitigation measures will continue to be considered and evaluated by the Proponent. The DEIR will provide a detailed project description and additional information regarding the project design, alternatives, potential impacts and alternative mitigation measures and it will provide another opportunity for State Agencies and the public to provide input on the project and its environmental impacts.

SCOPE

General

The Draft Environmental Impact Report (EIR) should follow Section 11.07 of the MEPA regulations for outline and content, as modified by this Scope.

Project Description and Permitting

The DEIR should include a detailed description of the proposed project and identify any changes to the project since the filing of the ENF. It should include all project elements, including racetrack operations, a description of potential changes to the horse barns area, and associated maintenance. It should include updated site plans for existing and proposed conditions at a legible scale. Plans should clearly identify access roadways and internal driveways, proposed structures, surface and structured parking, infrastructure (e.g. drainage, wastewater, water supply) wetland resource areas, and adjacent land uses. The DEIR should identify all State permits and approvals required for the project and identify how the project will be developed consistent with associated regulatory standards and requirements. In addition, it should describe project phasing and identify how permitting will be addressed within the context of this phasing. **MEPA 01** **MEPA 02**

The DEIR should identify the project's consistency with EO 384, the Commonwealth's Sustainable Development Principles, and regional and local land use plans, including the East Boston Master Plan (April 2000), the City of Revere Massachusetts, FY 2010-2015 Strategic Plan, and the Boston Region Metropolitan Planning Organization (MPO) Journey to 2030 (September 27, 2007). **MEPA 03**

To provide context for the project review, the DEIR should provide a summary of the relevant sections of the Expanded Gaming Act and associated regulations, the project application process, and the development of Host and Community agreements. **MEPA 04**

Alternatives Analysis

The project purpose is defined as the development of a resort casino proposed to be consistent with the Expanded Gaming Act, which was developed to create new jobs and spur economic development. The DEIR should identify elements of the project that are required by the legislation and/or regulations and the extent to which the size and associated impacts of the project are driven by gaming requirements, such as the minimum capital investment for a category 1 license. **MEPA 05**

The ENF references a 2006 study of the environmental impacts associated with a mixed use development scenario consisting of 3,236 residential units, and 698,305 sf of retail and restaurant uses. This study is used to provide a general comparison of environmental impacts. While this scenario may be useful to identify the maximum envelope of impacts associated with a large mixed-use development, it is unclear whether this is a fair comparison. For instance, it indicates that the scenario does not retain any significant open space and would include alterations to BVW. The DEIR should provide a more realistic mixed-use development scenario for the site to support a better understanding of the relative impacts of a resort casino compared to a mixed use development. I note that Senator Petruccelli, State **MEPA 06**

Rep Carlo Basile and Boston City Councilor Salvatore LaMattina request additional analysis of alternatives to provide the community with a better understanding of relative impacts.

The DEIR should identify each alternative's impacts on land alteration, creation of impervious area, impacts to wetland resource areas, public benefits associated with landlocked tidelands, traffic generation, parking, water use, and wastewater. This comparison should be provided in a tabular format with supporting narrative and conceptual site plans. **MEPA 07**

In addition, the Traffic and Transportation Section of the Scope identifies additional alternatives analysis that will be required for development of roadway improvements and mitigation.

Greenhouse Gas Emissions

The ENF identifies a strong commitment to sustainable development, including LEED certification of the project at the Gold level. It describes the Caesar's Resorts commitment to environmental sustainability through its CodeGreen program. The project offers a wide variety of opportunities to introduce innovative programs and establish the resort as a leader in environmental sustainability; its operating characteristics – including continuous operations, designs that include large open gaming rooms with varying levels of occupancy over the course of a day, and hotels with large hot water and standby loads – provide a strong incentive for doing so. The ENF indicates that the Proponent will consult with environmental and energy programs, including the Massachusetts Clean Energy Center, MassDEP and the Department of Energy Resources (DOER) to identify opportunities and technical assistance resources for design and implementation of projects or pilot programs.

This project is subject to review under the May 5, 2010 MEPA GHG Policy and it is subject to the Massachusetts Stretch Energy Code (Stretch Code) adopted by the City of Boston. The DEIR shall include an analysis of GHG emissions and mitigation measures in accordance with the standard requirements of this Policy. The analysis should quantify the direct and indirect GHG emissions associated with the project's energy use and transportation-related emissions. Direct emissions include on-site stationary sources, which typically emit GHGs by burning fossil fuel for heat, hot water, steam and other processes. Indirect emissions result from the consumption of energy, such as electricity, that is generated off-site by burning of fossil fuels, and from emissions associated with vehicle use by employees, vendors, customers and others. The DEIR should identify and commit to mitigation measures to reduce GHG emissions. **MEPA 08**

The DEIR should include a GHG emissions analysis that calculates and compares GHG emissions associated with: 1) a Massachusetts Building Code-compliant baseline (based on the Massachusetts Building Code 8th Edition (Chapter 780 CMR 13.00) which has been amended to adopt and integrate either the current version of the International Energy Conservation Code (IECC) or ASHRAE 90.7-2007; 2) a Preferred Alternative that includes energy efficiency design measures to achieve compliance with the Stretch Code. The Policy requires Proponents to use energy modeling software to quantify projected energy usage from stationary sources and energy consumption and modeling should be developed in accordance with ASHRAE 90.1–2007 Appendix G. **MEPA 09**

The GHG analysis should clearly demonstrate consistency with the objectives of MEPA review, one of which is to document the means by which Damage to the Environment can be avoided,

minimized and mitigated to the maximum extent feasible. The Proponent should identify the model used to analyze GHG emissions, clearly state modeling assumptions, explicitly note which GHG reduction measures have been modeled, and identify whether certain building design or operational GHG reduction measures will be mandated by the Proponent to future occupants or merely encouraged for adoption and implementation. The DEIR should include the modeling printout for each alternative and emission tables that compare base case emissions in tons per year (tpy) with the preferred alternative showing the anticipated reduction in tpy and percentage by emissions source (direct, indirect and transportation). Other tables and graphs may also be included to convey the GHG emissions and potential reductions associated with various mitigation measures as necessary. **MEPA 10**

The ENF indicates that, at a minimum, the project will incorporate the following measures into the buildings to reduce GHG emissions: high efficiency chillers, condensing boilers, water- and air-side economizers, heat recovery, high-efficiency lighting and controls, and water conserving plumbing fixtures. Comments from MassDEP and DOER provide additional guidance regarding mitigation measures that should be explored as part of the GHG analysis, as well as resources to assist in preparation of the analysis. In addition, I note that many other commenters, including the City of Boston Environment Department, the Metropolitan Area Planning Council (MAPC), MassAudubon and other advocacy organizations identify the design of a highly efficient, low energy use project as a priority and identify additional measures and programs for analysis.

The ENF indicates that the DEIR will should present an evaluation of mitigation measures identified in the GHG Policy Appendix. The feasibility of each of the mitigation measures outlined below should be assessed for each of the major project elements, and if feasible, GHG emissions reduction potential associated with major mitigation elements should be to evaluated to assess the relative benefits of each measure. **MEPA 11**

- Minimize energy use through building orientation and evaluate its impacts on energy usage, including solar gain, day-lighting and viability of solar photovoltaic (PV) systems;
- Use of high-albedo roofing materials;
- Install high-efficiency HVAC systems and adequate numbers of thermal zones to support temperature controls;
- Reduce energy use through peak shaving or load shifting strategies;
- Maximize interior day-lighting through floor-plates, increased building perimeter and use of skylights, clerestories and light wells;
- Incorporate window glazing to balance and optimize daylighting, heat loss and solar heat gain performance;
- Incorporate roof and wall insulation to minimize heat loss and minimize uncontrolled infiltration through the building envelope;
- Incorporate lighting motion sensors, climate control and building energy management systems;
- Install energy efficient lighting, both exterior and interior;
- Evaluate additional measures to reduce project plug loads, including the use of more efficient equipment (such as Energy Star), consider energy consumption as a factor in the selection of special equipment, such as slot machines, and consider power management techniques; and,
- Install water source heat pumps (hotel rooms only).

In addition to the typical measures identified above, the ENF includes a commitment to analyze combined heat and power (CHP), on-site photovoltaic (PV) systems for electricity and/or hot water (including consideration of PV on the parking structure) and anaerobic digestion for management of organic waste and development of renewable energy. I applaud the Proponent's commitment to thoroughly evaluate these alternatives and note the following:

- The CHP feasibility analysis should consider state incentives to support CHP as well as information provided by MassDEP regarding the use of CHP at a significant number of casinos and large hotels. The feasibility analysis should include consideration of one of the major benefits of a CHP system – the ability to produce off-grid power. **MEPA 12**
- Evaluation of PV systmes should consider state incentives to promote the use of PV systems (Commonwealth Solar II and Commonwealth Solar Stimulus). At a minimum, buildings should be oriented to the south to maximize solar exposure and, if the analysis demonstrates that such systems are presently infeasible, they should be "solar ready" to facilitate future installation of PV systems. **MEPA 13**
- The Proponent should consult with MassDEP regarding the amendment of its regulations to build capacity for organics management and associated permitting requirements. **MEPA 14**

The DEIR should explain, in reasonable detail, why certain measures, which could provide significant GHG reductions, were not selected - either because it is not applicable to the project or is considered technically or financially infeasible. As noted by MassDEP, the Proponent should also consider transportation demand management (TDM) measures (which are addressed in more detail within the following Traffic and Transportation Section) and adoption of additional sustainable design measures for which GHG reductions cannot be easily quantified, such as recycling efforts and water conservation measures, that can be incorporated into the project. Additional GHG reductions can be achieved through effective materials management during the design, construction, and operations phases of the project. These measures will be considered when evaluating whether the project can mitigate its GHG emission to the greatest extent practicable. **MEPA 15**

Additional water demand and wastewater generation associated with the project exceeds 300,000 gpd. Consistent with the GHG Policy, the DEIR should include an analysis of potential GHG emissions related to the treatment and conveyance of wastewater or withdrawal, treatment and conveyance of potable and/or non-potable water. To assist in calculation of these potential GHG emissions, the MEPA office and MassDEP have provided average energy use data for treatment facilities, including those located within an MWRA community, which are posted on the MEPA website. **MEPA 16**

The project may include leasing of space to tenants and, therefore, certain energy efficiency measures may require a level of design that will be deferred to the tenants' selection or which the developer may be less willing to commit to in advance because all the energy savings may inure to the tenants' benefit depending on the lease arrangements. While I encourage the Proponent to adopt those GHG reduction measures that are integrated into the building's core, shell and infrastructure, some measures may be transient or dependent on operational procedures implemented by the future occupant. In those instances, the Proponent should consider reasonable measures to educate and create incentives for the tenants to adopt energy efficiency/renewable generation measures. The DEIR should address the Proponent's commitment to providing energy efficiency consulting services and information and/or developing a tenant manual that requires or strongly supports GHG reduction measures. As an example **MEPA 17**

of such a document, I direct the Proponent to the New Patriots Stadium and Public Infrastructure Project (EEA No. 12037) Third Notice of Project Change and the associated Secretary's Certificate issued on April 17, 2009.

The DEIR should identify whether the project will include fleet vehicles. For the purposes of the GHG Policy, fleet vehicles are generally considered to be a source of direct GHG emissions from vehicles used by a project proponent in the everyday operation of a facility. In this case, these may include shuttle buses for employees and patrons, landscaping or catering vehicles, etc. The Proponent should consult the Policy for further direction on how to estimate direct mobile source GHG emissions and contact the MEPA office to discuss appropriate assumptions and methodology prior to conducting the analysis. **MEPA 18**

The Proponent should refer to the Policy for additional guidance on the GHG analysis. MEPA, MassDEP and DOER staff are available to assist with these efforts and I encourage the Proponent to consult with them regarding the analysis prior to submission of the DEIR. The DEIR should include a commitment to provide a self-certification to the MEPA Office at the completion of each building or group of buildings. It should be signed by an appropriate professional (e.g. engineer, architect, transportation planner, general contractor) indicating that all of the GHG mitigation measures, or equivalent measures that are designed to collectively achieve identified reductions in stationary source GHG emission and transportation-related measures, have been incorporated into the project. **MEPA 19**

Adaptation

A large portion of the site is located within a mapped 100-year floodplain and the project is located within ½ mile of the coastline. The project must be designed to comply with Massachusetts State Building Code requirements for structures within the floodplain and local requirements. Current rates of sea level rise, as well as projections for accelerated trends, pose significant threats to coastal development and resources, potentially increasing the height of storm surges and associated coastal flooding frequencies. The ENF indicates preliminary consideration of this issue and identifies hwo the project is designed to address potential impacts. Comments on the project, including comments from CZM highlight the importance of incorporating consideration of sea level rise and the potential for more frequent and intense storms into the project design. Development of adaptation measures should be guided by comments from CZM, including use of sea level rise scenarios identified in the Massachusetts Climate Change Adaptation Report. **MEPA 20**

Because the resort is designed to serve a significant numbers of patrons and is located in an area that could be directly affected by more severe storms and increased flooding, the Proponent should consider measures to generate on-site power in the event of disruptions in service to the electrical grid. In addition to providing energy more efficiently, a CHP system can continue to supply off-grid power, heat and cooling during a power outage which could benefit the facility as well as the larger community. **MEPA 21**

Traffic and Transportation

The ENF indicates that the DEIR will include a comprehensive transportation access and mitigation plan that will go beyond mitigating traffic impacts associated with the project, and will identify opportunities for addressing long-standing issues of local and regional concern. The Proponent,

and many commentors, including MassDOT, the City of Boston and MAPC identify the opportunity to develop a comprehensive multimodal access and mitigation plan.

The project abuts Route 1A which is a major commuter route and provides connections to downtown Boston, the regional highway network and to points north of Boston. The site is adjacent to the MBTA Blue Line and the Blue Line Suffolk Downs Station and Beachmont Station are located within walking distance of the site. In addition, several MBTA bus routes operate in and serve the area. Several designated bicycle routes provide connections between adjacent neighborhoods and direct pedestrian connections can be provided to the Orients Height neighborhood and other East Boston neighborhoods. Previous studies have identified significant congestion in the Route 1A corridor and, in particular at the Boardman Street intersection, continuing north on Route 60 through Revere and to Route 1. This congestion impacts daily commuters and affects local access to East Boston, Revere and Winthrop.

The project, including continued operation of the racetrack, has the potential to generate 40,500 unadjusted adt. The project requires a Vehicular Access Permit from MassDOT and a Construction and Access Permit from DCR. Development of an effective transportation access and mitigation plan is critical to avoid potentially significant impacts to the regional transportation system and state roadways. Project planning should place equal emphasis on roadway improvements and TDM measures and pursue creative solutions to encourage both patrons and employees to use alternative, less-polluting transportation. MassDOT provided detailed and extensive comments on the project and analysis required to assess impacts impacts and develop adequate mitigation. I hereby incorporate by reference the March 26, 2013 letter from MassDOT into the Scope. All issues identified in this letter should be addressed in the DEIR.

Traffic Study

To assess potential traffic impacts and develop effective mitigation, the ENF indicates that the proponent will conduct a traffic study consistent with the EEA/Massachusetts Department of Transportation (MassDOT) Guidelines for EIR/Environmental Impact Statement (EIS) Traffic Impact Assessment. The ENF identifies how the transportation study will be developed consistent with these Guidelines. It identifies elements that will be included in the transportation study and identifies strategies for addressing particular issues, such as trip generation estimates and mode splits.

The DEIR should present capacity analyses and a summary of average and 95th percentile vehicle queues for each intersection within the study area. The DEIR should also present a merge and diverge for each ramp junction and weaving analysis for all the interchanges located in the study area. Any proposed traffic signals must include a signal warrant analysis conducted according to the Manual of Uniform Traffic Control Devices (MUCTCD). The results of this analysis should be provided in a tabular format that identifies Existing, Future No-Build and Future Build Conditions for all peak hour conditions. Analysis should use a 10-year horizon (2022) for the traffic study and a 20-year horizon for analysis of proposed infrastructure improvements. **MEPA 22**

The ENF includes a proposed Study Area (page 3-11, Figure 3-1) for the traffic analysis. It includes the following locations within the Cities of Revere, Chelsea and Boston:

- Route 1A at Suffolk Downs (Tomasello Drive)
- Route 1A at Furlong Drive
- Route 145 (Winthrop Avenue) at Route 1A southbound on-ramp
- Route 145 (Winthrop Avenue) at North Shore Road
- Route 145 (Winthrop Avenue) at Suffolk Downs (Tomasello Drive)
- Bennington Street/State Road at Winthrop Avenue
- Bennington Street at Saratoga Street
- Boardman Street at Route 1A
- Route 145 (Winthrop Avenue) at Revere Beach Parkway (Route 16)/Harris Street
- Route 60 (American Legion Highway) at Bell Circle
- Route 1A (Beach Street) at Bell Circle
- Route 16 and Route 1A at Bell Circle
- Beach Street at Bell Circle
- Ocean Avenue at State Road/Revere Beach Parkway
- Eliot Circle
- Route 1A at Jug Handle
- Bennington Street at Neptune Road
- Neptune Road at Route 1A northbound off-ramp
- Butler Circle
- Revere Street at Route 60
- Brown Circle
- Copeland Circle
- Route 1/Route 16 Interchange
- Route 16 (Revere Beach Parkway) at Garfield Avenue/Webster Avenue
- Route 1A northbound at Waldemar Avenue

The ENF indicates that the study area may be expanded based on requests by MassDOT, DCR and/or municipalities. Comments from MassDOT, MBTA, and DCR recommend that the following locations be incorporated into the study area: **MEPA 23**

- Route 60/Charger Street
- Route 60/Sigourney Street
- Route 1/Copeland Circle interchange (including the rotary and adjacent segments)
- Route 1A/Wonderland MBTA Station Driveway
- Route 1A/Revere Street (signalized intersection)

In addition, MassDOT requests that a roadway segment analysis, prepared in accordance with the Highway Capacity Manual (HCM), be provided for the three harbor tunnels (Ted Williams Tunnel, Callahan Tunnel, and Sumner Tunnel) to identify daily volumes and peak characteristics.

Comments from BTD and the Revere Planning and Community Development Department request that the following locations be incorporated into the study area:

- Route 1A/Curtis Street
- Saratoga Street/Neptune Avenue
- Bremen Street/Neptune Road

- Bennington Street/Crescent Avenue

The ENF identifies traffic data that was collected to support evaluation of existing traffic operations, including patterns of traffic flow and peak periods. The program includes Automatic Traffic Recorder (ATR) counts and Turning Movement Counts (TMCs) collected in 2010 and 2012. The Proponent should consult with MassDOT regarding use of ATR and TMC to measure existing volumes, and whether additional and/or more recent counts are required for the study. In particular, the study should include the most recent data available for the Ted Williams Tunnel, Sumner Tunnel and Callahan Tunnel. **MEPA 24**

The study should evaluate existing conditions for transit, pedestrian and bicycle access, including an inventory of existing transit service, existing pedestrian access routes to the site, and an inventory of the existing bicycle network in the area. It should identify constraints that limit transit, walking and bicycle trips. It should include ridership estimates for the MBTA Suffolk Downs and Beachmont Stations and pedestrian and bicycle volumes. **MEPA 25**

As noted in the ENF and in comment letters, the Institute of Transportation Engineers (ITE) Trip Generation manual does not provide guidance for the proposed land use. Trip generation projections will be based on research of data for other comparable projects and information provided by the Proponent including data for existing gambling venues and projected data for its proposed operations at Suffolk Downs. Comments from MassDOT note that data from similar facilities will be of limited use because they are not typically located in close proximity to transit options. The Proponent should consult with the MassDOT Office of Transportation Planning and the MBTA Service Planning Department to develop appropriate and reasonable travel demand and trip generation characteristics. **MEPA 26**

Trips will be generated from a wide geographic range, including neighboring states. Trips will be generated over a 24-hour period, seven days a week, although more than half of the weekly gaming activity will occur on Friday, Saturday and Sunday. MassDOT requests that a temporal distribution of traffic over a full one-week period be provided, to support identification of the peak hours of casino traffic and most critical peak analysis periods resulting from existing roadway volumes and project site trips. Daily and peak hour trip projections by mode should be presented for patrons and employees separately and combined. Modeling and assumptions to determine the origin-destination patterns of trips should be clearly presented. **MEPA 27**

The ENF indicates that more than half of gaming activity will occur on Fridays, Saturdays and Sundays and projects that the peak traffic levels will occur after the weekday pm peak and the Saturday afternoon peak. Several commentors identify the importance of considering the potential for overlapping peak periods with other major traffic generators in the area (e.g. Logan Airport, general traffic/tunnel or beach traffic on Saturdays in May and June). In particular, MassDOT identifies a concern that peak periods for general/tunnel traffic, Logan Airport traffic and the casino could overlap and result in an extended peak period of congestion in the tunnels. MassDOT indicates that the study should identify the worst combination of projected project traffic and existing roadway volumes to determine the critical peak hours for analysis on Fridays and Saturdays. **MEPA 28**

Roadway and Signalization Improvements

The ENF provides preliminary concepts for on-site vehicular access and for off-site roadway, traffic and safety improvements that will be developed in consultation with MassDOT, affected municipalities and, where appropriate, with DCR. It identifies improvements to Tomasello Dive and its intersections with Route 1A, Furlong Drive and Route 145 (Winthrop Avenue). It identifies conceptual alternatives along the Route 1A corridor, including the following:

- Route 1A northbound flyover at Boardman Street
- Addition of a lane to Route 1A southbound
- Signalization of the Waldemar Avenue/Route 1A intersection
- Expansion and signalization of the Tomasello Drive intersection

In addition, the ENF identifies potential projects to shift regional and project-related traffic from the Route 60 corridor to the Route 1/Route 16 corridor in response to consultations with the City of Revere and the City of Chelsea:

- New ramp connections at the Route 1/Route 16 interchange
- Improvements along the Revere Beach Parkway corridor

Comments from MassDOT and BTD do not provide an evaluation or endorsement of these access alternatives. Using the data and analysis developed for the traffic study as a basis, the DEIR should include an alternatives analysis that considers a range of roadway improvements for the 1A corridor between Boardman Street and Route 145. Improvements should be identified that can address long-term regional goals for the corridor and provide adequate access to the site. I strongly recommend that the Proponent consult with MassDOT, DCR, the City of Boston, and the City of Revere regarding the development of this analysis and identification of mitigation alternatives prior to filing the DEIR. **MEPA 29**

The DEIR should include conceptual plans at a reasonable scale (e.g. 80-scale) for the proposed roadway improvements that clearly show proposed lane widths and offsets, layout lines and jurisdictions, and the land uses (including access drives) adjacent to areas where improvements are proposed. Land acquisition and/or easements required to support improvements should be identified in the DEIR. Any environmental impacts associated with roadway improvements should be identified (in text and on project plans) and quantified within the DEIR (i.e. wetlands impacts, stormwater, etc). In addition, the DEIR should identify consistency of access drives and roadway improvements with a Complete Streets design approach that provides adequate and safe accommodation for all roadway users, including drivers, pedestrians, cyclists and transit riders. The DEIR should include a site circulation plan that clearly identifies how vehicular (including trucks, shuttle buses, tour buses), pedestrian and bicycle access will be provided throughout the site. **MEPA 30** **MEPA 31** **MEPA 32** **MEPA 33**

Transportation Demand Management

The ENF indicates that the DEIR will include a comprehensive TDM Program that will provide incentives for using alternative transportation and discourage single-occupancy-vehicle (SOV) trips. The TDM program should evaluate all feasible measures to reduce trip generation associated with the project. It should include specific, defined mode share goals that target high rates of transit, bicycle, and **MEPA 34**

pedestrian use. Data and analysis of existing modes (including public transportation, walking, and bicycling), future demand and origin-destination patterns of casino employees and patrons, should be employed to identify physical improvements and supporting programs to increase these modes. The DEIR should specifically address TDM measures identified in the MassDEP comment letter.

The ENF identifies physical improvements to bicycle and pedestrian access to, and circulation within, the project site including bicycle parking, expansion of the bicycle network by providing on-street bicycle accommodations along the Bennington Street corridor, enhanced shuttle service, and improved access from neighborhoods to and through the site.

Comments from Walk Boston indicate agreement with the general design and its emphasis on providing safe access for pedestrians. The comments include constructive recommendations regarding design details, potential alternative routes and echoes comments from MassDOT regarding introducing permeability along the property line with adjacent neighborhoods, particularly with the Orient Heights neighborhood. I strongly encourage the Proponent to consult with Walk Boston regarding the development of pedestrian access to and within the site as well as incorporation of safe pedestrian access for off-site roadway improvements. The Proponent should consult with MassRIDES to identify additional TDM measures applicable to the project. **MEPA 35**

Public transportation should be a core component of the mitigation program. Comments from the MBTA and others indicate that the project has a unique opportunity to be fully integrated with the existing transit network. The Proponent should consult with MassDOT and the MBTA regarding existing service and ridership, potential impacts to MBTA Blue Line and bus routes, and provision of adequate transit infrastructure and amenities to encourage transit usage, including effective pedestrian connections to the site from the MBTA Blue Line, from bus routes and/or incorporation of on-site bus shelters/turnout. In particular, it should identify additional demand at the MBTA Suffolk Downs and Beachmont Stations and indicate whether structural and/or capacity improvements are necessary to meet demand and/or comply with current codes for safety, accessibility or other critical functions. MassDOT requests that the DEIR include a Build scenario for the #119 and #120 bus routes to identify increased demand for bus service and whether increases would affect the ability to maintain MBTA service standards. Operational impacts to MBTA bus service from increased traffic generation should be identified. In addition, transit availability and schedules should be considered in the development of shift schedules. Measures to address gaps in overnight transportation service by coordination with Massport Logan Express, airport shuttles, the MBTA sunrise service and private bus lines should be explored. **MEPA 36** **MEPA 37**

The ENF indicates that the Proponent will collaborate with the MBTA to determine ways to enhance the connections between the Suffolk Downs Station and the project. Stronger pedestrian, bicycle and shuttle bus connections will be made onsite to promote use of the station. The role and relative importance of Beachmont Station to the project should be clarified. The DEIR should identify the extent to which the Beachmont Station will be used by employees and patrons, and how access to the site may be improved further if studies identify constraints at the Suffolk Downs Station that warrant significant investment in infrastructure or operations. The DEIR should identify access alternatives from Beachmont Station and the Beachmont neighborhood that could reduce walking distances to the casino facilities and the adjacent shopping center. It should indicate whether any planned improvements to or consolidation of stables have the potential to facilitate more direct access. **MEPA 38**

The study should also consider expansion of the shuttle service from the MBTA Suffolk Downs T Station. It should evaluate development of a route that would serve both stations and other potential locations, such as the intersection of Tomasello Drive and Route 1A, the intersection of Tomasello Drive and Furlong Drive (and/or within the shopping center), and at remote areas of the parking lot. Such a route may be in addition to a direct route from the Suffolk Downs Station. The analysis should indicate whether the existing gated drive that connects the southeastern corner of the site with the Suffolk Downs Station will be used to provide a more direct connection than Waldemar Drive. **MEPA 39**

Parking

The project design includes 5,150 parking spaces, comprised of surface parking and structured parking. This is a reduction of 850 spaces compared to existing conditions and will reduce impervious surfaces by 9 acres. The ENF indicates that the DEIR will include a detailed parking demand and supply analysis. The DEIR should include a parking study that identifies assumptions and methodology used to project parking demand. This should be developed based on parking needs and supplies for comparable facilities, taking into account the urban location, access to transit and access to adjacent neighborhoods. It should identify type of parking required (e.g. patrons, employees, parking for private buses), parking demand at different times of day and, expected parking duration. The DEIR should describe opportunities for reducing the total amount of parking, which should be substantial considering the mixed use nature of the project and proximity to large retail areas and satellite parking, and consider banking parking until construction is warranted by demand. Strategic use of shared parking (on- and off-site) and provision of the minimum parking necessary, can support additional reductions in impervious surfaces, and will support the effectiveness of the TDM Program. The TDM Program should incorporate policies designed to minimize parking demand, including fees for parking and parking cash-out policies. **MEPA 40**

The Proponent should consider provision of charging stations and preferential parking for plug-in electric vehicles. It should provide preferential parking for hybrid or alternatively-fueled vehicles, carpool or vanpools and provide space for a shared car program (e.g. ZipCars). The Proponent should also consider supporting expansion of the Hubway bike share program to East Boston by providing an on-site docking station. **MEPA 41** **MEPA 42**

Monitoring Program

The DEIR should include a proposed monitoring program to evaluate assumptions regarding traffic generation, mode splits and, effectiveness of the traffic mitigation program and the TDM program. The Proponent should consult with MassDOT regarding the duration and frequency of monitoring, the identification of triggers for identification and implementation of additional improvements or programs. The Proponent should provide a clear commitment to implement and continuously fund the TDM Program. **MEPA 43**

In addition, the project is subject to the MassDEP Rideshare Regulation (310 CMR 7.16), a clean air program that applies to employers with 250 or more daily employees and includes reporting requirements.

Airspace/Aviation

The project site appears to be located within protected airport approach and/or transitional airspace areas as defined by state law (MGL, Chapter 90, Section 35B) and Federal regulations (Federal Aviation Regulation Part 77, Objects Affecting Navigable Airspace). State and federal notice is required for proposed buildings, parking lots/structures, lighting (within parking lot, street lights/traffic lights, temporary lighting during construction) and use of cranes. **MEPA 44**

Comments from Massport indicate that the proposed building heights are at or close to several airport approach and or transitional areas as defined by state law and federal regulations and, therefore, careful analysis of potential impacts is warranted. The Proponent should consult with Massport and the MassDOT Aeronautics Division regarding project elements, including lighting and consideration of reflective building materials or use of solar panels, to avoid glare that could impact aviation.

Air Quality

In accordance with the State Implementation Plan (SIP) for ozone attainment, the Proponent must conduct an indirect source review analysis because this is a mixed-use project generating 6,000 or more new adt. This analysis should be conducted in accordance with MassDEP Guidelines for Performing Mesoscale Analysis of Indirect Sources. The proponent should consult with MassDEP for guidance and for confirmation of the appropriate study areas. If hydrocarbon emissions associated with the Build scenario are greater than the No Build scenario, the proponent is required to provide mitigation, including the development of a TDM Program. **MEPA 45**

The MassDEP comment letter identifies potential certifications and permits that may be required for on-site energy sources such as boilers, stationary turbines, emergency generators, etc. The DEIR should identify certification and/or permits that likely will be required for proposed project elements. **MEPA 46**

Wetlands /Drainage

The project will be reviewed by the City of Boston Conservation Commission and the Revere Conservation Commission for its consistency with the Wetlands Protection Act and associated regulations (310 CMR 10.00), including stormwater management standards. The project will alter approximately 480,000 sf of BLSF and 1,100 sf of Riverfront Area. Alteration to BLSF is associated with raising site elevations in some areas to construct the interior driveways and parking areas, utility connections and stormwater management system improvements. Impacts to Riverfront Area is associated with minor re-grading to install stormwater management BMPs. Off-site roadway improvements will alter approximately 40,000 sf of LSCSF and 20,000 sf of buffer zone to Coastal Bank and Salt Marsh. The majority of work affecting wetland resource areas is located within previously altered areas.

The DEIR should demonstrate that the project can be designed and constructed consistent with performance standards. It should include plans at a reasonable scale that clearly delineate all applicable resource area boundaries including riverfront area, buffer zones, 100-year flood elevations, and tidelands. The DEIR should quantify the project's estimated impact on each resource area. It should describe the nature of all impacts that cannot be avoided including grading, clearing and construction- **MEPA 47**

related disturbances and whether they are temporary or permanent in nature. The project will reduce existing impervious surfaces by 9 acres. This reduction, combined with installation of a new stormwater management system, will support improved water quality. Further reductions in impervious surfaces may be feasible. The DEIR should identify and evaluate all feasible methods to reduce impervious surfaces, including reduced parking ratios, banking of parking, and narrow roadway widths. **MEPA 48**

The DEIR should include a stormwater management plan that demonstrates that source controls, pollution prevention measures, erosion and sediment controls and the drainage system will comply with the stormwater standards for water quality and quantity both during construction and post-development. If subsurface infiltration is proposed, the DEIR should demonstrate that soils and groundwater conditions are suitable for such discharges. It should include a commitment to develop an operations and management plan to ensure the long-term effectiveness of the stormwater management system. The locations of detention basins, distances from wetland resource areas and the expected quality of the effluent from the basins should be identified. The Proponent will be required to prepare a Stormwater Pollution Prevention Plan (SWPPP) in accordance with the NPDES Permit. **MEPA 49**

The ENF indicates that the project will not entail changes to the CAFO stormwater separation project completed in 2012. Drainage form the stable area is directed to a retention pond inside the racetrack. Wastewater is pumped from the retention pond to the BWSC sanitary sewer system within Walley street. Clean rooftop runoff from the stables is collected and discharged into the existing drains system to Sales Creek. In the context of considering climate change adaptation measures, the DEIR should evaluate measures that could be employed to provide enhanced protection from less frequent storm events (e.g., 25-year). **MEPA 50**

The Proponent should carefully review comments from MassDEP, the City of Boston and the Revere Planning and Community Development Department regarding wetlands and drainage issues. The ENF indicates the Proponent will consider incorporation of Low Impact Development (LID), water quality swales and bioretention basins. The DEIR should address these alternatives in more detail. In addition, I encourage the Proponent to consider how Sales Creek and associated drainage channels could be designed as a project amenity. **MEPA 51** **MEPA 52**

Landlocked Tidelands

The ENF indicates that the site includes landlocked, filled tidelands consistent with a previous MassDEP decision documented in a June 2000 letter (Attachment F). Comments from MassDEP indicate that it confirmed this decision through a review of previous Chapter 91 licenses, dating back to the 1800's, that were issued for the filling of tidelands, installation of tidegates, and creation of drainage features at and adjacent to the project site.

Projects on landlocked tidelands are subject to the provisions of *An Act Relative to Licensing Requirements for Certain Tidelands* (2007 Mass. Acts ch. 168). Consistent with Section 8 of this legislation, I must conduct a Public Benefits Review as part of the EIR review of projects located on landlocked tidelands that entail new use or modification of an existing use and I must make a Public Benefits Determination within 30 days of the issuance of the Certificate on the Final EIR (FEIR).

Section 3 of this legislation requires that any project that is subject to MEPA review and proposes a new use or structure or modification of an existing use or structure within landlocked tidelands address the project's impacts on tidelands and identify measures to avoid, minimize or mitigate any adverse impacts on these rights. **MEPA 53**

> *"In making said public benefit determination, the secretary shall consider the purpose and effect of the development; the impact on abutters and the surrounding community; enhancement to the property; benefits to the public trust rights in tidelands or other associated rights, including, but not limited to, benefits provided through previously obtained municipal permits; community activities on the development site; environmental protection and preservation; public health and safety; and the general welfare; provided further, that the secretary shall also consider the differences between tidelands, landlocked tidelands and great pond lands when assessing the public benefit and shall consider the practical impact of the public benefit on the development."*

The DEIR should address each of the considerations identified in the legislation and provide information to support this review. The Proponent should consider comments from TBHA, BHIA, MyRWA, the Friends of Belle Isle Marsh and others for consideration of measures that may support the PBD such as contributions to water transportation, support for tourism within and around Boston Harbor including the Boston Harbor Islands, and improvements to Belle Isle Marsh.

Water Supply

The project will increase water demand by 379,910 gpd for a total of 435,810 gpd. This includes 58,000 gpd for landscape irrigation and 22,400 gpd for racetrack irrigation and maintenance. The BWSC will continue to service the site. The City of Revere provides a limited amount of water (15,700 gpd). The ENF indicates that continued water service from Revere is under consideration. The ENF indicates that a new water service connection will be provided in Waldemar Avenue in approximately the same location as the existing connection. No changes are proposed to the 4" connection that serves the CAFO. The EIR should identify infrastructure improvements for water supply, demonstrate that adequate hydraulic capacity will be provided to serve the project, and identify measures to reduce water use, including reuse of grey water. **MEPA 54**

Comments from MWRA note that MWRA water mains are located in the vicinity of proposed replacement of the water main in Waldemar Avenue. The Proponent should consult with the MWRA to determine whether an 8(m) Permit is required to build, construct, excavate or cross within MWRA infrastructure. **MEPA 55**

The ENF identifies a range of water conservation measures that will be incorporated into the project. The DEIR should identify and describe commitments to water conservation and estimate associated decreases in demand. The hotels, in particular, provide numerous opportunities to reduce daily water demand by guests including the use of low-flow fixtures, modifications or the use of BMPs associated with laundry and food services, and guest education. Comments from BWSC recommend that timers, soil moisture indicators and rainfall sensors be installed in any in-ground sprinkler systems. The DEIR should explore opportunities for greywater recycling for use in sanitary facilities, irrigation, or ornamental uses (e.g. fountains). The DEIR should provide an analysis of potential water supply demand **MEPA 56**

reductions that may be achieved through the implementation of greywater recycling infrastructure and feasibility of implementing such a system.

Wastewater

The project requires a Sewer Connection Permit from MassDEP and a Sewer Use Discharge Permit (or waiver) from the MWRA. The ENF identifies existing wastewater generation, existing infrastructure, identifies additional wastewater generation and identifies new wastewater infrastructure. A gravity sewer line runs north-south and connects to a private sewer pump station located on the southerly side of the property. Wastewater is pumped via force main to the existing 12" sewer in Waldemar Avenue. Sewage and street drainage from the stables area is pumped from the settling pond in the northeastern area of the racetrack and discharges to the BWSC system near the MBTA Suffolk Downs Station. A separate storm drainage system collects rooftop runoff.

The ENF indicates that the project will generate an additional 307,080 gpd of wastewater for a total of 473,100 gpd. Approximately 323,100 gpd is associated with domestic wastewater and 150,000 gpd is associated with the CAFO. Comments from MassDEP and BWSC indicate that the DEIR should include revised wastewater flow projections. Projections should be developed consistent with 314 CMR 7.15 or 310 CMR 15.203 (2)-(5). Existing flows that will be maintained may be evaluated using existing meter data. The DEIR should detail the method for projecting wastewater flows. **MEPA 57**

The ENF indicates that the existing infrastructure has adequate capacity to support the project; however, redevelopment will include the replacement and/or relocation of infrastructure. Renovation of the grandstand building will include installation of a new gravity sewer main. In addition, a new force main is proposed to connect to the sewer pipe. Wastewater flows that are discharged to the sewer in Waldemar Avenue will be diverted to a discharge point downstream of the residential neighborhood. Wastewater will continue to be discharged to the BWSC system (East Boston Low Level Sewer (EBLLS)) for treatment and discharge at the MWRA Deer Island Wastewater Treatment Facility.

Comments from MassDEP, the MWRA and BWSC indicate that the Proponent will be required to participate in the MWRA flow control program to remove extraneous clean water, infiltration and inflow (I&I) from the sewer system. The Proponent will be required to offset flows associated with the project by removing I/I on a 4:1 basis of 4 gallons removed for every gallon generated. In addition, comments from the MWRA indicate that the EBLLS can be exceeded in large storms, due to high volumes of infiltration and inflows and can contribute to local system backups.

Comments from MassDEP note that the Proponent should continue to adhere to conditions and requirements of the Sewer Use Discharge Permit that authorizes the existing discharge from the CAFO.

The DEIR should include updated projections of wastewater generation, describe existing and proposed wastewater infrastructure for the entire site (including the horse barns), and identify measures to minimize wastewater demand and mitigate project impacts. **MEPA 58**

Hazardous Waste

The ENF indicates that a release of heavy metals, petroleum and polyaromatic hydrocarbons (PAH) was reported to MassDEP in 1997 and was assigned a Release Tracking Numbers (RTN) (3-14857). The file was closed in February 1998 with a Permanent Solution Class B-1 Response Action Outcome (RAO). No Activity and Use Limitation (AUL) was placed on the property. The project does not propose any disturbance of the easement area associated with the RTN. In addition, the ENF notes that a Phase I and Phase II Environmental Site Assessment, including subsurface investigations with soil and groundwater sampling and testing were completed in 2007. The report identified low levels of contaminants in soil and/or groundwater consistent with an urban site.

In the event that any new releases are discovered during demolition or construction, the status of the release in accordance with the Massachusetts Contingency Plan (MCP) should be identified in the DEIR. **MEPA 59**

Historic Resources

As noted previously, the Suffolk Downs Clubhouse, Grandstand and Racetrack (BOS.209) are included in the MHC Inventory of Historic and Archaeological Assets of the Commonwealth and may meet the criteria for listing in the State and National Registers of Historic Places. The project includes the renovation of the Grandstand and Clubhouse, demolition of the existing link between these structures and demolition of an office building and utility building.

Comments from MHC request that information to assist it in evaluating potential impacts of the project be provided prior to the filing of the DEIR. This includes an updated MHC Form A (Area Form) supported by current color photographs of all extant buildings and features and identification of the dates of construction and alterations if available. In addition, MHC indicates that the DEIR should clearly identify any and all potential alterations to the Revere Beach Parkway (REV.H), which is listed in the State and National Registers of Historic Places. **MEPA 60**

Construction Period Impacts

The EIR should include a discussion of construction phasing, evaluate potential impacts associated with construction activities (including but not limited to noise, vibration, dust, and traffic flow disruptions) and propose feasible measures to avoid or eliminate these impacts. The phasing plan should identify whether racetrack operations will continue during construction and, if so, how parking and other needs will be accommodated during construction. The ENF indicates that a draft Construction Management Plan (CMP) will be included in the DEIR. **MEPA 61** **MEPA 62**

The project must comply with MassDEP's Solid Waste and Air Quality Control regulations, pursuant to M.G.L. Chapter 40, Section 54, during demolition and construction. I note that the project will result in the generation of demolition waste, portions of which contain asbestos. Removal or abatement of regulated asbestos-containing material must be completed consistent with the requirements of 310 CMR 7.15 and the Proponent must provide an asbestos notification form (ANF 001) to MassDEP. The ENF indicates that the construction waste management plan will include a minimum **MEPA 63** **MEPA 64**

reuse/recycling goal of 75%. The DEIR should indicate whether a Beneficial Use Determination (BUD) will be required for any proposed reuse/recycling.

Because the project is located adjacent to residential areas, I encourage the Proponent to mitigate the construction period impacts of diesel emissions to the maximum extent feasible. This mitigation may be achieved through the installation of after-engine emission controls such as diesel oxidation catalysts (DOCs) or diesel particulate filters (DPFs), or the use of equipment that meets Tier 3 or Tier 4 emission standards for non-road construction equipment. Comments from MassDEP note that project contractors are required to use ultra low sulfur diesel (ULSD) fuel (15 parts per million sulfur) in off-road engines and provides additional resources to assist with implementation of this program. The DEIR should indicate measures that will be incorporated into the project. **MEPA 65**

Mitigation

The DEIR should include a separate chapter that identifies all mitigation measures. This chapter should also include separate draft Section 61 Findings for each State Agency that will issue permits for the project. The draft Section 61 Findings should contain clear commitments to implement mitigation measures, estimate the individual costs of each proposed measure, identify the parties responsible for implementation, and include a schedule for implementation. In addition, it should include a commitment to provide a self-certification document indicating that GHG measures have been incorporated into the project. **MEPA 66**

Comments

The DEIR should contain a copy of this Certificate and a copy of each comment letter received. To ensure that the issues raised by commenters are addressed, the DEIR should include responses to comments. This directive is not intended to, nor shall it be construed to, enlarge the scope of the DEIR beyond what has been expressly identified in this certificate. **MEPA 67**

Circulation

The Proponent should circulate the DEIR to the individuals and organizations who commented on the ENF, to any State Agencies from which the Proponent will seek permits or approvals and to any parties specified in section 11.16 of the MEPA regulations. In addition, the DEIR should be made available for review at the Boston Public Library (BPL), the East Boston Branch of the BPL and the Revere Public Library. **MEPA 68**



April 5, 2013
Date

Richard K. Sullivan Jr.

Comments received:

3/26/13	Coastal Zone Management (CZM)
3/26/13	Department of Conservation and Recreation (DCR)
3/26/13	Department of Fish and Game (DFG)/Division of Marine Fisheries (DMF)
4/3/13	Massachusetts Bay Transportation Authority (MBTA)
3/26/13	Massachusetts Department of Environmental Protection (MassDEP)/Northeast Regional Office (NERO)
3/26/13	Massachusetts Department of Transportation (MassDOT)
3/26/13	Massachusetts Historical Commission (MHC)
3/26/13	Massachusetts Port Authority (Massport)
2/26/13	Massachusetts Water Resources Authority (MWRA)
3/20/13	Senator Anthony Petruccelli, State Representative Carlo Basile and Boston City Councilor Salvatore LaMattina
3/25/13	Senator Jennifer L. Flanagan
3/20/13	State Representative Kathi-Anne Reinstein
2/20/13	Boston Water and Sewer Commission (BWSC)
3/26/13	City of Boston/Boston Transportation Department (BTD)
3/26/13	City of Boston/Environmental and Energy Services (EES)
3/25/13	Mayor Gary Christenson, City of Malden
3/25/13	Mayor Daniel Rizzo, City of Revere
3/19/13	City of Revere/Department of Planning and Community Development
3/26/13	Boston Harbor Island Alliance
3/21/13	Bike to the Sea
3/26/13	Building and Construction trades Council of the Metropolitan District
3/26/13	Clean Water Action (CWA)
3/25/13	Carpenter's Local Union 218
3/22/13	Construction & General Laborers' Union Local 22
3/26/13	East Boston Chamber of Commerce
3/25/13	Friends of Belle Isle Marsh
3/15/13	Greater Boston Labor Council, AFL-CIO
3/25/13	International Brotherhood of Electrical Workers (IBEW) Local 103 of Greater Boston
3/15/13	MC-EB Realty LLC
3/26/13	No Eastie Casino
3/26/13	Mass Audubon
3/26/13	Massachusetts AFL CIO
3/26/13	Metropolitan Area Planning Council (MAPC)
3/25/13	Mystic River Watershed Association (MyRWA)
3/25/13	New England Horsemen's Benevolent and Protective Association, Inc.
3/25/13	New England Regional Council of Carpenters
3/25/13	New England Stallion Station LLC
3/26/13	Painters & Allied Trades District Council #35
3/26/13	Plumbers & Gasfitters Local 12 Boston
3/19/13	Revere Chamber of Commerce
3/26/13	Saugus River Watershed Association
3/20/13	Sheet Metal Workers' International Association Local Union No. 17

3/25/13	Teamsters Local Union No. 25
3/26/13	The Boston Harbor Association (TBHA)
3/26/13	United Auto Workers
3/26/13	WalkBoston
3/21/13	John Antonellis
3/7/13	Daniel Blustein
3/7/13	Lois Baxter
3/20/13	Jason Burrell
3/26/3	Mary Ann Carvalho
3/26/13	Paula Cavalieri
3/24/13	Robert Fitch
3/30/13	Ryan Forsyth
3/21/13	Steve Holt
3/21/13	Andrew Hunt
3/25/13	Diane Ingemi and Eric Stack
3/20/13	Jessie Purvis
3/26/13	Gloria Ristaino
3/15/13	George Rotondo
2/6/13	John Stella
3/21/13	Joseph Todesca
3/25/13	Kathy Wyatt

RKS/CDB/cdb

MEPA 01 **The DEIR should include a detailed description of the proposed Project and identify any changes to the Project since the filing of the ENF. It should include all Project elements, including racetrack operations, a description of potential changes to the horse barn area, and associated maintenance. It should include updated site plans for existing and proposed conditions at a legible scale.**

A detailed Project description, which addresses all elements of the Project, is provided in Section 1.0, and changes to the Project since the ENF was filed are summarized in Section 1.5. Updated site plans for existing and proposed conditions are also referenced in Section 1.0 and provided in Volume II, Project Figures.

MEPA 02 **The DEIR should identify all State permits and approvals required for the Project and identify how the Project will be developed consistent with associated regulatory standards and requirements. In addition, it should describe Project phasing and identify how permitting will be addressed within the context of this phasing.**

Table 3-1 identifies the anticipated permits, approvals, and reviews required for this Project. Project consistency with regulatory standards and requirements are addressed in various sections of the Draft EIR in the context of specific issue areas. The Project schedule and phasing plan is described in Section 1.11.

MEPA 03 **The DEIR should identify the Project's consistency with EO384, the Commonwealth's Sustainable Development Principles, and regional and local land use plans, including the East Boston Master Plan (April 2000), the City of Revere Massachusetts FY 2010-2015 Strategic Plan, and the Boston Region MPO Journey to 2030 (September 27, 2007).**

Project consistency with these various planning documents is addressed in Section 3.4.

MEPA 04 **To provide context for the Project review, the DEIR should provide a summary of the relevant sections of the Expanded Gaming Act and associated regulations, the Project application process, and the development of Host and Community Agreements.**

Section 3.3 contains discussions of the relevant sections of the Expanded Gaming Act and associated regulations, Section 3.3.2 addresses the Project application process, and Section 3.3.3 describes the HCAs. Copies of the Boston and Revere HCAs are provided in Attachment B.

MEPA 05 **The DEIR should identify elements of the Project that are required by the [Expanded Gaming Act] and/or regulations and the extent to which the size and associated impacts of the Project are driven by gaming requirements, such as the minimum capital investment for a category 1 license.**

Section 1.9.1 describes the extent to which the size and associated impacts of the Project are driven by gaming requirements and licensing criteria.

MEPA 06 **The DEIR should provide a more realistic mixed-use development scenario for the site to support a better understanding of the relative impacts of a resort casino compared to a mixed-use development.**

Section 1.9 contains an alternatives analysis that includes discussion of two alternative development scenarios.

MEPA 07 **The DEIR should identify each alternative's impacts on land alteration, creation of impervious area, impacts to wetland resource areas, public benefits associated with landlocked tidelands, traffic generation, parking, water use, and wastewater. This comparison should be provided in a tabular format with supporting narrative and conceptual site plans.**

Table 1-4 compares the impacts from the proposed Project with a No-Build alternative as well as two alternatives for development of the site.

MEPA 08 **The DEIR shall include an analysis of GHG emissions and mitigation measures in accordance with the standard requirements of this Policy. The analysis should quantify the direct and indirect GHG emissions associated with the Project's energy use and transportation-related emissions... The DEIR should identify and commit to mitigation measures to reduce GHG emissions.**

A GHG analysis is provided as Section 7.0, and this analysis quantifies direct and indirect GHG emissions associated with the Resort. Proposed mitigation measures are described in Section 7.2 and 7.5, and other mitigation measures are discussed in Section 7.4.

MEPA 09 **The DEIR should include a GHG emissions analysis that calculates and compares GHG emissions associated with: (1) a Massachusetts Building Code-compliant baseline (based on the Massachusetts Building Code 8th Edition (chapter 780 CMR 13.00)), which has been amended to adopt and integrate with the current version of the IECC or ASHRAE 90.7-2007; and (2) a Preferred Alternative that include energy efficiency design measures to achieve compliance with the Stretch Code. The**

Policy requires Proponents to use energy modeling software to quantify projected energy usage from stationary sources and energy consumption and modeling should be developed in accordance with ASHRAE 90.1-2007 Appendix G.

The requested GHG analysis is provided in Section 7.0.

MEPA 10 The Proponent should identify the model used to analyze GHG emissions, clearly state modeling assumptions, explicitly note which GHG reduction measures have been modeled, and identify whether certain building design or operational GHG reduction measures will be mandated by the Proponent to future occupants or merely encouraged for adoption and implementation. The DEIR should include the modeling printout for each alternative and emission tables that compare base case emissions in tpy with the preferred alternative showing the anticipated reduction in tpy and percentage by emissions source (direct, indirect and transportation).

This information is provided in the GHG analysis in Section 7.0 as well as in Attachment D, which contains the GHG Technical Appendices.

MEPA 11 The feasibility of each of the mitigation measures outlined below should be assessed for each of the major Project elements, and if feasible, GHG emissions reduction potential associated with major mitigation elements should be evaluated to assess the relative benefits of each measure.

- Minimize energy use through building orientation and evaluate its impacts on energy usage, including solar gain, day-lighting and viability of solar PV systems;
- Use of high-albedo roofing materials;
- Install high-efficiency HVAC systems and adequate numbers of thermal zones to support temperature controls;
- Reduce energy use through peak shaving or load shifting strategies;
- Maximize interior day-lighting through floor-plates, increased building perimeter and use of skylights, clerestories and light wells;
- Incorporate window glazing to rebalance and optimize daylighting, heat loss and solar heat gain performance;
- Incorporate roof and wall insulation to minimize heat loss and minimize uncontrolled infiltration through the building envelope;
- Incorporate lighting motion sensors, climate control and building energy management systems;
- Install energy efficient lighting, both exterior and interior;

- Evaluate additional measures to reduce Project plug loads, including the use of more efficient equipment (such as Energy Star), consider energy consumption as a factor in the selection of special equipment, such as slot machines, and consider power management techniques; and
- Install water source heat pumps (hotel rooms only).

These and other mitigation measures are described and evaluated in Section 7.0.

MEPA 12 The CHP feasibility analysis should consider state incentives to support CHP as well as information provided by MassDEP regarding the use of CHP at a significant number of casinos and large hotels. The feasibility analysis should include consideration of one of the major benefits of a CHP system – the ability to produce off-grid power.

As described in Section 7.2, CHP is a proposed element of the Project design. The CHP analysis and engineering effort addresses incentives for CHP as well as the information provided by MassDEP regarding CHP use in casinos and hotels. It is anticipated that back-up power for the facility will be provided by emergency generators, rather than by CHP, because of the large standby power needs of the facility.

MEPA 13 Evaluation of PV systems should consider state incentives to promote the use of PV systems (Commonwealth Solar II and Commonwealth Solar Stimulus). At a minimum, buildings should be oriented to the south to maximize solar exposure and, if the analysis demonstrates that such systems are presently infeasible, they should be "solar ready" to facilitate future installation of PV systems.

Building orientation and application of PV are discussed in Section 7.2.

MEPA 14 The Proponent should consult with MassDEP regarding the amendment of its regulations to build capacity for organics management and associated permitting requirements.

The Project's organic waste management plan is described in Section 7.2.8.3.

MEPA 15 The DEIR should explain, in reasonable detail, why certain measures, which could provide significant GHG reductions, were not selected – either because it is not acceptable to the Project or is considered technically or financially infeasible. As noted by MassDEP, the Proponent should also consider TDM measures... and adoption of additional sustainable design measures for which GHG reductions cannot be easily quantified, such as recycling efforts and water conservation measures, that can be incorporated into the Project. Additional GHG reductions can be achieved through effective materials management during the design,

construction, and operations phases of the Project. These measures will be considered when evaluating whether the Project can mitigate its GHG emission to the greatest extent practicable.

Section 7.4 includes a discussion of mitigation measures that are not currently adopted in the Project design as well as measures for which GHG reduction impacts are not easily quantifiable but are important to sustainable design.

MEPA 16 The DEIR should include an analysis of potential GHG emissions related to the treatment and conveyance of wastewater or withdrawal, treatment and conveyance of potable and/or non-potable water.

The GHG analysis in Section 7.3.2 accounts for water and wastewater.

MEPA 17 While I encourage the Proponent to adopt those GHG reduction measures that are integrated into the building's core, shell and infrastructure, some measures may be transient or dependent on operational procedures implemented by the future occupant. In those instances, the Proponent should consider reasonable measures to educate and create incentives for the tenants to adopt energy efficiency/renewable generation measures. The DEIR should address the Proponent's commitment to providing energy efficiency consulting services and information and/or developing a tenant manual that requires or strongly supports GHG reduction measures.

Proponent's influence with tenants is described in Section 7.2.8.1.

MEPA 18 The DEIR should identify whether the Project will include fleet vehicles. For the purposes of the GHG Policy, fleet vehicles are generally considered to be a source of direct GHG emissions from vehicles used by a project proponent in the everyday operation of a facility. In this case, these may include shuttle buses for employees and patrons, landscaping or catering vehicles, etc.

GHG emissions of fleet vehicles and mitigation measures employed are described in Section 7.5.1.

MEPA 19 The DEIR should include a commitment to provide a self-certification to the MEPA Office at the completion of each building or group of buildings. It should be signed by an appropriate professional… indicating that all of the GHG mitigation measures, or equivalent measures that are designed to collectively achieve identified reductions in stationary source GHG emission and transportation-related measures, have been incorporated into the Project.

The GHG analysis summary provided in Section 7.6.2 contains this self-certification commitment, and this commitment is also reflected in the proposed Section 61 Findings in Section 10.0.

MEPA 20 **The Project must be designed to comply with Massachusetts State Building Code requirements for structures within the floodplain and local requirements.**

Resort buildings will not be within the flood zone.

MEPA 21 **Because the resort is designed to serve a significant number of patrons and is located in an area that could be directly affected by more severe storms and increased flooding, the Proponent should consider measures to generate on-site power in the event of disruptions in service to the electrical grid.**

In the event of a natural disaster and loss of utility power, standby power will be generated by standby generators. It is anticipated that two generators, each two megawatts in capacity, will serve the site and will be capable of providing power for emergency and life safety needs as well as basic building functions (e.g., maintaining partial heating for the buildings).

MEPA 22 **The DEIR should present capacity analyses and a summary of average and 95th percentile vehicle queues for each intersection within the study area. The DEIR should also present a merge and diverge for each ramp junction and weaving analysis for all the interchanges located in the study area. Any proposed traffic signals must include a signal warrant analysis conducted according to the MUTCD. The results of this analysis should be provided in a tabular format that identifies Existing, Future No-Build, and Future Build Conditions for all peak hour conditions. Analysis should use a 10-year horizon (2022) for the traffic study and a 20-year horizon for analysis of proposed infrastructure improvements.**

The requested transportation analyses are presented in Section 5.0.

MEPA 23 **Comments from MassDOT, MBTA, and DCR recommend that the following locations be incorporated into the study area:**

- **Route 60/Charger Street**
- **Route 60/Sigourney Street**
- **Route 1/Copeland Circle interchange (including the rotary and adjacent segments)**
- **Route 1A/Wonderland MBTA Station Driveway**
- **Route 1A/Revere Street (signalized intersection)**

In addition, MassDOT requests that a roadway section analysis, prepared in accordance with the HCM, be provided for the three harbor tunnels (Ted Williams Tunnel, Callahan Tunnel, and Sumner Tunnel) to identify daily volumes and peak characteristics.

Comments from BTD and the Revere Planning and Community Development Department request that the following locations be incorporated into the study area:

- Route 1A/Curtis Street
- Saratoga Street/Neptune Avenue
- Bremen Street/Neptune Road
- Bennington Street/Crescent Avenue

The additional locations requested by MassDOT, MBTA, DCR, BTD, and the Revere Planning and Community Development Department have been incorporated in the study area for the transportation analysis presented in Section 5.0, and are noted specifically in Section 5.2.6. Traffic volume data for the harbor tunnels are discussed in Section 5.2.7.

MEPA 24 The Proponent should consult with MassDOT regarding use of ATR and TMC to measure existing volumes, and whether additional and/or more recent counts are required for the study. In particular, the study should include the most recent data available for the Ted Williams Tunnel, Sumner Tunnel and Callahan Tunnel.

Validation of traffic data and additional counts requested by MassDOT are presented in Sections 5.2.7, 5.2.8, and 5.2.9.

MEPA 25 The study should evaluate existing conditions for transit, pedestrian and bicycle access, including an inventory of existing transit service, existing pedestrian access routes to the site, and an inventory of the existing bicycle network in the area. It should identify constraints that limit transit, walking and bicycle trips. It should include ridership estimates for the MBTA Suffolk Downs and Beachmont Stations and pedestrian and bicycle volumes.

Analyses of existing transit, pedestrian, and bicycle access, including MBTA ridership data, are presented in Section 5.2.

MEPA 26 The Proponent should consult with the MassDOT Office of Transportation Planning and the MBTA Service Planning Department to develop appropriate and reasonable travel demand and trip generation characteristics.

The Proponent has had numerous consultations with MassDOT's Office of Transportation Planning (OTP), and through the OTP the MBTA Service Planning Department. A detailed description of travel demand and trip generation characteristics for the Project is presented in Sections 5.4.1 through 5.4.5.

MEPA 27 **MassDOT requests that a temporal distribution of traffic over a full one-week period be provided, to support identification of the peak hours of casino traffic and most critical peak analysis periods resulting from existing roadway volumes and Project site trips. Daily and peak hour trip projections by mode should be presented for patrons and employees separately and combined. Modeling and assumptions to determine the origin-destination patterns of trips should be clearly presented.**

Temporal distribution of existing roadway volumes is presented in Section 5.2.8. Temporal distribution of Project traffic is presented in Section 5.4.2. Daily and peak hour Project trip projections are presented separately for patrons and employees in Section 5.4.6. Vehicular trip distribution and assignment is presented in Section 5.4.7.

MEPA 28 **Several commenters identify the importance of considering the potential for overlapping peak periods with other major traffic generators in the area (e.g., Logan Airport, general traffic/tunnel or beach traffic on Saturdays in May and June). In particular, MassDOT identifies a concern that peak periods for general/tunnel traffic, Logan Airport traffic and the casino could overlap and result in an extended peak period of congestion in the tunnels. MassDOT indicates that the study should identify the worst combination of projected Project traffic and existing roadway volumes to determine the critical peak hours for analysis on Fridays and Saturdays.**

Studies completed for the Project have shown that the overlapping periods are minimized due to the nature of Resort-related trips and peak commuter and weekend hours. The worst combination of existing traffic and Project trips is identified in Sections 5.2.8 and 5.4.2.

MEPA 29 **Using the data and analysis developed for the traffic study as a basis, the DEIR should include an alternatives analysis that considers a range of roadway improvements for the 1A corridor between Boardman Street and Route 145. Improvements should be identified that can address long-term regional goals for the corridor and provide adequate access to the site. I strongly recommend that the Proponent consult with MassDOT, DCR, the City of Boston, and the City of Revere regarding the development of this analysis and identification of mitigation alternatives prior to filing the DEIR.**

An alternatives analysis of Route 1A infrastructure improvements is presented in Section 5.5. Other traffic, safety, and roadway improvements committed to in the HCAs with Revere and Boston are presented in Section 5.6. The Proponent has consulted with MassDOT, DCR, and with the cities of Revere, Boston, and Chelsea in developing plans for these improvements.

MEPA 30 **The DEIR should include conceptual plans at a reasonable scale (e.g., 80-scale) for the proposed roadway improvements that clearly show proposed lane widths and offsets, layout lines and jurisdictions, and the land uses (including access drives) adjacent to areas where improvements are proposed.**

Conceptual plans for proposed roadway improvements are presented in the relevant parts of Sections 5.5 and 5.6 as well as in Attachment A.

MEPA 31 **Land acquisition and/or easements required to support improvements should be identified in the DEIR.**

The Proponent owns fee title to the Project site. As discussed in Section 1.1, the Project includes certain off-site traffic improvements along Route 1A, including widening Route 1A and construction of infrastructure improvements at the intersection of Boardman Street and Route 1A in East Boston. The precise amount of land or rights in land ultimately required will depend on the alternative selected and the final design details of the improvements. The Proponent has begun discussions with certain property owners who own property in the proposed ROW and will continue to work with these property owners to obtain all rights required for construction, maintenance, and operation of the proposed Route 1A infrastructure improvements. Once constructed, ownership of the improvements and the necessary rights in land on which the improvements have been made will be transferred to the owner and operator of the roadway facility. The Proponent does not expect that any of the other transportation improvements proposed in accordance with the HCAs will require additional right-of-way.

MEPA 32 **Any environmental impacts associated with roadway improvements should be identified (in text and on Project plans) and quantified within the DEIR (i.e., wetlands impacts, stormwater, etc.).**

Environmental impacts associated with roadway improvements, based on the flyover concept, are discussed in Section 6.0.

MEPA 33 **The DEIR should identify consistency of access drives and roadway improvements with a Complete Streets design approach that provides adequate and safe accommodation for all roadway users, including drivers, pedestrians, cyclists, and**

transit riders. The DEIR should include a site circulation plan that clearly identifies how vehicular (including trucks, shuttle buses, tour buses), pedestrian, and bicycle access will be provided throughout the site.

The concept plans for access drive and roadway improvements presented in Sections 5.5 and 5.6 have been developed consistent with a Complete Streets approach. Site circulation plans based on a Complete Streets approach are presented in Section 4.0.

MEPA 34 The TDM program should evaluate all feasible measures to reduce trip generation associated with the Project. It should include specific, defined mode share goals that target high rates of transit, bicycle, and pedestrian use. Data and analysis of existing modes (including public transportation, walking, and bicycling), future demand and origin-destination patterns of casino employees and patrons, should be employed to identify physical improvements and supporting programs to increase these modes. The DEIR should specifically address TDM measures identified in the MassDEP comment letter.

A comprehensive TDM Plan is presented in Section 5.9.

MEPA 35 I strongly encourage the Proponent to consult with Walk Boston regarding the development of pedestrian access to and within the site as well as incorporation of safe pedestrian access for off-site roadway improvements. The Proponent should consult with MassRIDES to identify additional TDM measures applicable to the Project.

As suggested, the Proponent has scheduled meetings with WalkBoston and MassRIDES.

MEPA 36 Public transportation should be a core component of the mitigation program... The Proponent should consult with MassDOT and the MBTA regarding existing service and ridership, potential impacts to MBTA Blue Line and bus routes, and provision of adequate transit infrastructure and amenities to encourage transit usage, including effective pedestrian connections to the site from the MBTA Blue Line, from bus routes and/or incorporation of on-site bus shelters/turnout. In particular, it should identify additional demand at the MBTA Suffolk Downs and Beachmont Stations and indicate whether structural and/or capacity improvements are necessary to meet demand and/or comply with current codes for safety, accessibility or other critical functions.

The MBTA has provided existing service and ridership data to the Proponent. Analyses of existing conditions and potential impacts under Build conditions, including additional demand at Suffolk Downs Station, are presented in Sections 5.5.1 and 5.8.1, respectively. Supporting infrastructure and amenities are described in Sections 4.0, 5.8, and 5.9.

MEPA 37 **MassDOT requests that the DEIR include a Build scenario for the #119 and #120 bus routes to identify increased demand for bus service and whether increases would affect the ability to maintain MBTA service standards. Operational impacts to MBTA bus service from increased traffic generation should be identified. In addition, transit availability and schedules should be considered in the development of shift schedules. Measures to address gaps in overnight transportation service by coordinating with Massport Logan Express, airport shuttles, the MBTA sunrise service, and private bus lines should be explored.**

Increased demand for ridership on the #119 and #120 MBTA buses is discussed in Section 5.8.1.3, along with an analysis of potential operational impacts. The Proponent's off-site shuttle plan, described in Section 5.8.3.2, will provide alternative transportation during the night when the MBTA is not operating. As described in the TDM plan in Section 5.9, the Proponent will adjust employee shift times to the extent possible to reflect transit availability. In addition, the Proponent is committed to exploring coordinated services with Massport, the MBTA, and others.

MEPA 38 **The role and relative importance of Beachmont Station to the Project should be clarified. The DEIR should identify the extent to which the Beachmont Station will be used by employees and patrons, and how access to the site may be improved further if studies identify constraints at the Suffolk Downs Station that warrant significant investment in infrastructure or operations. The DEIR should identify access alternatives from Beachmont Station and the Beachmont neighborhood that could reduce walking distances to the casino facilities and the adjacent shopping center. It should indicate whether any planned improvements to, or consolidation of, stables have the potential to facilitate more direct access.**

In discussions with MBTA, MassDOT, and BTD, the Proponent has indicated that very limited use of Beachmont Station is expected by Resort patrons, and that the vast majority of patrons and employees using the Blue Line will use Suffolk Downs Station, which is a short walk from the Resort buildings and will be served by enhanced shuttle service. Independent of this consideration, as described in Section 5.6, the Proponent has committed to provide substantial streetscape and pedestrian improvements in Donnelly Square adjacent to Beachmont Station and along Winthrop Avenue between the station and the Project site access at Tomasello Drive.

MEPA 39 **The study should also consider expansion of the shuttle service from the MBTA Suffolk Downs T Station. It should evaluate development of a route that would serve both stations and other potential locations, such as the intersection of Tomasello Drive and Route 1A, the intersection of Tomasello Drive and Furling Drive (and/or within the shopping center), and at remote areas of the parking lot. Such a route may be in addition to a direct route from the Suffolk Downs Station. The analysis should indicate whether the existing gated drive that connects the southeastern corner of the site with the Suffolk Downs Station will be used to provide a more direct connection than Waldemar Drive.**

The Proponent's proposed on- and off-site shuttle plans are described in Sections 5.8.1 and 5.8.4.

MEPA 40 **The DEIR should include a parking study that identifies assumptions and methodology used to project parking demand. This should be developed based on parking needs and supplies for comparable facilities, taking into account the urban location, access to transit and access to adjacent neighborhoods. It should identify type of parking required (e.g., patrons, employees, parking for private buses), parking demand at different times of day, and expected parking duration. The DEIR should describe opportunities for reducing the total amount of parking, which should be substantial considering the mixed use nature of the Project and proximity to large retail areas and satellite parking, and consider banking parking until construction is warranted by demand. Strategic use of shared parking (on- and off-site) and provision of the minimum parking necessary, can support additional reductions in impervious surfaces, and will support the effectiveness of the TDM Program. The TDM Program should incorporate policies designed to minimize parking demand, including fees for parking and parking cash-out policies.**

The parking analysis for the Project is presented in Section 5.10. In addition, the TDM plan presented in Section 5.9 includes strategies to minimize parking demand.

MEPA 41 **The Proponent should consider provision of charging stations and preferential parking for plug-in electric vehicles. It should provide preferential parking for hybrid or alternately-fueled vehicles, carpool or vanpools and provide space for a shared car program (e.g., ZipCars).**

Charging stations, preferential parking for carpools/vanpools, and accommodation of a shared car program are included in the TDM plan presented in Section 5.9.

MEPA 42 **The Proponent should also consider supporting expansion of the Hubway bike share program to East Boston by providing an on-site docking station.**

As noted in Section 5.8.3, the Proponent has committed to providing two Hubway stations when the City of Boston expands the Hubway program to include East Boston.

MEPA 43 **The DEIR should include a proposed monitoring program to evaluate assumptions regarding traffic generation, mode splits, and effectiveness of the traffic mitigation program and the TDM program. The Proponent should consult with MassDOT regarding the duration and frequency of monitoring, the identification of triggers for identification and implementation of additional improvements or programs. The Proponent should provide a clear commitment to implement and continuously fund the TDM Program.**

Commitments to monitoring are identified in Section 5.9.5 and are to be coordinated with MassDOT and BTD. The Proponent has committed to joining the Logan TMA as part of its long-term commitment to TDM, and will require tenants to adopt equivalent TDM commitments.

MEPA 44 **The Project site appears to be located within protected airport approach and/or transitional airspace areas as defined by state law (MGL, Chapter 90, Section 35B) and Federal regulations (Federal Aviation Regulation Part 77, Objects Affecting Navigable Airspace). State and federal notice is required for proposed buildings, parking lots/structures, lighting (within parking lot, street lights/traffic lights, temporary lighting during construction) and use of cranes... The Proponent should consult with Massport and the MassDOT Aeronautics Division regarding Project elements, including lighting and consideration of reflective building materials or use of solar panels, to avoid glare that could impact aviation.**

The Proponent has had several meetings with Massport and FAA staff to discuss the potential impacts of Project elements on aviation, particularly at Logan Airport, and has also discussed the Project with the MassDOT Aeronautics Division. The Proponent will continue to engage with Massport and the MassDOT Aeronautics Division to ensure there are no negative impacts on aviation.

MEPA 45 **In accordance with the SIP for ozone attainment, the Proponent must conduct an indirect source review analysis because this is a mixed-use project generating 6,000 or more new adt. This analysis should be conducted in accordance with MassDEP Guidelines for Performing Mesoscale Analysis of Indirect Sources. The Proponent should consult with MassDEP for guidance and for confirmation of the appropriate study areas. If hydrocarbon emissions associated with the Build scenario are greater than the No Build scenario, the Proponent is required to provide mitigation, including the development of a TDM Program.**

The methodology and results from the mesoscale analysis are presented in Sections 6.5.4.1 and 6.5.5.1, respectively.

MEPA 46 **The MassDEP comment letter identifies potential certifications and permits that may be required for on-site energy sources such as boilers, stationary turbines, emergency generators, etc. The DEIR should identify certification and/or permits that likely will be required for proposed Project elements.**

Certifications and permits likely required for stationary sources are presented in Section 6.5.7.

MEPA 47 **The DEIR should demonstrate that the Project can be designed and constructed consistent with performance standards. It should include plans at a reasonable scale that clearly delineate all applicable resource area boundaries including RFA, buffer zones, 100-year flood elevations, and tidelands. The DEIR should quantify the Project's estimated impact on each resource area. It should describe the nature of all impacts that cannot be avoided including grading, clearing and construction-related disturbances and whether they are temporary or permanent in nature.**

On-site and off-site wetland resource areas are described in Sections 6.9.1 and 6.9.2, respectively. Potential Project impacts are quantified, and the resource areas are also depicted.

MEPA 48 **The DEIR should identify and evaluate all feasible methods to reduce impervious surfaces, including reduced parking ratios, banking of parking, and narrow roadway widths.**

The proposed parking layout has been designed to accommodate the minimum number of spaces required to meet the Resort demands. A multi-story parking garage is included to reduce the amount of surface parking needed, thus allowing for more green space on the Project site. All parking spaces will be 9 feet by 18 feet, and aisle widths have been minimized to reduce the amount of impervious surface on the site to the extent practicable.

MEPA 49 **If subsurface infiltration is proposed, the DEIR should demonstrate that soils and groundwater conditions are suitable for such discharges. It should include a commitment to develop an operations and management plan to ensure the long-term effectiveness of the stormwater management system. The locations of detention basins, distances from wetland resource areas, and the expected quality of the effluent from the basins should be identified. The Proponent will be required to prepare a SWPPP in accordance with the NPDES Permit.**

Extensive soil testing performed on-site indicates soil conditions are marginal for stormwater infiltration. The site design includes a maximized number of bioretention areas to infiltrate water and provide for evaporation of collected stormwater, thereby reducing runoff from the site. These basins will provide for cleaner and lower-volume stormwater runoff from the site relative to existing

conditions. An Operations and Maintenance Plan has been developed for the site and is included in the drainage report (see Attachment F). A draft SWPPP has also been prepared and is included with the drainage report.

MEPA 50 **In the context of considering climate change adaptation measures, the DEIR should evaluate measures that could be employed to provide enhanced protection from less frequent storm events (e.g., 25-year).**

Climate change adaptation measures have been included in the site design, including, among other measures, elevating buildings, roadways, and critical infrastructure above anticipated sea level rise elevations. Section 2.3 addresses climate change and adaptation.

MEPA 51 **The ENF indicates the Proponent will consider incorporation of LID, water quality swales, and bioretention basins. The DEIR should address these alternatives in more detail.**

LID drainage design has been incorporated into the Project design to the maximum extent practicable. Section 9.3 describes stormwater management, including LID drainage design and BMPs incorporated into the Project.

MEPA 52 **I encourage the Proponent to consider how Sales Creek and associated drainage channels could be designed as a Project amenity.**

Section 2.0 contains information about use of the site's green infrastructure as a visual, experiential, and educational amenity. The Project will improve water quality in Sales Creek since the proposed drainage system will be a significant improvement over the existing system, which was installed in the 1930s prior to implementation of stormwater management guidelines. Since the entire site drains to Sales Creek and ultimately Belle Isle Marsh, the Project will benefit these systems. Section 9.3 describes the proposed drainage system.

MEPA 53 **Section 3 of [the Landlocked Tidelands] legislation requires that any project that is subject to MEPA review and proposes a new use or structure or modification of an existing use or structure within landlocked tidelands address the project's impacts on tidelands and identify measures to avoid, minimize or mitigate any adverse impacts on these rights... The DEIR should address each of the considerations identified in the legislation and provide information to support this review.**

Section 6.7 contains a request for a Public Benefits Determination, and therein describes the Project's public benefits and protection of public rights.

MEPA 54 **The EIR should identify infrastructure improvements for water supply, demonstrate that adequate hydraulic capacity will be provided to serve the Project, and identify measures to reduce water use, including reuse of grey water.**

The Project team continues to work with the BWSC regarding developing mitigation strategies for the proposed Project to reduce water and wastewater impacts. The Project design includes three large rainwater reuse tanks that will collect roof runoff and enable the Proponent to reuse stormwater for cooling tower water, irrigation water, and track watering. Use of these tanks will save approximately 4.5 million gallons of water per year. Section 9.0 describes water, wastewater, and stormwater issues.

MEPA 55 **Comments from MWRA note that MWRA water mains are located in the vicinity of proposed replacement of the water main in Waldemar Avenue. The Proponent should consult with the MWRA to determine whether an 8(m) Permit is required to build, construct, excavate, or cross within MWRA infrastructure.**

The Proponent is coordinating with the MWRA regarding water supply impacts (see Section 9.2).

MEPA 56 **The DEIR should identify and describe commitments to water conservation and estimate associated decreases in demand. The hotels, in particular, provide numerous opportunities to reduce daily water demand by guests including the use of low-flow fixtures, modifications or the use of BMPs associated with laundry and food services, and guest education. Comments from BWSC recommend that timers, soil moisture indicators, and rainfall sensors be installed in any in-ground sprinkler systems. The DEIR should explore opportunities for greywater recycling for use in sanitary facilities, irrigation, or ornamental uses (e.g., fountains). The DEIR should provide an analysis of potential water supply demand reductions that may be achieved through the implementation of greywater recycling infrastructure and feasibility of implementing such a system.**

As described in the response to MEPA 54, the Project includes three large rainwater reuse tanks that will save approximately 4.5 million gallons of water per year (see Section 9.0). Sections 4.4 and 4.5 describe methods to minimize site irrigation as well as stormwater re-use for irrigation. Potable water demand in the facility itself will be reduced via the use of low-flow fixtures and waterless fixtures: low-flow fixtures will be used throughout the facility, including in hotel guest rooms; waterless urinals will be used in public spaces in the podium.

MEPA 57 **Comments from MassDEP and BWSC indicate that the DEIR should include revised wastewater flow projections. Projections should be developed consistent with 314 CMR 7.15 or 310 CMR 15.203 (2)-(5). Existing flows that will be maintained may be evaluated using existing meter data. The DEIR should detail the method for projecting wastewater flows.**

Revised wastewater calculations, consistent with 310 CMR 15, are included in Section 9.1, which also describes the methodology used to calculate the Resort's estimated wastewater generation.

MEPA 58 **The DEIR should include updated projections of wastewater generation, describe existing and proposed wastewater infrastructure for the entire site (including the horse barns), and identify measures to minimize wastewater demand and mitigate Project impacts.**

Section 9.1 describes the wastewater design for the site, which is intended to reduce water demand and, therefore, wastewater generation. The Proponent will continue to work with BWSC and the MWRA regarding wastewater generation and mitigation.

MEPA 59 **In the event that any new releases are discovered during demolition or construction, the status of the release in accordance with the MCP should be identified in the DEIR.**

The Proponent will comply with any MCP requirements, including any new releases that may be discovered during demolition or construction.

MEPA 60 **Comments from MHC request that information to assist it in evaluating potential impacts of the Project be provided prior to the filing of the DEIR. This includes an updated MHC Form A (Area Form) supported by current color photographs of all extant buildings and features and identification of the dates of construction and alterations if available. In addition, MHC indicates that the DEIR should clearly identify any and all potential alterations to the Revere Beach Parkway (REV.H), which is listed in the State and National Registers of Historic Places.**

An updated MHC Form A was submitted to the MHC and BLC on July 2, 2013. A copy of the inventory form is included as Attachment J. Potential alterations to the Revere Beach Parkway associated with the Project are described in Sections 5.0 and are included in Attachment A.

MEPA 61 **The EIR should include a discussion of construction phasing, evaluate potential impacts associated with construction activities (including but not limited to noise, vibration, dust, and traffic flow disruptions) and propose feasible measures to avoid or eliminate these impacts. The phasing plan should identify whether racetrack operations will continue during construction and, if so, how parking and other needs will be accommodated during construction.**

Construction phasing and potential impacts associated with construction activities and operational measures to mitigate those impacts are described in the Draft CMP in Attachment L.

MEPA 62 **The ENF indicates that a draft CMP will be included in the DEIR.**

The Draft CMP in Attachment L describes construction-period activities and considerations.

MEPA 63 **I note that the Project will result in the generation of demolition waste, portions of which will contain asbestos. Removal or abatement of regulated asbestos-containing material must be completed consistent with the requirements of 310 CMR 7.15 and the Proponent must provide an asbestos notification form (ANF 001) to MassDEP.**

The Proponent is familiar with the requirements for removing or abating regulated asbestos-containing material, and will comply with these requirements.

MEPA 64 **The ENF indicates that the construction waste management plan will include a minimum reuse/recycling goal of 75%. The DEIR should indicate whether a BUD will be required for any proposed reuse/recycling.**

Demolition of the existing administrative building, electrical building, and portions of the grandstand and link buildings will generate asphalt, brick, and concrete (ABC) debris. ABC that is not coated, impregnated, or otherwise treated will be crushed and reused on-site, an activity that does not require MassDEP pre-approval provided that MassDEP and the municipalities are notified in advance. However, for ABC that is painted, coated, impregnated, or otherwise treated, the contractor will submit a BUD application to MassDEP for approval for crushing and reuse. The application will be supported by documentation demonstrating that the material will be beneficially used on site and that use of the material will not result in a significant risk to health or the environment and will not increase the overall level of contamination at the site.

MEPA 65 **Because the Project is located adjacent to residential areas, I encourage the Proponent to mitigate the construction-period impacts of diesel emissions to the maximum extent feasible. This mitigation may be achieved through the installation of after-engine emission controls such as DOCs or DPFs, or the use of equipment that meets Tier 3 or Tier 4 emission standards for non-road construction equipment. Comments from MassDEP note that Project contractors are required to use ultra low sulfur diesel (ULSD) fuel (15 ppm sulfur) in off-road engines and provide additional resources to assist with implementation of this program. The DEIR should indicate measures that will be incorporated into the Project.**

Construction air quality, including the mitigation of diesel emissions, is discussed in the Draft CMP in Attachment L.

MEPA 66 **The DEIR should include a separate chapter that identifies all mitigation measures. This chapter should also include separate draft Section 61 Findings for each State Agency that will issue permits for the Project. The draft Section 61 Findings should contain clear commitments to implement mitigation measures, estimate the individual costs of each proposed measure, identify the parties responsible for implementation, and include a schedule for implementation.**

Section 10.0 summarizes the proposed mitigation measures and contains proposed Section 61 Findings for each State Agency that will issue a permit(s) for the Project.

MEPA 67 **The DEIR should contain a copy of this Certificate and a copy of each comment letter received. To ensure that the issues raised by commenters are addressed, the DEIR should include responses to comments.**

This section contains copies of the Certificate and all comment letters received on the ENF, and all comments are addressed herein.

MEPA 68 **The Proponent should circulate the DEIR to the individuals and organizations who commented on the ENF, to any State Agencies from which the Proponent will seek permits or approvals, and to any parties specified in section 11.16 of the MEPA regulations. In addition, the DEIR should be made available for review at the Boston Public Library (BPL), the East Boston Branch of the BPL, and the Revere Public Library.**

The Circulation List provided as Attachment M conforms to these requirements.

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Northeast Regional Office • 205B Lowell Street, Wilmington MA 01887 • 978-694-3200

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lieutenant Governor

RICHARD K. SULLIVAN JR.
Secretary

KENNETH L. KIMMELL
Commissioner

March 26, 2013

Richard K. Sullivan Jr., Secretary
Executive Office of
Energy & Environmental Affairs
100 Cambridge Street
Boston MA, 02114

RE: Boston/Revere
Caesars Resort at Suffolk Downs
Suffolks Downs Racecourse
Route 1A Tomasello Drive
EEA # 15006

Attn: MEPA Unit

Dear Secretary Sullivan:

The Massachusetts Department of Environmental Protection (MassDEP) has reviewed the Environmental Notification Form (ENF) submitted by Sterling Suffolk Racecourse, LLC to construct a resort casino on the 161 acre, Suffolk Downs Racetrack property in Boston and Revere (EEA #15006). The site is bisected by the Rumney Marshes Area of Critical Environmental Concern (ACEC), which extends along Sales Creek. The casino will comprised of up to 450 hotel rooms in two hotels; multi-purpose meeting space; approximately 16 restaurants; 200,000 square feet (sf) of gaming space; 30,000 sf of retail space; and parking that includes a seven-story parking garage with about 2,600 spaces, valet parking for 450 vehicles, and 2,100 surface parking spaces. The Suffolk Downs Grandstand building will be repurposed to support one of the casino areas. The entire project is estimated at 1,802,363 sf in several linked buildings, and it exceeds several MEPA thresholds, which make the project categorically included for the preparation of an environmental impact report. MassDEP provides the following comments.

Wastewater

The ENF states that there is sufficient capacity in the existing collection system to accommodate the estimated 307,080 gallons per day (gpd) of new wastewater flow, which will increase the wastewater discharge to 473,100 gpd from the project site. Since new flows from the site will be greater than 50,000 gpd, a sewer extension/connection permit will be required. Additional information on the sewer extension and connection regulations is available on the MassDEP website: http://www.mass.gov/dep/service/regulations/314cmr07.pdf. Flows from the entire project must be included in the MassDEP Sewer Connection Permit Application. Wastewater generated by the project will discharge into the City of Boston's sewer system and ultimately flow to the MWRA's Deer Island Wastewater Treatment Facility. The wastewater flow generation estimation should be expanded from the information provided in the **DEP 01**

ENF. Wherever possible, the flow generation numbers noted in 314 CMR 7.15 or 310 CMR 15.203(2) – (5) should be used as design flows. In this regard, the estimate for theatre seats should be five gallons per day (gpd)/seat and not three gpd/seat, as noted in the ENF. Flows from existing areas which are to remain may be estimated using existing water meter data. Future flows which are not encompassed in the regulations cited above should be based on best engineering judgment, and typically can be determined utilizing 200 percent of the average daily flows using actual data from similar facilities. The method used to produce flow estimates must be detailed in the DEIR.

MassDEP collaborates with the MWRA and its member communities, (including Boston), in implementing a flow control program in the MWRA regional wastewater system to remove extraneous clean water, which is referred to as infiltration/inflow (I/I) from the sewer system. Proponents adding significant new wastewater flow participate in the I/I reduction effort to ensure that the additional wastewater flows from their projects are offset by the removal of I/I, which is typically at a rate of four gallons of I/I removed for every gallon of wastewater added. In accordance with the provisions of the MassDEP policy on I/I mitigation requirements in MWRA communities, (available at http://www.mass.gov/dep/water/laws/mwraii09.pdf), I/I mitigation is a required element of a MassDEP sewer connection permit for projects which generate greater than 15,000 gallons per day of wastewater flow where a project exceeds any MEPA threshold for an DEIR or if the project has a significant risk of creating conditions leading to a sanitary sewer overflow. Given the scope and impacts of the proposed project, and the need for I/I mitigation, the proponent should arrange to meet with MassDEP and the cities of Boston and Revere to develop a plan to meet the mitigation requirements of the MassDEP I/I Policy. **DEP 02**

Chapter 91, Waterways Licensing

The ENF suggests that no Chapter 91 license is required for the project because it is not located on jurisdictional tidelands. This view is consistent with a prior opinion from MassDEP in June, 2000, that found the tidelands on the site are non-jurisdictional because they are landlocked tidelands in accordance with the definition of that term in the waterways regulations at 310 CMR 9.02. The Department has confirmed the conclusion of the 2000 correspondence through a careful review of previous Chapter 91 licenses, dating back to the late 1800's, that were issued for the filling of tidelands, installation of tidegates, and creation of drainage features at and adjacent to the project site.

While projects on landlocked tidelands are not subject to licensing, they are required to seek a Public Benefits Determination by the Secretary. According to the ENF, the DEIR will include more information regarding the projects benefits to public trust rights in tidelands. The Department will review and comment upon the DEIR's discussion of the public benefits provided by the project.

Wetlands

MassDEP requests a description of the wetland resources onsite and off-site where project-related work or mitigation is proposed. The DEIR should quantify the extent of unavoidable wetland alteration, including both temporary and permanent impacts. Plans at a readable scale should show the boundaries of all wetland resource areas and areas to be altered. **DEP 03**

The proposal also should explain how the project will comply with the applicable performance standards as required in the wetlands regulations and demonstrate that wetland alteration has been avoided and minimized to the extent feasible through preparation of an alternatives analysis (see 310 CMR 10.55(4)). Where opportunities exist, revised site designs should be considered in order to avoid and minimize wetland impacts. The proposal should include plans depicting and quantifying wetlands replication areas and information on how altered wetland functions will be restored.

According to the ENF, the project will fill 480,000 square feet (sf) of Bordering Land Subject to Flooding (BLSF), and this loss will be compensated with 140,000 cubic feet (cf) of compensatory flood storage. The areas of impact and compensation will need to be shown on plans at a readable scale. Compensatory flood storage must be provided at an incremental basis, in accordance with the performance standards under 310 CMR 10.57(4). **DEP 04**

In addition, off-site work relating to the project would alter 40,000 sf of Land Subject to Coastal Storm Flowage (LSCSF). This area also needs to be shown on the project plans. MassDEP also requests a full description of this floodplain area and an explanation for classifying this area as LSCSF, rather than BLSF.

Stormwater

A new stormwater drainage system is proposed for the two casino areas, parking garage, and surface parking areas. As explained in the ENF, the stormwater system for the CAFO operations in the northern and northeastern portions of the site is expected to remain as is.

According to the ENF, the Redevelopment Standard 7 in the MassDEP stormwater management regulations (SMR), (310 CMR 10.05(6)(k)), is applicable to the project. This standard allows the proponent to demonstrate that the standards have been met "to the maximum extent practicable," where it is not feasible to comply with the standards fully. However, this is a largely underdeveloped project site that includes the Rumney Marshes ACEC, and the nearby waterbodies are impaired, such that total maximum daily loads (TMDL) are needed and a draft pathogen TMDL has been established. Therefore, MassDEP strongly encourages the proponent to evaluate stormwater management designs in the DEIR that fully comply with the SMR performance standards in order to protect the ACEC and conform to the goals established in the pathogen TMDL. The project has an opportunity and obligation to contribute toward the ongoing revitalization of this significant natural resource, which notably received one million dollars last year from the U.S Fish and Wildlife Service (USFWS) National Coastal Wetland Conservation Grant Program (NCWCG) to restore 33 acres of the 2,000 acre Rumney Marsh, the largest contiguous salt marsh habitat in the Boston metropolitan area. **DEP 05**

As specified for redevelopment in the *Stormwater Management Handbook Volume 1*, a demonstration of "to the maximum extent practicable" entails a demonstration that all reasonable efforts have been made to comply with the standards, including considering on and off-site alternatives. "The scope and effort to be undertaken to meet the standards should reflect the scale and impacts of the proposed project and the classification and sensitivity of the affected wetlands and water resources." Conventional best management practices (BMPs) and low impact

development techniques are proposed for compliance with the applicable performance standards. Currently, there are no detailed stormwater management plans in the ENF.

The DEIR should demonstrate that the project's water quality and quantity impacts would be controlled with best management practices (BMPs) to comply with SMR standards and for consistency with the applicable Storm Water Programs under the NPDES Phase I and Phase II Stormwater General Permits for MassDOT and the cities of Boston and Revere. These state and local stormwater management programs have requirements and implementation strategies to control the release of pollutants in stormwater runoff to impaired waterbodies with total maximum daily loads (TMDLs). As there is a *Draft Pathogen TMDL for the Boston Harbor Watershed (excluding the Neponset River sub-basin)* for impaired and non-impaired waterbodies in the vicinity of the project site, the stormwater management study should consider how stormwater controls conform to the TMDL and associated implementation strategies established for pathogens. In general, the MassDEP report, *Mitigation Measures to Address Pathogen Pollution in Surface Water: A TMDL Implementation Guidance Manual for Massachusetts,* recommends the use of infiltration BMPs to control pathogens. "Given the high concentrations of bacteria often found in stormwater and the lack of targeted mitigation measures, perhaps the most effective means of reducing stormwater contributions to pathogen impairment is to reduce the volume of runoff by increasing infiltration to groundwater." The DEIR should present a thoughtful analysis of the effectiveness of the stormwater management system in controlling the recognized water quality impairments, particularly pathogens, taking into consideration pollution prevention, source control, BMPs, and system maintenance. Additional information on pathogen mitigation is available in this report; it is available at the following MassDEP website: http://www.mass.gov/dep/water/resources/impguide.pdf. **DEP 06**

Stormwater runoff impacts during construction and post-construction will need to be evaluated in the DEIR, including off-site transportation mitigation and sewer-related work. It is anticipated that the stormwater management report will be sufficiently detailed to demonstrate that source controls, pollution prevention measures, erosion and sediment controls, and the post-development drainage system will be designed in compliance with the MassDEP stormwater management regulations, pursuant to 310 CMR 10.05(6)(k) and all applicable performance standards, including Standard 6 for Critical Areas such as ACECs, which are addressed in greater detail in the Stormwater Management Handbooks. **DEP 07**

The DEIR also should demonstrate that source controls, pollution prevention measures, erosion and sediment controls during construction, and the post-development drainage system will be designed to comply with the SMR and standards for water quality and quantity impacts and for consistency with the Storm Water Programs identified previously. Calculations, stormwater system design plans at a readable scale, best management practice (BMP) designs, and supporting information should demonstrate that the stormwater system design protects wetland resources in conformance with the stormwater regulations and NPDES permits. **DEP 08**

Low Impact Development

The proponent is considering low impact development (LID) and the use of integrated management practices (IMP) for control of stormwater in combination with conventional drainage control measures, as the SMR requires. The range of LID techniques offers a

stormwater management approach that minimizes runoff impacts by maintaining and mimicking existing hydrologic functions. LID can be less costly than conventional gutter and pipe drainage systems to construct and maintain. LID also can provide redundancy for stormwater control.

The current project layout reduces imperviousness by about nine acres, which downsizes the volume of stormwater that will need to be controlled and may allow infiltration of rainwater to limit the release of contaminants from the site into nearby marshland and waterbodies. Currently 71 acres of the 161 acre site are impervious, with 90 acres considered pervious. This project also is suitable for other low impact development (LID) stormwater control strategies and practices. For example, flat-roof buildings could be vegetated as green roofs, and pervious pavement could be used for low intensity parking areas and sidewalks on site. There also may be an opportunity to add raingardens/bioretention areas and tree box filters for enhanced stormwater infiltration in open space and landscaped strips. Additional information on LID practices with high environmental performance efficiencies is available on the following USEPA website: www.epa.gov/nps/lid. **DEP 09**

Greenhouse Gas Emissions (GHG)

According to the ENF, the project "will set a new standard of excellence in sustainable design..." for similar facilities. The goal for this project is the US Building Council's Leadership in Energy and Environmental Design (LEED) Gold rating. The project will need to comply with the City of Boston's Article 37 Zoning Ordinance and the applicable Stretch Building Code, which is being revised and expected to take effect either this year or 2014. It is anticipated that the DEIR will describe the design measures that will adopted to achieve at least these standards, in addition to providing a full analysis of mobile and stationary sources of greenhouse gas emissions. The proposed project is subject to the *MEPA Greenhouse Gas Emissions Policy and Protocol (Policy)* as amended on May 5, 2010. **DEP 10**

The policy requires energy modeling to quantify projected energy consumption and the related GHG emissions from direct and indirect stationary sources, and to evaluate the energy efficient design alternatives that will be incorporated into the project to reduce greenhouse gas emissions. The policy allows the proponent to select a model; however, MassDEP and DOER recommend using EQUEST for stationary source modeling. The DEIR should include the modeling printout for at least three scenarios: base case, preferred alternative case, and preferred alternative with greater GHG mitigation case. In addition, the DEIR should include emission tables that compare base case emissions in tons with the mitigation alternatives showing the reduction in tons and percentage by emissions source, direct, indirect and transportation. Other tables or graphs that show the tonnage and percentage reduction of major mitigation elements are also very useful in comparing the value added of different measures. The DEIR should explain, in reasonable detail, any measure not selected that has the potential to significantly reduce GHG emissions. At this stage of the MEPA review, the proponent anticipates that the project would include high efficiency chillers, condensing boilers, water and airside economizers, heat recovery, high efficiency lighting, lighting controls, and water conserving plumbing fixtures. **DEP 11** **DEP 12** **DEP 13**

The Massachusetts Clean Energy and Climate Plan 2020 estimates that MEPA project reviews will contribute by reducing approximately 100,000 Metric Tons of CO_2 equivalent by 2020. Significant projects, such as Caesars Resort are integral to the achievement of this goal.

Therefore, MassDEP encourages the proponent to adopt cutting-edge energy efficient designs and equipment wherever feasible, taking into consideration that energy efficient designs yield cost-savings over time.

At this early planning stage, the proponent is evaluating on-site anaerobic digestion (AD) to reduce organic waste from the casino and racetrack, which can generate an alternative fuel source for the project. In addition, photovoltaics (PV), green roofs, and combined heat and power (CHP) will be given consideration. The DEIR should layout information and plans to understand the feasibility of incorporating renewable energy into the project design. Should a renewable energy option be infeasible, it is requested that the DEIR provide an explanation and a thoughtful discussion of the changes that would be needed for reconsideration of that alternative. **DEP 14**

MassDEP is very supportive of CHP for this project, in light of the information provided by USEPA on CHP and casinos, such as the USEPA factsheet and market analysis, which are available at the following websites: http://www.epa.gov/chp/markets/casino_fs.html and http://www.epa.gov/chp/documents/hotel_casino_analysis.pdf, respectively. According to USEPA, CHP is a viable option for a significant number of large hotels and casinos; CHP typically supplies 50 to 70 percent of the electricity needed. As the proponent proceeds with the technical and economic feasibility evaluation, it may be helpful to consult the CHP Partnership, an organization that assists with the design process and to identify financing options and other services that can be accessed through the USEPA website: http://www.epa.gov/chp/. In addition, MassDEP has promulgated regulations to encourage the installation of CHP systems. These regulations may be found at 310 CMR 7.26(45) Combined Heat and Power (CHP). **DEP 15**

Anaerobic Digestion(AD) to Energy

MassDEP supports the proponent's efforts to evaluate AD as an energy source for this project and requests that the DEIR describe and provide plans for an AD system, or alternative AD systems that would utilize available resources to meet the project's energy needs. The potential for GHG emissions reductions from an alternative fuel should be considered in the DEIR. **DEP 16**

In terms of air quality permitting, the proponent has the option of either complying in full with the MassDEP regulations for engines and turbines in 310 CMR 7.26(43), or alternatively, complying with the Best Available Control Technology (BACT) requirements in 310 CMR 7.02(5). The engine and turbine regulations apply to engines that have a power output rating equal to or greater than 50kW and turbines with a rated power output less than or equal to ten MW.

If the alternative approach and BACT is selected, the requirements for top-case BACT are explained in the commercial AD BACT Guidance document, entitled *Current Best Available Control Technology (BACT) Requirements,* which is available at the following MassDEP website: http://www.mass.gov/dep/air/approvals/bactadc.pdf. In addition, detailed information on the Air Quality (AQ) Plan Approval process, as well as the AQ forms that would be needed in order to obtain a written AQ Plan Approval are available on the following MassDEP website: http://www.mass.gov/dep/air/approvals/aqforms.htm#airpapp.

In addition, with respect to any proposed AD component of the project, the DEIR should discuss the applicability of MassDEP's regulations promulgated in November 2012 for the purpose of building capacity for managing organic materials (310 CMR 16.00, 310 CMR 19.00 & 314 CMR 12.00). These regulatory amendments were developed to address barriers to the development of certain types of recycling, composting, and other clean/green cutting edge technologies in the Commonwealth, such as AD. The regulatory changes were created to bring the regulations up-to-date with innovative clean energy technologies by establishing a clear permit pathway for these activities; thereby facilitating siting of these projects and ensuring that high environmental standards are met. Among other things, these regulations exempt certain activities from solid waste site assignment requirements and set forth a straightforward pathway for permitting certain recycling, composting, and conversion (RCC) activities.

MassDEP is available to hold pre-application meetings with the proponent in order to fully answer any technical questions concerning regulatory requirements for AD, and to describe the best path to take to fulfill the regulatory requirements expeditiously. However, in the event that an AD system is found to be infeasible for the project, MassDEP requests that the DEIR provide an organics management plan for the project. **DEP 17**

Air Quality

The ENF estimates that the project will generate 24,600 new vehicle trips per day based on a preliminary analysis which will be refined in the Draft Environmental Impact Report (DEIR). Nevertheless, it is anticipated that the final, new vehicle trip projection will exceed MassDEP's review threshold of 3,000 daily trips for mixed use development requiring an air quality mesoscale analysis of project related emissions. The purpose of the mesoscale analysis is to determine to what extent the proposed project trip generation will increase the amount of volatile organic compounds (VOCs) and nitrogen oxides (NOx) in the project study area. The proposed project also is subject to the MEPA Greenhouse Gas Emissions Policy and Protocol (Policy) as amended on May 5, 2010. The Policy requires the project proponent to quantify project-related carbon dioxide (CO_2) emissions and identify measures to avoid, minimize, and mitigate these emissions. The mesoscale analysis also should be used for this purpose. The analysis must compare the indirect emissions from transportation sources under future No Build, Build, and Build with Mitigation conditions. Subsequent environmental filings should include the results of the mesoscale analysis for VOC, NOx, and CO2 emissions under these conditions. **DEP 18**

MassDEP supports the proponent's commitment to collaborate with the MBTA to enhance transit service to the site and to mitigate the impacts of the project-related traffic through a combination of local and regional roadway improvements, transportation demand management (TDM), and parking management.

Enhanced Transit Service

The project site enjoys excellent transit connections with nearly direct access via Suffolk Downs and Beachmont Blue Line Stations, local bus service, and limited express bus service. MassDEP recommends that the proponent exploit the potential of this transit-rich location by promoting transit service to the project site from neighboring communities, Logan Airport, Downtown, and the Seaport District. Accordingly, the DEIR should explore all reasonable opportunities for trip reduction and management tailored to the specific needs of employees and **DEP 19**

patrons with particular emphasis on transit connections as well as bicycle and pedestrian infrastructure and amenities. MassDEP recommends that the project proponent consider the following three actions: **DEP 20**

- Work closely with the MBTA to consider adding an on-site bus stop for the Express Bus Routes 424, 434, 448, and 449 for increased transit service to the site.
- Maintain the existing Suffolk Downs shuttle service to adjacent Blue Line stations and expand the shuttle service as necessary to accommodate additional Blue Line ridership to the project site.
- Offer active support for any future consideration to expand the Silver Line into East Boston and Chelsea. Should the Hubway bike share program expand into East Boston, MassDEP recommends the proponent support an on-site docking station.

MassDEP encourages the proponent to explore these and other opportunities for trip reduction and management and recommends that the DEIR includes greater emphasis on pedestrian and bicycle measures that take advantage of the project's proximity to several transit options.

Recommended Mitigation Measures

In addition to MassDEP's aforementioned recommendations and the transit demand management (TDM) measures presented in the ENF, MassDEP recommends that the DEIR contain a greater emphasis on TDM and mitigation measures to reduce project related emissions, such as the following measures: **DEP 21**

- Provide market incentives that encourage patrons to seek travel by charter bus service rather than private automobile.
- Charge market price for parking spaces used by single occupant vehicle (SOV) drivers. Proponents can charge a fee to those who drive alone, while keeping parking free for bus, transit, carpool or vanpool.
- Offer parking cash-out incentives to employees whose parking is provided. This strategy encourages employers/tenants to provide employees with an option for compensation for not utilizing dedicated parking spaces, thus encouraging employees to seek alternative modes of transportation such as walking, biking, carpooling, or taking public transit to work.
- Provide expanded private shuttle service to transit connections for both employees and patrons.
- Improve proposed bicycle parking by providing short and long term accommodations, as appropriate, for project employees and patrons. Bicycle parking should be secure, convenient, weather protected, and sufficient to meet demand.
- Work with Boston officials to support and fund as necessary, off-site, improved bicycle access to the project site, including the use of the most recent MassDOT Design Guidelines or engineering judgment, as appropriate.
- Offer Alternative Work Schedules to all employees as well as staggered work shifts, where appropriate, to reduce peak period traffic volumes.
- Provide Direct Deposit for employees.

- Participate in the USEPA SmartWay Transport Program. SmartWay is a voluntary program that increases energy efficiency and reduces greenhouse gas emissions.
- Provide Guaranteed Ride Home to those employees who regularly commute by transit, bicycle, or vanpool to the site and who have to leave work in the event of a family emergency or leave work late due to unscheduled overtime.
- Establish infrastructure that provides publicly available electric vehicle charging facilities.
- Provide electronic signage displaying shuttle and transit schedule information.
- Dedicate space for Car Sharing/Bike Sharing. The proponent should dedicate a minimum of two car sharing spaces in the proposed garage. MassDEP recommends the proponent provide support and dedicated space for bike sharing on site as this concept expands into the area.
- Hire an Employee Transportation Coordinator to administer the parking management program. A Coordinator can act as a point of contact for the various tenants within a given development, help enforce the parking requirements, and carry out any other day-to-day tasks and strategies from the rest of the list above.
- Unbundle hotel guest parking fees from accommodation rates, thus encouraging alternative travel mode choice.
- Provide preferential and free parking for guests using carpools.
- Explore shared parking opportunities to take advantage of the varying parking demand periods of nearby facilities.

Recommended Construction Period Air Quality Mitigation Measures

Diesel emissions contain fine particulates that exacerbate a number of heath conditions, such as asthma and respiratory ailments. MassDEP recommends that the proponent work with its staff to implement construction-period diesel emission mitigation, which could include the installation of after-engine emission controls such as oxidation catalysts or diesel particulate filters, or the use of construction equipment that meet Tier 3 or Tier 4 emission standards for non-road construction equipment. Additional information is available on the MassDEP website: http://www.mass.gov/dep/air/diesel/conretro.pdf. In addition, project contractor(s) are required to use ultra low diesel fuel (ULSD) in their off-road construction equipment in conjunction with after-engine emission controls. **DEP 22**

Required Mitigation Measures: Compliance with the Massachusetts Idling Regulation

The ENF acknowledges the Massachusetts Idling regulation (310 CMR 7.11) which prohibits motor vehicles from idling their engines more than five minutes unless the idling is necessary to service the vehicle or to operate engine-assisted power equipment (such as refrigeration units) or other associated power. The DEIR should address how the project will ensure compliance with the regulation. Questions regarding this regulation should be directed to Julie Ross of MassDEP at 617-292-5958. **DEP 23**

Recycling Issues

MassDEP acknowledges the proponent's commitment to recycle and reuse as much of the construction and demolition (C&D) waste as feasible. The proponent also should be aware of

that certain materials are restricted from disposal, pursuant to 310 CMR 19.017 and that demolition activities must comply with both Solid Waste and Air Pollution Control regulations, pursuant to M.G.L. Chapter 40, Section 54, which provides:

"Every city or town shall require, as a condition of issuing a building permit or license for the demolition, renovation, rehabilitation or other alteration of a building or structure, that the debris resulting from such demolition, renovation, rehabilitation or alteration be disposed of in a properly licensed solid waste disposal facility, as defined by Section one hundred and fifty A of Chapter one hundred and eleven. Any such permit or license shall indicate the location of the facility at which the debris is to be disposed. If for any reason, the debris will not be disposed as indicated, the permittee or licensee shall notify the issuing authority as to the location where the debris will be disposed. The issuing authority shall amend the permit or license to so indicate."

For the purposes of implementing the requirements of M.G.L. Chapter 40, Section 54, MassDEP considers an asphalt, brick, and concrete (ABC) rubble processing or recycling facility, (pursuant to the provisions of Section (3) under 310 CMR 16.05, the Site Assignment regulations for solid waste management facilities), to be conditionally exempt from the site assignment requirements, if the ABC rubble at such facilities is separated from other solid waste materials at the point of generation. In accordance with 310 CMR 16.05(3), ABC can be crushed on-site with a 30-day notification to MassDEP. However, the asphalt is limited to weathered bituminous concrete, (no roofing asphalt), and the brick and concrete must be uncoated or not impregnated with materials such as roofing epoxy. If the brick and concrete are not clean, the material is defined as construction and demolition (C&D) waste and requires either a Beneficial Use Determination (BUD) or a Site Assignment and permit before it can be crushed.

Pursuant to the requirements of 310 CMR 7.02 of the Air Pollution Control regulations, if the ABC crushing activities are projected to result in the emission of one ton or more of particulate matter to the ambient air per year, and/or if the crushing equipment employs a diesel oil fired engine with an energy input capacity of three million or more British thermal units per hour for either mechanical or electrical power which will remain on-site for twelve or more months, then a plan application must be submitted to MassDEP for written approval prior to installation and operation of the crushing equipment.

In addition, if significant portions of the demolition project contain asbestos, the project proponent is advised that asbestos and asbestos-containing waste material are a special waste as defined in the Solid Waste Management regulations, (310 CMR 19.061). Asbestos removal notification on permit form ANF 001 and building demolition notification on permit form AQ06 must be submitted to MassDEP at least 10 working days prior to initiating work. Except for vinyl asbestos tile (VAT) and asphaltic-asbestos felt and shingles, the disposal of asbestos containing materials within the Commonwealth must be at a facility specifically approved by MassDEP, (310 CMR 19.061). No asbestos containing material including VAT, and/or asphaltic-asbestos felts or shingles may be disposed at a facility operating as a recycling facility, (310 CMR 16.05). The disposal of the asbestos containing materials outside the jurisdictional boundaries of the Commonwealth must comply with all the applicable laws and regulations of the state receiving the material.

The demolition activity also must conform to current Massachusetts Air Pollution Control regulations governing nuisance conditions at 310 CMR 7.01, 7.09 and 7.10. As such, the proponent should propose measures to alleviate dust, noise, and odor nuisance conditions, which may occur during the demolition. Again, MassDEP must be notified in writing, at least 10 days in advance of removing any asbestos, and at least 10 days prior to any demolition work. The removal of asbestos from the buildings must adhere to the special safeguards defined in the Air Pollution Control regulations, (310 CMR 7.15 (2)). **DEP 24**

The proponent's record for its comprehensive recycling programs should be emulated and expanded in Massachusetts. In addition to paper, glass, plastics, waste oil, and cardboard, MassDEP would appreciate and encourage a commitment to innovative recycling of the waste stream, characteristic of a resort casino, such as is being done with gently-used soap and personal care products. Facilitating future waste reduction and recycling and integrating recycled materials into the project are necessary to minimize or mitigate the long-term solid waste impacts of this type of development. The Commonwealth's waste diversion strategy is part of an integrated solid waste management plan, contained in The Solid Waste Master Plan that places a priority on source reduction and recycling. Efforts to reduce waste generation and promote recycling have yielded significant environmental and economic benefits to Massachusetts' residents, businesses and municipal governments over the last ten years. Waste diversion will become even more important in the future as the key means to conserve the state's declining supply of disposal capacity and stabilize waste disposal costs. **DEP 25**

In revising the Solid Waste Master Plan, MassDEP is advancing a goal to divert 450,000 tons of food waste from landfills and incinerators by 2020. In the future, large-scale food waste generators, which may include Caesar's Resort, will be banned from landfilling or incinerating food waste. Therefore, MassDEP strongly encourages the proponent to move forward with plans for anaerobic digestion (AD) on-site. If this is infeasible, an alternative AD facility and/or composting facility should be considered for the project's organic waste. **DEP 26**

As the lead state agencies responsible for helping the Commonwealth achieve its waste diversion goals, MassDEP and EEA have strongly supported voluntary initiatives by the private sector to institutionalize source reduction and recycling into their operations. Adapting the design, infrastructure, and contractual requirements necessary to incorporate reduction, recycling and recycled products into existing large-scale developments has presented significant challenges to recycling proponents. Integrating those components into developments such as the Caesars Resort at Suffolk Downs project at the planning and design stage enable the project's management and occupants to establish and maintain effective waste diversion programs. For example, facilities with minimal obstructions to trash receptacles and easy access to main recycling areas and trash chutes allow for implementation of recycling programs and have been proven to reduce cleaning costs by 20 percent to 50 percent. Other designs that provide sufficient space and electrical services will support consolidating and compacting recyclable material and truck access for recycling material collection.

By incorporating recycling and source reduction into the design, the proponent has the opportunity to join a national movement toward sustainable design. Sustainable design was endorsed in 1993 by the American Institute of Architects with the signing of its *Declaration of*

Interdependence for a Sustainable Future. The project proponent should be aware there are several organizations that provide additional information and technical assistance, including Recycling Works in Massachusetts, the Chelsea Center for Recycling and Economic Development, and MassRecycle.

Massachusetts Contingency Plan/M.G.L. c.21E

Contaminated Soil and Groundwater: The ENF has identified 1 contamination sites assigned to release tracking numbers, including: RTN 3-14857 (RAO B-1). The project proponent is advised that excavating, removing and/or disposing of contaminated soil, pumping of contaminated groundwater, or working in contaminated media must be done under the provisions of MGL c.21E (and, potentially, c.21C) and OSHA. If permits and approvals under these provisions are not obtained beforehand, considerable delays in the project can occur. The project proponent cannot manage contaminated media without prior submittal of appropriate plans to MassDEP, which describe the proposed contaminated soil and groundwater handling and disposal approach, and health and safety precautions. Because contamination at the site is known or suspected, the appropriate tests should be conducted well in advance of the start of construction and professional environmental consulting services should be readily available to provide technical guidance to facilitate any necessary permits. If dewatering activities are to occur at a site with contaminated groundwater, or in proximity to contaminated groundwater where dewatering can draw in the contamination, a plan must be in place to properly manage the groundwater and ensure site conditions are not exacerbated by these activities. Dust and/or vapor monitoring and controls are often necessary for large-scale projects in contaminated areas. The need to conduct real-time air monitoring for contaminated dust and to implement dust suppression must be determined prior to excavation of soils, especially those contaminated with compounds such as metals and PCBs. An evaluation of contaminant concentrations in soil should be completed to determine the concentration of contaminated dust that could pose a risk to health of on-site workers and nearby human receptors. If this dust concentration, or action level, is reached during excavation, dust suppression should be implemented as needed, or earthwork should be halted. **DEP 27** **DEP 28** **DEP 29**

Potential Indoor Air Impacts: Parties constructing and/or renovating buildings in contaminated areas should consider whether chemical or petroleum vapors in subsurface soils and/or groundwater could impact the indoor air quality of the buildings. All relevant site data, such as contaminant concentrations in soil and groundwater, depth to groundwater, and soil gas concentrations should be evaluated to determine the potential for indoor air impacts to existing or proposed building structures. Particular attention should be paid to the vapor intrusion pathway for sites with elevated levels of chlorinated volatile organic compounds such as tetrachloroethylene (PCE) and trichloroethylene (TCE). MassDEP has additional information about the vapor intrusion pathway on its website at http://www.mass.gov/dep/cleanup/laws/vifs.htm. **DEP 30**

New Structures and Utilities: Construction activities conducted at a disposal site shall not prevent or impede the implementation of likely assessment or remedial response actions at the site. Construction of structures at a contaminated site may be conducted as a Release Abatement Measure if assessment and remedial activities prescribed at 310 CMR 40.0442(3) are completed within and adjacent to the footprint of the proposed structure prior to or concurrent

with the construction activities. Excavation of contaminated soils to construct clean utility corridors should be conducted for all new utility installations.

The MassDEP appreciates the opportunity to comment on this proposed project. Please contact Jerome.Grafe@state.ma.us at (617) 292-5708 for mobile source air quality impacts, Rachel.Freed@state.ma.us at (978) 694-3258 Kevin.Brander@state.ma.us at (978) 694-3236 for further information on the wastewater issues, James.Belsky@state.ma.us, at (978) 694-3288 for issues relating to air quality plan approval, and Alex.Strysky@state.ma.us at (617) 292-5616 for issues relating to the Chapter 91, waterways license. If you have any general questions regarding these comments, please contact Nancy.Baker@state.ma.us, MEPA Review Coordinator at (978) 694-3338.

Sincerely,

John D. Viola
Deputy Regional Director

cc: Brona Simon, Massachusetts Historical Commission
Jerome Grafe, Alex Strysky, MassDEP-Boston
Eric Worrall, Susan Ruch, Kevin Brander, Rachel Freed, Heidi Davis, Jim Belsky, Jill Provencal, MassDEP-NERO
City of Boston, Conservation Commission
City of Revere, Conservation Commission
Marianne Connolly, MWRA
John E. Sullivan, P.E. BWSC

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION

DEP 01 **The wastewater flow generation estimation should be expanded from the information provided in the ENF. Wherever possible, the flow generation numbers noted in 314 CMR 7.15 or 310 CMR 15.203(2) – (5) should be used as design flows. In this regard, the estimate for theatre seats should be five gpd/seat and not three gpd/seat, as noted in the ENF. Flows from existing areas which are to remain may be estimated using existing water meter data. Future flows which are not encompassed in the regulations cited above should be based on best engineering judgment, and typically can be determined utilizing 200 percent of the average daily flows using actual data from similar facilities. The method used to produce flow estimates must be detailed in the DEIR.**

Revised wastewater calculations, consistent with 310 CMR 15, are provided in Section 9.1, which also describes the methodology used to calculate the Resort's estimated wastewater generation.

DEP 02 **Given the scope and impacts of the proposed Project, and the need for I/I mitigation, the Proponent should arrange to meet with MassDEP and the cities of Boston and Revere to develop a plan to meet the mitigation requirements of the MassDEP I/I Policy.**

The Proponent has been coordinating with BWSC regarding mitigation for I/I. The entire wastewater collection system for the Project site will be replaced with a new wastewater collection and conveyance system, thereby reducing I/I to the maximum extent practicable (see Section 9.1). The Proponent will also confer with MassDEP and the City of Revere regarding I/I.

DEP 03 **MassDEP requests a description of the wetland resources onsite and off-site where Project-related work or mitigation is proposed. The DEIR should quantify the extent of unavoidable wetland alteration, including both temporary and permanent impacts. Plans at a readable scale should show the boundaries of all wetland resource areas and areas to be altered. The proposal also should explain how the Project will comply with the applicable performance standards as required in the wetlands regulations and demonstrate that wetland alteration has been avoided and minimized to the extent feasible through preparation of an alternatives analysis (see 310 CMR 10.55(4)). Where opportunities exist, revised site designs should be considered in order to avoid and minimize wetland impacts. The proposal should include plans depicting and quantifying wetlands replication areas and information on how altered wetland functions will be restored.**

On-site wetland resource areas delineated by Epsilon Associates, Inc. are described in Section 6.9.1. A more detailed description can be found in Attachment I. Off-site wetland resource areas evaluated by Vanasse Hangen Brustlin Inc. are described in Section 6.9.2.

The proposed alterations to RFA and BLSF on the Project site are described and quantified in Section 6.9.1. No other alterations to wetland resource areas on the Project site are proposed, including but not limited to BVW, Inland Bank, or LUW. Information demonstrating compliance with the applicable performance standards and measures designed to avoid or minimize wetland resource area impacts is provided in Section 6.9.

As described in Section 6.9.2 some of the off-site transportation improvement activities will occur in LSCSF and within RFA. Depending on feedback from MassDOT and pending final design, work along Lee Burbank Highway (Route 1A) could entail alteration of Salt Marsh and Coastal Bank. Section 6.9 contains additional detail on estimated and worst-case scenario alterations of off-site wetland resource areas as well as information demonstrating compliance with WPA regulations.

DEP 04 **According to the ENF, the Project will fill 480,000 square feet of BLSF, and this loss will be compensated with 140,000 cubic feet of compensatory flood storage. The areas of impact and compensation will need to be shown on plans at a readable scale ... In addition, off-site work relating to the Project would alter 40,000 square feet of LSCSF. This area also needs to be shown on the Project plans. MassDEP also requests a full description of this floodplain area and an explanation for classifying this area as LSCSF, rather than BLSF.**

Since the filing of the ENF, the proposed site plans have been refined and alterations to BLSF have been updated; approximately 615,000 square feet of BLSF will be altered on the Project site (see Section 6.9.1.2). As demonstrated in Section 6.9.1, compensatory flood storage will be provided for all flood storage volume that will be permanently lost as a result of the Project. The volume will be created in an area not previously used for flood storage and will be incrementally equal to the theoretical volume of flood water lost at each elevation, up to and including the 100-year flood elevation, which will be displaced by the Project.

With regard to off-site activities proposed in LSCSF that does not require compensatory flood storage, Table-6-35 and Section 6.9.2 provides detailed resource area impacts.

DEP 05 MassDEP strongly encourages the Proponent to evaluate stormwater management designs in the DEIR that fully comply with the stormwater management regulations' performance standards in order to protect the [Rumney Marshes] ACEC and conform to the goals established in the pathogen [TMDL].

The Project has been designed to meet MassDEP Stormwater Management Guidelines to the maximum extent practicable. Wherever practicable, the Project design meets the Standards. The Project design will ensure improvements in the quality and quantity of discharges to the Rumney Marshes ACEC, and the use of LID stormwater techniques will improve water quality by reducing pathogens, bacteria, phosphorus, and nitrogen in stormwater runoff (see Section 9.3).

DEP 06 The DEIR should demonstrate that the Project's water quality and quantity impacts would be controlled with BMPs to comply with stormwater management regulations standards and for consistency with the applicable Storm Water Programs under the NPDES Phase I and Phase II Stormwater General Permits for MassDOT and the cities of Boston and Revere... As there is a *Draft Pathogen TMDL for the Boston Harbor Watershed (excluding the Neponset River sub-basin)* for impaired and non-impaired Waterbodies in the vicinity of the Project site, the stormwater management study should consider how stormwater controls conform to the TMDL and associated implementation strategies established for pathogens... The DEIR should present a thoughtful analysis of the effectiveness of the stormwater management system in controlling the recognized water quality impairments, particularly pathogens, taking into consideration pollution prevention, source control, BMPs, and system maintenance.

The Project is being designed to be consistent with the NPDES Phase I and Phase II programs as well as the Draft Pathogen TMDL for Boston Harbor. The Project design incorporates LID drainage design measures that will improve water quality by reducing pathogens, bacteria, phosphorus, and nitrogen in stormwater runoff (see Section 9.3).

DEP 07 Stormwater runoff impacts during construction and post-construction will need to be evaluated in the DEIR, including off-site transportation mitigation and sewer-related work. It is anticipated that the stormwater management report will be sufficiently detailed to demonstrate that source controls, pollution prevention measures, erosion and sediment controls, and the post-development drainage system will be designed in compliance with the MassDEP stormwater management regulations, pursuant to 310 CMR 10.05(6)(k) and all applicable performance standards, including Standard 6 for Critical Areas such as ACECs...

Section 9.3 and the Stormwater Management Report address source controls, pollution prevention measures, erosion and sedimentation controls, and compliance with Stormwater Management Regulations.

DEP 08 **The DEIR should also demonstrate that source controls, pollution prevention measures, erosion and sediment controls during construction, and the post-development drainage system will be designed to comply with the stormwater management regulations and standards for water quality and quantity impacts and for consistency with the Storm Water Programs identified previously. Calculations, stormwater system design plans at a readable scale, BMP designs, and supporting information should demonstrate that the stormwater system design protects wetland resources in conformance with the stormwater regulations and NPDES permits.**

Attachment F contains a comprehensive drainage report that describes the proposed drainage system and its compliance with Stormwater Management Guidelines in detail. This report includes drainage area plans and calculations as well as a draft SWPPP. Section 9.3 describes stormwater management.

DEP 09 **The current Project layout reduces imperviousness by about nine acres... This Project is also suitable for other LID stormwater control strategies and practices. For example, flat-roof buildings could be vegetated as green roofs, and pervious pavement could be used for low-intensity parking areas and sidewalks on site. There also may be an opportunity to add raingardens/bioretention areas and tree box filters for enhanced stormwater infiltration in open space and landscaped strips.**

LID drainage BMPs are incorporated into the Project design to the maximum extent practicable. These measures include bioretention basins, biofiltration swales, pervious pavers in select plaza and pedestrian areas, and rainwater harvesting tanks (see Section 9.3).

DEP 10 **The goal for this Project is the USGBC's LEED Gold rating. The Project will need to comply with the City of Boston's Article 37 Zoning Ordinance and the applicable Stretch Building Code, which is being revised and expected to take effect either this year or 2014. It is anticipated that the DEIR will describe the design measures that will be adopted to achieve at least these standards, in addition to providing a full analysis of mobile and stationary sources of GHG emissions.**

The Project's status with respect to LEED and Article 37 are described in Section 2.2. The Stretch Code and related design measures that will result in compliance are addressed in Sections 7.2 and 7.3.1. Mobile source GHG analysis is presented in Section 7.5.

DEP 11 **The [MEPA Greenhouse Gas Emissions Policy and Protocol] allows the Proponent to select a model; however, MassDEP and DOER recommend using EQUEST for stationary source modeling.**

Building energy modeling is described in Section 7.3.

DEP 12 The DEIR should include the modeling printout for at least three scenarios: base case, preferred alternative case, and preferred alternative with greater GHG mitigation case. In addition the DEIR should include emission tables that compare base case emissions in tons with the mitigation alternatives showing the reduction in tons and percentage by emissions source, direct, indirect and transportation.

MassDEP is referring to an older version of the MEPA GHG Emissions Policy; the current (May 2010) version requires only two cases. Nevertheless, various individual mitigation measures are addressed in Section 7.0. Building energy model results and GHG emissions are presented in Section 7.3.

DEP 13 The DEIR should explain, in reasonable detail, any measure not selected that has the potential to significantly reduce GHG emissions... MassDEP encourages the Proponent to adopt cutting-edge energy efficient designs and equipment wherever feasible, taking into consideration that energy efficient designs yield cost-savings over time.

Mitigation measures that have not been adopted into the current Project design are nonetheless discussed in Section 7.4.

DEP 14 The DEIR should lay out information and plans to understand the feasibility of incorporating renewable energy into the Project design. Should a renewable energy option be infeasible, it is requested that the DEIR provide an explanation and a thoughtful discussion of the changes that would be needed for reconsideration of that alternative.

Section 7.2 includes a discussion of renewable energy technology included in the design. Section 7.4 presents the rationale for not using other renewable technologies.

DEP 15 MassDEP is very supportive of CHP for this Project... As the Proponent proceeds with the technical and economic feasibility evaluation, it may be helpful to consult the CHP Partnership, an organization that assists with the design process and to identify financing options and other services that can be accessed through the USEPA website: http://www.epa.gov/chp.

CHP is discussed in the context of the GHG analysis in Sections 7.2 and 7.4.

DEP 16 MassDEP supports the Proponent's efforts to evaluate anaerobic digestion as an energy source for this Project and requests that the DEIR describe and provide plans for an anaerobic digestion system, or alternative anaerobic digestion systems that would utilize available resources to meet the Project's energy needs. The potential for GHG emissions reductions from an alternative fuel should be considered in the DEIR... In addition, with respect to any proposed anaerobic digestion component of

the Project, the DEIR should discuss the applicability of MassDEP's regulations promulgated in November 2012 for the purpose of building capacity for managing organic materials (310 CMR 16.00, 310 CMR 19.00 & 314 CMR 12.00).

Anaerobic digestion is discussed in the context of the GHG analysis in Section 7.2.8.3.

DEP 17 In the event that an anaerobic digestion system is found to be infeasible for the Project, MassDEP requests that the DEIR provide an organics management plan for the Project.

Organics management is discussed in Section 2.2.4 and, in the context of the feasibility of composting or of an anaerobic digestion system, in the GHG analysis in Section 7.2.8.3 and 7.4.3.8.

DEP 18 It is anticipated that the final, new vehicle trip project will exceed MassDEP's review threshold of 3,000 daily trips for mixed use development, requiring an air quality mesoscale analysis of Project-related emissions... The analysis must compare the indirect emissions from transportation sources under future No Build, Build, and Build with Mitigation conditions. Subsequent environmental filings should include the results of the mesoscale analysis for VOC, NOx, and CO2 emissions under these conditions.

The methodology and results of the mesoscale analysis are presented in Sections 6.5.4.1 and 6.5.5.1, respectively.

DEP 19 MassDEP recommends that the Proponent exploit the potential of this transit-rich location by promoting transit service to the Project site from neighboring communities, Logan Airport, Downtown, and the Seaport District. Accordingly, the DEIR should explore all reasonable opportunities for trip reduction and management tailored to the specific needs of employees and patrons with particular emphasis on transit connections as well as bicycle and pedestrian infrastructure and amenities.

Section 5.8 presents an analysis and discussion of alternate modes to vehicle travel for patrons and employees, including an HOV Shuttle plan. The TDM program presented in Section 5.9 presents a comprehensive package of trip reduction strategies and incentives to promote alternative transportation modes.

DEP 20 MassDEP recommends that the Proponent consider the following three actions:

- Work closely with the MBTA to consider adding an on-site bus stop for the Express Bus Routes 424, 434, 448, and 449 for increased transit service to the site.

- Maintain the existing Suffolk Downs shuttle service to adjacent Blue Line stations and expand the shuttle service as necessary to accommodate additional Blue Line ridership to the Project site.
- Offer active support for any future consideration to expand the Silver Line into East Boston and Chelsea. Should the Hubway bike share program expand into East Boston, MassDEP recommends the Proponent support an on-site docking station.

The Proponent has committed to providing an MBTA bus stop on-site should the MBTA wish to route bus service through the Project site. The Proponent has also committed to enhancing the existing shuttle service between Suffolk Downs Station and Resort lobbies. The Proponent will continue to develop and refine transit options in coordination with the MBTA. The Proponent has committed to providing two Hubway stations when the City of Boston expands the Hubway program to include East Boston.

DEP 21 MassDEP recommends that the DEIR contain a greater emphasis on TDM and mitigation measures to reduce Project-related emissions, such as:

- Provide market incentives that encourage patrons to seek travel by charter bus service rather than private automobile.
- Charge market price for parking spaces used by SOV drivers. Proponents can charge a fee to those who drive alone, while keeping parking free for bus, transit, carpool or vanpool.
- Offer parking cash-out incentives to employees whose parking is provided. This strategy encourages employers/tenants to provide employees with an option for compensation for not utilizing dedicated parking spaces, thus encouraging employees to seek alternative modes of transportation such as walking, biking, carpooling, or taking public transit to work.
- Provide expanded private shuttle service to transit connections for both employees and patrons.
- Improve expanded private shuttle service to transit connections for both employees and patrons.
- Improve proposed bicycle parking by providing short and long-term accommodations, as appropriate, for Project employees and patrons. Bicycle parking should be secure, convenient, weather-protected, and sufficient to meet demand.
- Work with Boston officials to support and fund, as necessary, off-site improved bicycle access to the Project site, including the use of the most recent MassDOT Design Guidelines or engineering judgment, as appropriate.

- Offer Alternative Work Schedules to all employees as well as staggered work shifts, where appropriate, to reduce peak period traffic volumes.
- Provide Direct Deposit for employees.
- Participate in the USEPA SmartWay Transport Program. SmartWay is a voluntary program that increases energy efficiency and reduces GHG emissions.
- Provide Guaranteed Ride Home to those employees who regularly commute by transit, bicycle, or vanpool to the site and who have to leave work in the event of a family emergency or leave work late due to unscheduled overtime.
- Establish infrastructure that provides publicly available electric vehicle charging facilities.
- Provide electronic signage displaying shuttle and transit schedule information.
- Dedicate space for Car Sharing/Bike Sharing. The Proponent should dedicate a minimum of two car sharing spaces in the proposed garage. MassDEP recommends the Proponent provide support and dedicated space for bike sharing on site as this concept expands into the area.
- Hire an Employee Transportation Coordinator to administer the parking management program. A coordinator can act as a point of contact for the various tenants within a given development, help enforce the parking requirements, and carry out any other day-to-day tasks and strategies from the rest of the list above.
- Unbundle hotel guest parking fees from accommodation rates, thus encouraging alternative travel mode choice.
- Provide preferential and free parking for guests using carpools.
- Explore shared parking opportunities to take advantage of the varying parking demand periods of nearby facilities.

A comprehensive TDM plan is presented in Section 5.9.

DEP 22 MassDEP recommends that the Proponent work with its staff to implement construction-period diesel emission mitigation, which could include the installation of after-engine emission controls such as oxidation catalysts or diesel particulate filters, or the use of construction equipment that meet Tier 3 or Tier 4 emission standards for non-road construction equipment... In addition, Project contractor(s) are required to use ultra low sulfur diesel (ULSD) fuel in their off-road construction equipment in conjunction with after-engine emission controls.

Construction air quality, including the mitigation of diesel emissions, is discussed in the Draft CMP in Attachment L.

DEP 23 **The DEIR should address how the Project will ensure compliance with the [Massachusetts Idling] regulation (310 CMR 7.11), [which prohibits motor vehicles from idling their engines more than five minutes unless the idling is necessary to service the vehicle or to operate engine-assisted power equipment (such as refrigeration units) or other associated power].**

Idling during construction is discussed in the Draft CMP in Attachment L.

DEP 24 **The demolition activity must also conform to current Massachusetts Air Pollution Control regulations governing nuisance conditions at 310 CMR 7.01, 7.09 and 7.10. As such, the Proponent should proposed measures to alleviate dust, noise, and odor nuisance conditions.**

Mitigation measures proposed to alleviate dust, noise, and odor during construction are described in the Draft CMP in Attachment L.

DEP 25 **In addition to paper, glass, plastics, waste oil, and cardboard, MassDEP would appreciate and encourage a commitment to innovative recycling of the waste stream, characteristic of a resort casino, such as is being done with gently-used soap and personal care products.**

Solid waste and recycling are discussed in Section 2.2.4.

DEP 26 **In revising the Solid Waste Master Plan, MassDEP is advancing a goal to divert 450,000 tons of food waste from landfills and incinerators by 2020. In the future, large-scale food waste generators, which may include Caesars Resort, will be banned from landfilling or incinerating food waste. Therefore, MassDEP strongly encourages the Proponent to move forward with plans for anaerobic digestion on-site. If this is infeasible, an alternative anaerobic digestion facility and/or composting facility should be considered for the Project's organic waste.**

Use of off-site anaerobic digestion and composting facilities is described in Section 7.2.8.3.

DEP 27 **The ENF has identified 1 contamination site assigned to a release tracking number: RTN 3-14857 (RAO B-1)… Because contamination at the site is known or suspected, the appropriate tests should be conducted well in advance of the start of construction and professional environmental consulting services should be readily available to provide technical guidance to facilitate any necessary permits.**

The regulatory status of the site and the status of reportable conditions associated with this RTN are discussed in Section 6.11.1.

DEP 28 If dewatering activities are to occur at a site with contaminated groundwater, or in proximity to contaminated groundwater where dewatering can draw in the contamination, a plan must be in place to properly manage the groundwater and ensure site conditions are not exacerbated by these activities.

Construction-period dewatering is discussed in the Draft CMP in Attachment L.

DEP 29 The need to conduct real-time air monitoring for contaminated dust and to implement dust suppression must be determined prior to excavation of soils, especially those contaminated with compounds such as metals and PCBs. An evaluation of contamination concentrations in soil should be completed to determine the concentration of contaminated dust that could pose a risk to health of on-site workers and nearby human receptors. If this dust concentration, or action level, is reached during excavation, dust suppression should be implemented as needed, or earthwork should be halted.

Construction-period air quality, including potential dust impacts and measures proposed to mitigate those impacts, is addressed in the Draft CMP in Attachment L.

DEP 30 Parties constructing and/or renovating buildings in contaminated areas should consider whether chemical or petroleum vapors in subsurface soils and/or groundwater could impact the indoor air quality of the buildings.

Potential vapor intrusion is discussed in Section 6.11.4.

Deval L. Patrick, Governor
Timothy P. Murray, Lt. Governor
Richard A. Davey, Secretary & CEO

massDOT
Massachusetts Department of Transportation

March 26, 2013

Richard K. Sullivan, Jr., Secretary
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114-2150

RE: Boston/Revere – Caesars Resort at Suffolk Downs – ENF
(EEA #15006)

ATTN: MEPA Unit
Deirdre Buckley

Dear Secretary Sullivan:

On behalf of the Massachusetts Department of Transportation, I am submitting comments regarding the Caesars Resort at Suffolk Downs project in Boston and Revere, as prepared by the Office of Transportation Planning. If you have any questions regarding these comments, please call J. Lionel Lucien, P.E., Manager of the Public/Private Development Unit, at (857) 368-8862.

Sincerely,

David J. Mohler
Executive Director
Office of Transportation Planning

DJM/jll

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cc: Francis A. DePaola, P.E., Administrator, Highway Division
Dr. Beverly A. Scott, Administrator, Rail & Transit
Christopher Willenborg, Administrator, Aeronautics
James Doolin, Chief Development Officer, Massport
Thomas Timlin, Commissioner, City of Boston
Thomas F. Broderick, P.E., Chief Engineer, Highway Division
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Mark Boyle, Assistant General Manager, MBTA
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Katie Servis, Airport Planner, Aeronautics
Stanley Wood, P.E., Highway Design Engineer
Neil Boudreau, State Traffic Engineer
Boston Region Metropolitan Planning Organization
Planning Department, City of Boston
Planning Department, City of Revere
Kristin Slaton, Director, MassRIDES
PPDU files
MPO Activities files

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TRANSPORTATION
OFFICE OF TRANSPORTATION PLANNING
MEMORANDUM

TO: David J. Mohler, Executive Director
Office of Transportation Planning

FROM: J. Lionel Lucien, P.E., Manager
Public/Private Development Unit

DATE: March 26, 2013

RE: Boston/Revere – Caesars Resort at Suffolk Downs – ENF
(EEA #15006)

The Office of Transportation Planning has reviewed the Environmental Notification Form (ENF) for the Caesars Resort at Suffolk Downs project in East Boston and Revere. The proposed project entails the redevelopment of the existing Suffolk Downs thoroughbred racetrack facility located along Route 1A on approximately 161 acres currently zoned as Economic Development Area (EDA). Upon completion, the project is proposed to include:

- An approximately 300-room hotel and an approximately 150-room hotel;
- Multipurpose meeting/entertainment space;
- Approximately 16 restaurants including fine dining, casual restaurants, and a marketplace/food court;
- Approximately 200,000 square feet of gaming space containing 4,000-5,000 slot machines, 200 table games, and a World Series of Poker room;
- Approximately 30,000 square feet of retail;
- A Central Utility Plant; and
- Approximately 2,600-space, seven-story parking garage; one level of underground valet parking for approximately 450 cars; and approximately 2,100 surface parking spaces (total of 5,150 spaces).

The project also involves continuing operations at the racetrack, as well as ongoing maintenance in the existing horse barn area, which will include replacing or improving horse barns as necessary. The project site comprises approximately 116 acres of land located within the City of Boston and 45 acres located in the City of Revere. The project is bounded to the west by a retail shopping plaza, properties containing fuel storage tanks owned by Irving Oil Terminals Inc. and by Global Petroleum, and Route 1A; to the north by Winthrop Avenue; to the east by the Massachusetts Bay Transportation Authority (MBTA) Blue Line and Bennington Street; and to the south by Waldemar Avenue. Based on information included in the ENF, the project at full build is expected

to generate approximately 24,600 new vehicle trips, for a total of 40,500 vehicle trips on an average weekday. The project is categorically included for the preparation of an Environmental Impact Report (EIR). The project requires a Vehicular Access Permit because of revised site access and roadway improvements proposed along Route 1A to mitigate the project's traffic impacts.

The ENF includes a general description of the existing Suffolk Downs Racetrack as well as the proposed redevelopment of the site into a destination resort casino. It also discusses the existing conditions and potential future conditions with and without the proposed project. Based on the expected trip generation for the project, the development plan for the project at full build would have significant impacts on the nearby transportation system. The ENF has identified a range of potential transportation improvements that, according to the proponent, would address existing local and regional transportation problems in the area, and would minimize the potential negative impacts of the project. These include both multimodal physical infrastructure improvements and non-physical improvements, such as a proposed TDM program designed to reduce single-occupant vehicle (SOV) travel and encourage the use of non-SOV travel modes.

The information presented in the ENF is generally limited to the description of the project, the existing and future conditions, and the potential mitigation. The information is adequate to enable the preparation of a scope for a transportation study for the project. Therefore, the DEIR should include a transportation study prepared in conformance with EOEEA/MassDOT Guidelines for Transportation Impact Assessments. The study should include a comprehensive assessment of the transportation impacts of the project based on a thorough analysis of existing conditions, future No-Build conditions, and future Build conditions. The study should take into account the regional context of the project and provide a comprehensive, integrated multimodal mitigation package that would allow the maximum possible use of non-SOV travel modes by both employees and customers. **DOT 01**

MassDOT strongly encourages the proponent to provide similar focus to both physical- and non-physical improvements and to seek creative solutions that would encourage both patrons and employees to reduce SOV traffic. **DOT 02**

Regional Context

Based on the nature of the land use, the trip generation for the project is expected to be drawn from a wide area of eastern Massachusetts and beyond into neighboring states. A preliminary analysis of casino demand presented by the proponent, which is based on Caesar Entertainment's model for potential casino patrons, seems to support that assumption. In keeping with this analysis, the project should be evaluated based on its regional nature and the key elements of the transportation system that casino patrons are expected use.

The DEIR should also provide a comprehensive evaluation of the travel characteristics of the casino patrons. **DOT 03** The proposed site is located within an urban setting, which provides many access options. The project abuts Route 1A, which is a major commuter route and provides connections to downtown Boston, the regional highway network, and to points north of the Boston core. The project site is also located along the MBTA Blue Line and in close proximity to several MBTA bus routes. Several designated bicycle routes are also close to the site and connect to adjacent neighborhoods. The site also connects to the urban fabric of the East Boston neighborhood, and provides the opportunity for direct pedestrian connections.

Generally, the availability and costs of different modes of transportation are two important factors that influence urban travel and trip patterns. The location of the site provides the opportunity to develop a comprehensive multimodal access and mitigation plan based on a thorough analysis of existing and future conditions. Through the mitigation program, the proponent should seek every opportunity to influence the mode choice of both casino patrons and employees in order to improve overall mobility in the vicinity of the site. **DOT 04**

Trip Generation

According to the ENF, the trip generation estimates for the project will be based on research data for other comparable projects, and on information from proprietary data for existing gaming venues and projected data for its proposed operations at Suffolk Downs. As indicated in the ENF, the Institute of Transportation Engineers (ITE) Trip Generation Manual does not contain trip generation factors for this type of facility. The DEIR should present a comprehensive analysis of the research and proprietary data cited above, and should provide the background documentation justifying the selection of the variable(s) used to estimate project trip generation. **DOT 05**

Consistent with MassDOT's analysis of other casino projects currently under review, the number of gaming positions seems to be the most appropriate variable in estimating the trip generation for casino facilities. The DEIR should provide information on the size, geographic location, and traffic volumes of the comparable sites that is sufficient to establish a correlation between the number of gaming positions and trip generation. Based on this information, the DEIR should provide a temporal distribution of traffic over a full one-week period, which would help determine the peak hours of casino traffic. This information would help identify the most critical peak analysis periods, which should consist of the highest combination of existing roadway volumes and project site trips. The DEIR traffic analysis should be based on these critical peak hour periods.

The DEIR should include all back-up data used to arrive at any trip generation in order to corroborate any assumptions included in the DEIR. The project proponent should present a trip generation discussion with an employee demand distribution based on the nature of work shifts. The proponent should evaluate the impacts of instituting different shift schedules around the availability of transit services in order to maximize transit usage by employees. **DOT 06**

Transit Demand and Mode Split

As described above, the MBTA currently operates extensive rapid transit and bus service to the site, as well as other services in the general vicinity of the project site. The DEIR should include an analysis of what additional transit demand would be generated by the project. As noted above and in the ENF, the Institute of Transportation Engineers (ITE) Trip Generation Manual does not contain trip generation factors for a facility of this type and size located in an urban setting. Moreover, similar resort and gaming facilities around the country may be of limited comparison since there are few, if any, similar facilities in the country that are as close to a rapid transit network as this location. While the proximity of transit provides an excellent opportunity for a high level of transit usage, MassDOT anticipates that it will be a challenge to adequately model the transit trip generation and trip assignments for the project. As a result, the proponent should work closely with the MassDOT Office of Transportation Planning and the MBTA Service Planning Department to develop appropriate and reasonable travel demand and trip generation characteristics. The DEIR should then present not just the **DOT 07**

results of that analysis, but a full and complete presentation on how those trip generation estimates and trip assignment rates were developed, and what research was done to support these rates.

Trip Distribution

The trip distribution for the project should be based on a gravity model or similar model to apply a spatial distribution onto the trip generation estimates in order to determine the origin-destination patterns of the casino trips in the study area. Additional factors such as population, travel time, and distance should be considered in the model to determine trip characteristics for casino patrons and employees. The DEIR should provide all appropriate documentation to verify how the different percentages are calculated and assigned to the roadway network and the transit system. In addition, the model should be able to consider other casino proposals in Massachusetts that could impact the trip distribution for this project. **DOT 08**

Once the trip generation estimates, the modal split assumptions, the trip distribution, and the trip assignment are developed, network maps of the study area should be created for the different peak-hour analyses and the different modes. **DOT 09**

Study Area

The proposed casino development is expected to add significant traffic in the surrounding communities of Chelsea, Revere, and within the City of Boston. As indicated in the ENF, the project is surrounded by a regional roadway network that includes Route 1A to the west, Route 145 (Revere Beach Parkway/Winthrop Avenue) to the north, Bennington Street to the east, and Waldemar Avenue to the south. In addition, the study area roadway network (in particular Route 1A) provides connections to the nearby interstate highway system and metropolitan highway system, which include the eastern terminus of I-90 (Massachusetts Turnpike), the Ted Williams Tunnel (TWT), the Sumner Tunnel, the Callahan Tunnel, and I-93.

The ENF has proposed a study area that includes locations within the Cities of Revere, Chelsea, and Boston. The study area includes a number of signalized and unsignalized intersections, three roundabouts/rotaries (Elliot, Butler, and Brown Circles), and the Route 1/Route 16 interchange that includes ramps and highway merges/diverges.

In addition to the locations proposed in the ENF, MassDOT recommends that the following locations and roadway segments be included in the study area: **DOT 10**

- The Route 60/Charger Street intersection;
- The Route 60/Sigourney Street intersection;
- The Route 1/Copeland Circle interchange (including the rotary and adjacent segments, as well as their associated impacts to the through-traffic on Route 1 between Route 60 and Route 99);
- The Ted Williams Tunnel;
- The Callahan Tunnel; and
- The Sumner Tunnel.

Horizon Year

Generally, MassDOT requires that a 7-year horizon be used to evaluate traffic impacts for most private development projects. Given the nature of the proposed land use, the location of the project, and the transportation infrastructure that may be impacted, MassDOT requires that a 10-year horizon (2022) be used for the traffic study, and that a 20-year design horizon be used for the proposed infrastructure improvements. This would allow for all the phases of the project to be completed and reach full occupancy; it would also enable MassDOT to adequately evaluate the effectiveness of the transportation system improvements and the TDM program. **DOT 11**

Traffic Volumes

The ENF has identified a comprehensive data collection program to evaluate existing and future traffic conditions. The data collection program consists of Automatic Traffic Recorder (ATR) counts and Turning Movement Counts (TMC) to measure the existing volumes on the roadway network at a number of locations in the study area. The ENF indicates that some of these counts were performed in 2010 and repeated in 2012. It is not clear whether the repeated counts were done for all of the locations within the study area. The proponent should be aware that 2010 counts will not be acceptable for use in the DEIR traffic analysis unless reviewed and approved by MassDOT. No counts taken prior to 2010 will be acceptable. **DOT 12**

The ENF includes a traffic volume summary table that indicates daily, evening peak hour, and afternoon peak hour traffic volumes for a typical weekday (Monday – Thursday), Friday, and Saturday for a number of roadway segments within the study area. The DEIR should provide a similar table that shows the increase in traffic volume on these roadway segments for the future No-Build and future Build conditions once the trip generation and distribution have been validated and approved by MassDOT. **DOT 13**

This table should include the Ted Williams Tunnel, Sumner Tunnel, and Callahan Tunnel in order to demonstrate existing daily volumes and peak characteristics. These facilities currently provide access to Logan International Airport, and it is critical that they continue to operate at acceptable levels of service. There may be three different traffic demand peak hours within the study area: the peak hour of the general traffic/tunnel facilities; the peak hour of Logan International Airport; and the peak hour of the resort casino. These three peak hours are likely to fall close together on Friday night, and the project-related traffic could result in an extended peak (Friday 5-8 PM) period of very high congestion levels in the tunnels. Thus, it is essential that the DEIR provide the necessary information and analysis for these tunnels in order to evaluate appropriate mitigation measures, if any, to minimize traffic impacts on these facilities. The proponent should work closely with the MassDOT Highway Division and Massport to obtain the latest ATR volumes for these facilities, in addition to other traffic counts that may be required to conduct the necessary analysis. **DOT 14**

Traffic Operations

The DEIR should present capacity analyses and a summary of average and 95th percentile vehicle queues for each intersection within the study area. The DEIR should also present a merge and diverge for each ramp junction, and weaving analysis for all the interchanges located in the study area. Any proposed traffic signal along Route 1A or at other locations must include a traffic signal warrant analysis conducted according to the Manual of Uniform Traffic Control Devices **DOT 15** **DOT 16**

(MUTCD). The DEIR should ensure that any proposed mitigation is compatible with future long-term transportation improvements under consideration by MassDOT for this area.

In addition, the proponent should provide a roadway segment analysis for the three harbor tunnel locations based on the latest methodology of the Highway Capacity Manual or appropriate traffic software analysis approved by MassDOT. This information is critical for MassDOT to evaluate the impacts of the project on these facilities and to help identify physical and/or non-physical mitigation measures to lessen the impacts associated with the project. **DOT 17**

The DEIR should present the performance measures of these analyses in a summary format that would allow comparisons of Existing, Future No-Build, and Future Build conditions with mitigation for all peak-hour conditions. Where appropriate, the DEIR should discuss how the proposed system improvements and impacts to one mode can be measured relative to the improvements and impacts of the other modes. **DOT 18**

Pedestrian Access

The ENF indicates that the project would provide pedestrian accommodations on site with appropriate connectivity to the off-site pedestrian network in the area. The DEIR should provide a thorough inventory of all existing, planned, and proposed services, facilities, and routes for accessing the site. It should also provide an evaluation of the network to include pavement conditions, sidewalk widths, crosswalks, compliance with current accessibility standards, and existing pedestrian volumes and movements. The proponent should develop the site plan to ensure that the project is as open to pedestrians, and to the neighborhood, and as permeable along all edges, as possible. **DOT 19**

Bike Access

The ENF also proposes improvements to the existing bicycle network within the vicinity of the project. The DEIR should include a detailed inventory of the bicycle network, to include types of bicycle facilities, widths of bicycle facilities, and bicycle volumes. The proponent should identify suitable bicycle routes within the study area, as well as any other existing bicycle facilities (e.g. bicycle lanes, cycle tracks, shared-use paths). The DEIR should reevaluate these routes based on the origin-destination patterns of potential casino employees and patrons. Based on this analysis, the proponent should consider the feasibility of expanding some of these existing routes or consider new routes to encourage bicycle travel in and around the site. **DOT 20**

Alternatives Analysis

The ENF has presented a conceptual plan for improvements that consists of a Route 1A northbound flyover at Boardman Street, an additional Route 1A southbound lane, the signalization of the Route 1A/Waldemar Avenue intersection, and the signalization of the Route 1A/Tomasello Drive intersection. It should be noted that MassDOT has not endorsed any access alternative for the site at this time. The proponent should continue discussions with MassDOT to evaluate alternatives that address long term regional goals for the corridor while providing access to the site. As such, the DEIR should include a comprehensive alternatives evaluation along this segment of the Route 1A corridor, between the Boardman Street intersection and the Route 145 intersection. **DOT 21**

The access alternatives should be consistent with MassDOT standards and provide for multimodal travel along the corridor. MassDOT recommends that this evaluation focus not only on physical improvement strategies, but also on creative and innovative strategies that would encourage non-SOV travel modes and reduce congestion within the study area. It should consider all previous studies conducted by MassDOT within this corridor and should ensure that any proposed mitigation is compatible with future long-term alternatives previously identified by MassDOT. The DEIR should also identify access management techniques to improve overall corridor traffic along the Route 1A corridor, the Route 145 corridor, and local streets in the vicinity of the project. For any locations where the proponent proposes a new traffic signal, the DEIR should include a traffic signal warrant analysis conducted according to the Highway Capacity Manual methodology. **DOT 22** **DOT 23**

The DEIR should include sufficiently detailed conceptual plans (preferably 80-scale) for any proposed roadway improvements in order to verify the feasibility of constructing such improvements. The conceptual plans should clearly show proposed lane widths and offsets, layout lines and jurisdictions, and the land uses (including access drives) adjacent to areas where improvements are proposed. Any proposed mitigation within the state highway layout must be consistent with a Complete Streets design approach that provides adequate and safe accommodation for all roadway users, including pedestrians, bicyclists, and public transit riders. Guidance on Complete Streets design guidelines is included in the MassDOT *Project Development and Design Guide*. Where these criteria cannot be met, the proponent should provide the justification as to the reason why, and should work with the MassDOT Highway Division to obtain a design waiver. **DOT 24** **DOT 25**

Public Transportation (MBTA)

Given the scale of the proposed project and its potential traffic impacts, the major congestion of the regional highway network in the area, and the proximity of excellent public transit services to the project, the proponent should make public transportation a core component of its mitigation program. Therefore, the DEIR should include a comprehensive analysis of existing and future conditions of transit services within the study area. The DEIR should identify existing frequency and capacity; provide a realistic projection of future demand; propose a comprehensive transit mitigation plan to reduce site vehicular traffic; and commit to key investments that will attract both employees and patrons to public transportation. The proponent should ensure that public transit serving the site has robust connections to the casino and all on-site facilities, and that transit access is visible, fully integrated with the casino facility and other elements of the project, and outfitted with ample accommodation for transit vehicles and with attractive amenities for passengers. The DEIR site plan should show, and the DEIR narrative should describe, how customers and employees arriving by buses, the Blue Line, and other transit modes will have accommodations at least equivalent to those for customers and employees arriving by private automobile. **DOT 26**

MassDOT and the MBTA are interested in working with the proponent to develop transportation plans for the project that allow for the project to take advantage of its close proximity to an extensive transit network, while at the same time realizing and responding to the inherent limitations of the transit system and the MBTA's capacity constraints. High-level MBTA-related issues that should be addressed in the DEIR include the following:

- What will the ridership impacts be on the MBTA Blue Line and bus network, and what changes to the current operational system, if any, will be required to accommodate this additional demand? **DOT 27**
- How will this additional demand affect Suffolk Downs Station given its size and existing condition? **DOT 28**
- What will the traffic impacts on the local and regional roadways be and how will MBTA buses currently operating in the area be affected by this additional traffic and/or proposed roadway changes? **DOT 29**
- What measures and steps will the proponent take to encourage, to the greatest degree possible facility employees and customers to arrive by transit? **DOT 30**
- How will the day to day operations of the resort facility impact MBTA stations and operations other than Suffolk Downs Station? **DOT 31**

Impacts to Blue Line Ridership

DOT 32

The DEIR should contain an assessment of how riders, particularly in the MBTA peak period, are expected to board and alight at Suffolk Downs Station. The MBTA understands from the proponent that it does not anticipate many casino patrons or employees to utilize Beachmont Station, given the pedestrian network that will exist from Beachmont. The DEIR should estimate what additional new ridership on the Blue Line can be anticipated and what time of day those impacts will occur. The proponent should work with the MBTA Service Planning Department to ensure that it has access to the most recent and most relevant ridership and operational statistics for the Blue Line.

Impacts to Suffolk Downs Station

The Blue Line Station at Suffolk Downs was designed and fully rebuilt in the mid-1990's as part of the major Blue Line Upgrade project designed to modernize all stations, make them accessible to people with disabilities, and accommodate longer, six-car Blue Line trains. The Suffolk Downs Station was designed, however, as a small neighborhood station and was not designed to accommodate the potentially large number of employees and customers that would access the Caesars Resort at Suffolk Downs by transit. In fact, the Suffolk Downs Station currently has the lowest number of daily boardings of any of the MBTA's heavy rail rapid transit stations (that is, Red, Orange, and Blue Lines).

In addition, in the nearly two decades since design plans for Suffolk Downs Station were conceived, there have been a number of advancements and new approaches to planning and design of transit facilities so as to reduce or eliminate the barriers that people with disabilities experience when trying to access transit. Many of these types of improvements and design elements are not implemented at stations like Suffolk Downs. Given what could be a substantial change in the usage and volumes of the station, many of these types of improvements will become all the more important for people accessing the station.

DOT 33

The DEIR should address what the additional ridership demand is on Suffolk Downs Station (or any other related Blue Line station such as Beachmont Station) and how that ridership compares not only to current usage but also to station capacity and station functionality. The DEIR should determine which current building and safety codes could be affected by adding potentially large numbers of riders to the station. A code analysis that compares existing station conditions to current codes (i.e. those relating to life safety, emergency egress, accessibility or other critical functions) should be performed

to determine what, if any, upgrades need to be made to the station. The proponent should work with the MBTA's Design Department, Engineering and Maintenance, and System-Wide Accessibility to identify key building and safety codes which are most applicable to this station. Of particular importance to the MBTA are all building codes and standards related to the Americans with Disabilities Act (ADA), the Massachusetts Architectural Access Board (MAAB), and Federal Transit Authority (FTA) regulations and guidance. The proponent should present in the DEIR what the current accessibility conditions of the station are and how those conditions should be upgraded given the potentially large number of additional riders being added to this small station.

Impacts to MBTA Bus Service

In addition to Blue Line service, the area is also served by a series of MBTA bus routes, predominantly the Route 119 (Northgate to Beachmont Station), as well as Route #120 (Orient Heights to Maverick Station). The Route #450 and Route #459 (running from Boston to Salem) currently make stops in the vicinity. A third series of Routes (#424, #434, #448 and #449) run through the travel area but do not currently stop in the vicinity of the proposed resort.

As part of the DEIR, the MBTA would like to see a detailed presentation of the impact to the MBTA bus network. Specifically, the MBTA asks that the DEIR be prepared so that the document can identify the future build demand for the #119 and #120 buses and how it compares to the future No-Build demand for local bus services. Based on this assessment, the DEIR should present the anticipated demand in terms of MBTA service standards for bus volumes and capacity in order to determine what the impacts to the MBTA bus network will be. The DEIR should determine what if any additional service would need to be added to the bus network in order to ensure that the MBTA bus routes would meet existing MBTA service standards. Using current MBTA standards for labor, fuel, maintenance costs, etc., the proponent should calculate what the cost to the MBTA would be to accommodate all of the unmet transit demand and to do so in a way that meets MBTA service standards. **DOT 34**

In addition, the DEIR should specifically address what the operational impacts to MBTA bus service would be due to traffic generated by the project. The MBTA assumes that the DEIR will provide a level of service analysis for all affected intersections. The MBTA requests that the DEIR present, in a tabular format, an assessment of which of these intersections are utilized by MBTA buses and how their timing or turning movements may be affected by the increased traffic and/or proposed roadway changes generated by the project. **DOT 35**

New Transit Usage during Existing MBTA Peak Periods

For both rapid transit and bus service, the MBTA is currently constrained from offering more service during the AM and PM weekday rush hours (approximately 7:00-9:00 AM and 4:00-6:30 PM). This is due to the limitations of existing infrastructure – the number of rail and bus vehicles, the capacity of storage and maintenance facilities, the limitations of rail signaling systems, and so on. Existing ridership at these peak periods already results in overcrowded conditions throughout the MBTA network. Therefore, special note should be taken of any impacts to MBTA service from the proposed resort facility during weekday rush hours, and the DEIR should describe how any negative impacts could be mitigated. **DOT 36**

Access to and From Suffolk Downs Station

The DEIR should identify, preferably in graphic format, how the facility's shuttle buses will access the Blue Line Station at Suffolk Downs. The shuttle buses that currently serve Suffolk Downs racetrack pick up and drop off passengers approximately 100 feet from the entrance to the station. The DEIR should show how these new and additional shuttles will serve the station and how passengers will have a safe and accessible path of travel from the Blue Line Station to the Shuttle. The proponent should develop its site plan to ensure that the pickup and drop off of transit and shuttle bus passengers is seamless and easy for passengers, particularly those passengers with limited mobility. **DOT 37**

Additionally, the DEIR should identify, also preferably in graphic format, how pedestrians who choose to walk from the Blue Line Station or the local bus service will access the facility. The DEIR should demonstrate what the path of travel will be, and what steps will be taken to design and maintain a path of travel that is safe, accommodating, accessible and inviting. The MBTA feels that while immediate transit access to the facility should help to encourage transit ridership to the facility, a well-planned and well-maintained path between the Suffolk Downs station and the resort facility is critical to encouraging transit usage. **DOT 38**

The MBTA believes that the proposed Caesar's Resort at Suffolk Downs has a unique opportunity to be fully integrated with the existing transit network. The DEIR should identify the steps that will be taken to encourage transit usage and what the resulting effects will be on the existing transit network. The MBTA has extensive background and information on the service in the area.

Airspace Obstructions

The project site appears to be located within protected airport approach and/or transitional airspace areas as defined by state law (Massachusetts General Law, Chapter 90, Section 35B) and Federal regulations (Federal Aviation Regulation Part 77, Objects Affecting Navigable Airspace). Therefore, state and federal notice is required for the following: **DOT 39**

- Proposed buildings;
- Proposed parking lots/parking structures;
- Proposed parking lot lights;
- Proposed permanent street lights and/or traffic lights;
- Proposed temporary installation of cranes that may be used to construct the structure/structures; and
- Proposed temporary lights that may be used during nighttime construction.

Both state (MassDOT Aeronautics Division) and federal (Federal Aviation Administration) agencies can be notified of the proposed project by filing online as indicated below.

- **State notice** is required by filing a MAC Form E-10, *Aeronautics Commission Request for Airspace Review*, per 780 Code of Massachusetts Regulations (CMR) 111.7, *Hazards to Air Navigation*, to determine if any part of the project impacts the protected airport approach areas. Online filing is available via http://app1.massdot.state.ma.us/airspacereview/
- **Federal notice** is required by filing an FAA Form 7460-1, *Notice of Proposed Construction or Alteration*, per Code of Federal Regulations (CFR) Title 14 Part 77.13, *Construction or Alteration Requiring Notice*, to determine if any part of the project impacts the protected

airport approach areas. Online filing is available via https://oeaaa.faa.gov/oeaaa/external/portal.jsp

- Under provisions of 780 CMR 111.7, *Hazards to Air Navigation*, the proponent of the project is required to furnish a copy of the FAA Form 7460-1 to the MassDOT Aeronautics Division within three business days after submitting said form to the FAA.

Lighting/Glare Impacts to Aviation

The preservation of optimal night vision is important for pilots operating an aircraft at night. Exposure to bright light can result in temporary visual impairment due to glare. Therefore, any temporary lights that may be used during nighttime construction must be placed and aimed in such a way as to minimize glare to aircraft pilots. Light shielding must be incorporated into the design of all temporary lighting such as cranes and lighting used during nighttime construction and permanent lighting such as parking lot and traffic lights to reduce potential visual impacts. **DOT 40**

Additionally, lighting and glare could occur if the project employs reflective building materials or green technologies such as solar panels. Please ensure that any such materials are discussed with both Massport and the MassDOT Aeronautics Division. **DOT 41**

Construction Activities and Impacts to Aviation

Construction activities should also be closely coordinated with Massport and the MassDOT Aeronautics Division. If temporary cranes, construction lights, or other heavy equipment will be used, or if dust and/or smoke are generated, Massport and the MassDOT Aeronautics Division must be able to ensure that appropriate notices to airmen can be issued (NOTAMS). Additionally, if cranes are to be used for construction purposes, the cranes must be appropriately marked and lighted according to U.S. Department of Transportation/Federal Aviation Administration Advisory Circular (AC) 70/7460-1K, Obstruction Marking and Lighting. The temporary cranes shall also be lowered to the ground at night and/or when not in use. **DOT 42**

Parking

According to the ENF, a substantial portion of the current site comprises surface parking, with a total capacity of 5,830 spaces. The redevelopment of the site would include an approximately 2,600-space, seven-story parking garage; one level of underground valet parking for approximately 450 cars; and approximately 2,100 surface parking spaces, for a total of 5,150 spaces. Although the project is reducing the number of spaces compared to existing conditions, the DEIR should clarify how the parking needs of the project were determined and explain the methodology used to determine the total parking required. **DOT 43**

The Institute of Transportation Engineers' *Parking Generation* generally provides a reasonable basis for comparison to parking requirements under local zoning, but this reference does not present parking rates for this type of land use. In the absence of such a ready reference for parking supply, the DEIR should analyze the anticipated parking demand based upon parking needs and supplies for comparable facilities (based on multiple data sources, and discounted to allow for the urban location and available transit); the projected traffic demand at different times of day; the expected parking duration; and the different types of parking demand (e.g. casino patron, employee, **DOT 44**

hotel guest, etc.). The proponent should propose parking policies that are designed to minimize parking demand and automobile use, such as fees for parking, parking cash-out policies, and other demand-reduction measures for employees.

Transportation Demand Management

The DEIR must include a proposed Travel Demand Management (TDM) program based on the project proposal that would implement measures aimed at reducing site trip generation. The DEIR should further refine the Transportation Demand Management (TDM) program in light of the regional context of the project. The TDM plan should be based on the specific measures that have been successful in reducing trip generation for similar facilities, and should further investigate measures that would maximize usage of existing and new pedestrian, bicycle, and transit facilities. Such measures should include subsidizing transit passes for both employees and patrons/hotel guests, limiting the available parking supply, providing on-site amenities and conveniences that would reduce the need for automobile travel, and shuttle services that fill unmet gaps in transit access for the proposed project. The proponent should provide a central, climate-controlled transit hub that is integrated into the facility so that transit provides access that is equivalent to or better than that provided to patrons arriving by automobile. **DOT 45**

The proponent should also commit to hiring a full-time, dedicated Transportation Coordinator for the project; this Transportation Coordinator may also require support staff. The DEIR should also evaluate the feasibility of providing shuttle services that would run from remote parking locations within the casino market area, similar to the Logan Express Bus program that serves travelers and employees going to Logan Airport. MassDOT recommends that the proponent investigate opportunities for partnering or emulating the existing program at Braintree, Framingham, Peabody and Woburn or other MBTA parking locations as mentioned above. To that end, the proponent should develop a strong incentive program that would encourage both casino patrons and employees to use such services. **DOT 46** **DOT 47**

The proponent should also seek to address the gap in overnight transportation service by reaching out to other transportation service providers such as the Massport Logan Express, internal airport shuttles, the MBTA sunrise service, the large shuttle operations within the Boston area, and the private regional/intercity bus lines that already serve South Station and other downtown destinations. **DOT 48**

The DEIR should identify what type of TDM programs will be implemented to ensure that employees use transit to the greatest degree possible. Specifically, the DEIR should identify how shifts will be scheduled so that all three shifts can utilize transit. The MBTA has observed that most employees who work a second or a third shift can generally rely on the transit service if the second or third shifts begin/end between 6:00 AM and 12:00 midnight (except Sundays between 7:00 AM and 12:00 midnight). This type of scheduling allows employees coming off of a second shift or doing an overnight shift to generally be able to use transit, even though transit ceases to operate overnight. The DEIR should describe how shifts will be laid out, and how tenants and vendors at the facility will be encouraged to schedule shifts as well so as to promote transit usage as much as possible, while also being mindful of the weekday rush hour conditions noted above. **DOT 49**

DOT 50

Additionally, the DEIR should identify whether or not employee shuttles from remote locations will be used to allow employees to park and take shuttle buses to the facility. If so, the proponent should work with the MBTA to see if a joint usage of parking facilities can be arranged at the MBTA parking locations such as the Lynn parking garage, Wellington Station, Anderson Intermodal Facility in Woburn or other remote locations. The proponent should work with the MBTA Parking Department to identify appropriate remote locations where a shared usage agreement can be arranged.

DOT 51

The DEIR should also describe the full range of TDM proposals being considered by the proponent and how those TDM concepts will be incorporated into the operations of the facility. The DEIR should also propose how these TDM ideas can be tracked and evaluated during operations so that they can be regularly reviewed and updated as appropriate.

DOT 52

The TDM program should identify existing and proposed connections for pedestrians and bicyclists; analyze their existing and future conditions based on the project's impacts; and commit to making improvements that will increase usage of those modes. The site plan should also provide pedestrian and bicycle connections to existing land uses within close proximity to the project site, maximize the connectivity and permeability of the site edges, and provide excellent pedestrian and bicycle connections within the project site. The proponent should provide ample bicycle parking, including both secure, weather-protected bicycle parking for employees and highly-visible bicycle parking near the entrances for customers; on-site showers, lockers, and changing facilities; and financial incentives to encourage employees and customers to walk, bicycle, or ride public transit to the site.

DOT 53

The project proponent should also consult with MassRides, the Commonwealth's travel options service, as well as the Logan Transportation Management Association (Logan TMA). These travel options services can help the proponent identify potential trip reduction measures, especially

DOT 54

those targeting employees, and support the implementation of the TDM program. The proponent should provide charging stations for plug-in electric vehicles, and reserve these spaces for such

DOT 55

vehicles. The DEIR should also identify incentives for both patrons and employees to use high occupancy vehicles, either in the form of financial incentives or priority treatments such as preferred parking spaces. The proponent should also promote ridesharing through NuRide, the Commonwealth's web-based trip planning and ridematching service that enables participants to earn rewards for taking "green" trips. The proponent should provide information on the substance and outcomes of its consultations in the DEIR, along with a summary of the revised TDM program proposal.

Transportation Monitoring Program

DOT 56

As part of the project mitigation program, the project proponent should commit to implement a transportation monitoring program to be conducted upon the occupancy of the project. The goals of the transportation monitoring program will be to evaluate the assumptions made in the DEIR and the adequacy of the transportation mitigation measures, as well as to determine the effectiveness of the TDM program. The project proponent shall discuss with MassDOT an appropriate timeframe for the monitoring program, or commit to initiating the monitoring program upon MassDOT's request.

Due to the size of the project, MassDOT anticipates the need to monitor and update the TDM program as necessary before the project reaches full occupancy. If the traffic monitoring program indicates that the proposed mitigation is not effective in accommodating the future traffic volumes at

key area intersections impacting the state highway system, the project proponent will be responsible for identifying and implementing operational improvements at these constrained locations. These improvements could entail traffic signal timing and phasing modifications, optimization of the coordinated/interconnected signal system, and/or further refinement of the TDM program to reduce site trip generation. The ENF indicates that the proponent would provide a monitoring program based on the City of Boston Transportation Access Plan Agreement and/or the MassDEP Rideshare regulations. MassDOT will require its own transportation monitoring program to ensure that the TDM measures and the infrastructure improvements are successful in reducing traffic volumes and reducing congestion along a number of key corridors within the study area, although MassDOT is amenable to the proponent coordinating its response with the requirements of the City of Boston and MassDEP monitoring programs.

The Proponent should continue consultation with appropriate MassDOT Divisions, including the Office of Transportation Planning, the Highway Division, and the MBTA during the preparation of the DEIR for the project. If you have any questions regarding these comments, please contact me at (617) 368-8862 or Andrew Brennan of the MBTA at 617-222-3126 or by email at abrennan@mbta.com.

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION

DOT 01 **The DEIR should include a transportation study prepared in conformance with EOEEA/MassDOT Guidelines for Transportation Impact Assessments. The study should include a comprehensive assessment of the transportation impacts of the Project based on a thorough analysis of existing conditions, future No-Build conditions, and future Build conditions. The study should take into account the regional context of the Project and provide a comprehensive, integrated multimodal mitigation package that would allow the maximum possible use of non-SOV travel modes by both employees and customers.**

A comprehensive transportation study has been prepared in conformance with EEA/MassDOT Guidelines for Transportation Impact Assessments. This study is presented in Section 5.0 along with a multimodal package of alternative modes supported by a comprehensive TDM plan.

DOT 02 **MassDOT strongly encourages the Proponent to provide similar focus to both physical and non-physical improvements and to seek creative solutions that would encourage both patrons and employees to reduce SOV traffic.**

The transportation plan for the Project presented in Section 5.0 includes a wide range of multimodal physical and non-physical improvements which strives to reduce SOV travel by patrons and employees while improving infrastructure for alternative modes as well as addressing existing traffic issues and potential Project impacts.

DOT 03 **The DEIR should also provide a comprehensive evaluation of the travel characteristics of the casino patrons.**

A comprehensive evaluation of the travel characteristics of patrons and employees is presented in Sections 5.4.1 through 5.4.7.

DOT 04 **The location of the site provides the opportunity to develop a comprehensive multimodal access and mitigation plan based on a thorough analysis of existing and future conditions. Through the mitigation program, the Proponent should seek every opportunity to influence the mode choice of both casino patrons and employees in order to improve overall mobility in the vicinity of the site.**

As described in Section 5.0, the site design and transportation plan for the Project seize the opportunity to take advantage of multimodal access supported by a comprehensive TDM plan to influence mode choice by patrons and employees.

DOT 05 As indicated in the ENF, the Institute of Transportation Engineers (ITE) Trip Generation Manual does not contain trip generation factors for this type of facility. The DEIR should present a comprehensive analysis of the research and proprietary data [for existing gaming venues], and should provide the background documentation justifying the selection of the variable(s) used to estimate Project trip generation. Consistent with MassDOT's analysis of other casino projects currently under review, the number of gaming positions seems to be the most appropriate variable in estimating the trip generation for casino facilities. The DEIR should provide information on the size, geographic location, and traffic volumes of the comparable sites that is sufficient to establish a correlation between the number of gaming positions and trip generation. Based on this information, the DEIR should provide a temporal distribution of traffic over a full one-week period, which would help determine the peak hours of casino traffic. This information would help identify the most critical peak analysis periods, which should consist of the highest combination of existing roadway volumes and Project site trips. The DEIR traffic analysis should be based on these critical peak hour periods.

A detailed description of travel demand and trip generation characteristics for the Project, based on evaluation of extensive research on other successful projects and experience of the Proponent and including data collection at comparable sites, is presented in Sections 5.4.1 through 5.4.5.

DOT 06 The Project Proponent should present a trip generation discussion with an employee demand distribution based on the nature of work shifts. The Proponent should evaluate the impacts of instituting different shift schedules around the availability of transit services in order to maximize transit usage by employees.

The employees' demand distribution, based on extensive proprietary data, is presented and discussed in Section 5.4.2. As explained, the multiple shift changes required to support the range of job types at the Project already result in a temporal distribution of employee trips throughout the day. In the TDM plan (see Section 5.9), the Proponent has committed to modifying work shifts to minimize commuting during the nighttime period when the MBTA is not in operation.

DOT 07 The DEIR should include an analysis of what additional transit demand would be generated by the Project... While the proximity of transit provides an excellent opportunity for a high level of transit usage, MassDOT anticipates that it will be a challenge to adequately model the transit trip generation and trip assignments for the Project. As a result, the Proponent should work closely with the MassDOT Office of Transportation Planning and the MBTA Service Planning Department to develop appropriate and reasonable travel demand and trip generation

characteristics. The DEIR should then present not just the results of that analysis, but a full and complete presentation on how those trip generation estimates and trip assignment rates were developed, and what research was done to support these rates.

An analysis of existing and Build transit operations, based on ridership information provided by the MBTA, is presented in Sections 5.2.1 and 5.8.1, respectively. The basis for Project demand projections is described in detail in Section 5.4.1.

DOT 08 The trip distribution for the Project should be based on a gravity model or similar model to apply a spatial distribution onto the trip generation estimates in order to determine the origin-destination patterns of the casino trips in the study area. Additional factors such as population, travel time, and distance should be considered in the model to determine trip characteristics for casino patrons and employees. The DEIR should provide all appropriate documentation to verify how the different percentages are calculated and assigned to the roadway network and the transit system. In addition, the model should be able to consider other casino proposals in Massachusetts that could impact the trip distribution for this Project.

The Project trip distribution and assignment analysis is presented in Section 5.4.7.

DOT 09 Once the trip generation estimates, the modal split assumptions, the trip distribution, and the trip assignment are developed, network maps of the study area should be created for the different peak-hour analyses and the different modes.

Study area network maps are presented for all analysis scenarios in the figures accompanying Section 5.0 (see Volume II, Project Figures).

DOT 10 In addition to the locations proposed in the ENF, MassDOT recommends that the following locations and roadway segments be included in the study area:

- The Route 60/Charger Street intersection;
- The Route 60/Sigourney Street intersection;
- The Route 1/Copeland Circle interchange (including the rotary and adjacent segments, as well as their associated impacts to the through-traffic on Route 1 between Route 60 and Route 99);
- The Ted Williams Tunnel;
- The Callahan Tunnel;
- The Sumner Tunnel; and

- [the following two included per April 3, 2013 email:] Route 1A and the Wonderland MBTA Station Driveway; and
- Route 1A/Revere Street (signalized intersection).

The additional locations requested by MassDOT have been incorporated in the study area for the transportation analysis presented in Section 5.0, and are noted specifically in Section 5.2.6.

DOT 11 Given the nature of the proposed land use, the location of the Project, and the transportation infrastructure that may be impacted, MassDOT requires that a 10-year horizon (2022) be used for the traffic study, and that a 20-year design horizon be used for the proposed infrastructure improvements. This would allow for all the phases of the Project to be completed and reach full occupancy; it would also enable MassDOT to adequately evaluate the effectiveness of the transportation system improvements and the TDM program.

The Build impact analysis presented in Section 5.4 is based on a 10-year horizon (2022), and the alternatives analysis for the Route 1A infrastructure improvements presented in Section 5.5 also includes a 20-year design horizon analysis.

DOT 12 The Proponent should be aware that 2012 [ATR counts and TMC] will not be acceptable for use in the DEIR traffic analysis unless reviewed and approved by MassDOT. No counts taken prior to 2010 will be acceptable.

The validation of 2010 and 2012 traffic counts is presented in Section 5.2.7, and MassDOT has approved the relevant traffic counts incorporated in the DEIR/EPNF analysis.

DOT 13 The ENF includes a traffic volume summary table that indicates daily, evening peak hour, and afternoon peak hour traffic volumes for a typical weekday (Monday-Thursday), Friday, and Saturday for a number of roadway segments within the study area. The DEIR should provide a similar table that shows the increase in traffic volume on these roadway segments for the future No-Build and future Build conditions once the trip generation and distribution have been validated and approved by MassDOT. This table should include the Ted Williams Tunnel, Sumner Tunnel, and Callahan Tunnel in order to demonstrate existing daily volumes and peak characteristics... it is critical that they continue to operate at acceptable LOS.

No-Build and Build traffic volumes are presented in Sections 5.4 and 5.5, respectively.

DOT 14 There may be three different traffic demand peak hours within the study area: the peak hour of the general traffic/tunnel facilities; the peak hour of Logan International Airport; and the peak hour of the resort casino. These three peak hours are likely to fall close together on Friday night, and the Project-related traffic could result in an extended peak (Friday 5-8PM) period of very high congestion levels in the tunnels. Thus, it is essential that the DEIR provide the necessary information and analysis for these tunnels to evaluate appropriate mitigation measures, if any, to minimize traffic impacts on these facilities. The Proponent should work closely with the MassDOT Highway Division and Massport to obtain the latest ATR volumes for these facilities, in addition to other traffic counts that may be required to conduct the necessary analysis.

Traffic data for the harbor tunnels are discussed in Section 5.2.7.

DOT 15 The DEIR should present capacity analyses and a summary of average and 95th percentile vehicle queues for each intersection within the study area. The DEIR should also present a merge and diverge for each ramp junction, and weaving analysis for all other intersections located in the study area.

The capacity analysis presented in Section 5.7 includes vehicle queues as requested, and also includes merge/diverge and weaving analysis where appropriate.

DOT 16 Any proposed traffic signal along Route 1A or at other locations must include a traffic signal warrant analysis conducted according to the MUTCD. The DEIR should ensure that any proposed mitigation is compatible with future long-term transportation improvements under consideration by MassDOT for this area.

Traffic signal warrant analysis will be performed for proposed signal locations on Route 1A and other locations as the concept alternatives are further developed in coordination with MassDOT, DCR, and/or the cities of Boston and Revere.

DOT 17 The Proponent should provide a roadway segment analysis for the three harbor tunnel locations based on the latest methodology of the Highway Capacity Manual or appropriate traffic software analysis approved by MassDOT.

As described in Sections 5.2.7 and 5.7, adequate data are not available for the three harbor tunnels to facilitate roadway segment analysis, but the Proponent will continue to work with MassDOT to collect appropriate data to facilitate such analysis.

DOT 18 The DEIR should present the performance measures of these [transportation] analyses in a summary format that would allow comparisons of Existing, Future No-Build, and Future Build conditions with mitigation for all peak-hour conditions.

Where appropriate, the DEIR should discuss how the proposed system improvements and impacts to one mode can be measured relative to the improvements and impacts of the other modes.

Section 5.0 presents Existing, No-Build, Build, and Build with HCA commitments analyses for both the critical Friday afternoon peak and Saturday afternoon peak hours. Although limited Project trip generation is projected for the weekday morning peak, the Route 1A infrastructure alternatives analysis presented in Section 5.5 also includes morning peak-hour analysis to support design considerations.

DOT 19 The DEIR should provide a thorough inventory of all existing, planned, and proposed services, facilities, and routes for accessing the site. It should also provide an evaluation of the network to include pavement conditions, sidewalk widths, crosswalks, compliance with current accessibility standards, and existing pedestrian volumes and movements. The Proponent should develop the site plan to ensure that the Project is as open to pedestrians, and to the environment, and as permeable along all edges, as possible.

Sections 1.4 and 4.4.7 describe pedestrian and bicycle connections on the Project site and in the surrounding vicinity.

DOT 20 The DEIR should include a detailed inventory of the bicycle network, to include types of bicycle facilities, widths of bicycle facilities, and bicycle volumes. The Proponent should identify suitable bicycle routes within the study area, as well as any other existing bicycle facilities (e.g. bicycle lanes, cycle tracks, shared-use paths). The DEIR should reevaluate these routes based on the origin-destination patterns of potential casino employees and patrons. Based on this analysis, the Proponent should consider the feasibility of expanding some of these existing routes or consider new routes to encourage bicycle travel in and around the site.

Section 5.3.2 describes and presents the existing and planned bicycle network. Proposed on- and off-site bicycle accommodations are described in Sections 5.6 and 5.8.3.

DOT 21 It should be noted that MassDOT has not endorsed any access alternative for the site at this time. The Proponent should continue discussions with MassDOT to evaluate alternatives that address long-term regional goals for the corridor while providing access to the site. As such, the DEIR should include a comprehensive alternatives evaluation along this segment of the Route 1A corridor, between the Boardman Street intersection and the Route 145 intersection. The access alternatives should be consistent with MassDOT standards and provide for multimodal travel along the corridor. MassDOT recommends that this evaluation

focus not only on physical improvement strategies, but also on creative and innovative strategies that would encourage non-SOV travel modes and reduce congestion within the study area.

An alternatives analysis of Route 1A infrastructure improvements is presented in Section 5.5. Strategies to encourage non-SOV travel and reduce congestion are described in Sections 5.8 and 5.9.

DOT 22 The DEIR should identify access management techniques to improve overall corridor traffic along the Route 1A corridor, the Route 145 corridor, and local streets in the vicinity of the Project.

A primary objective of the roadway improvements identified in Section 5.5 and 5.6 is the management of access in a way that addresses existing safety issues and provides safe access to the Resort.

DOT 23 For any locations where the Proponent proposes a new traffic signal, the DEIR should include a traffic signal warrant analysis conducted according to the Highway Capacity Manual methodology.

Traffic signal warrant analysis will be performed for proposed signal locations on Route 1A and other locations as the concept alternatives are further developed in coordination with MassDOT, DCR, and/or the cities of Boston and Revere.

DOT 24 The DEIR should include sufficiently detailed conceptual plans (preferably 80-scale) for any proposed roadway improvements in order to verify the feasibility of constructing such improvements. The conceptual plans should clearly show proposed lane widths and offsets, layout lines and jurisdictions, and the land uses (including access drives) adjacent to areas where improvements are proposed.

Concept plans for all proposed roadway improvements are included in Sections 5.5 and 5.6.

DOT 25 Any proposed mitigation within the state highway layout must be consistent with a Complete Streets design approach that provides adequate and safe accommodation for all roadway users, including pedestrians, bicyclists, and public transit riders.

The concept plans for roadway improvements presented in Sections 5.5 and 5.6 have been developed consistent with a Complete Streets approach, and the design development in coordination with MassDOT, DCR, and the cities of Revere and Boston will be consistent with a Complete Streets approach.

DOT 26 Given the scale of the proposed Project and its potential traffic impacts, the major congestion of the regional highway network in the area, and the proximity of excellent public transit services to the Project, the Proponent should make public

transportation a core component of its mitigation program. Therefore, the DEIR should include a comprehensive analysis of existing and future conditions of transit services within the study area. The DEIR should identify existing frequency and capacity, provide a realistic projection of future demand, propose a comprehensive transit mitigation plan to reduce site vehicular traffic, and commit to key investments that will attract both employees and patrons to public transportation. The Proponent should ensure that public transit serving the site has robust connections to the casino and all on-site facilities, and that transit access is visible, fully integrated with the casino facility and other elements of the Project, and outfitted with ample accommodation for transit vehicles and with attractive amenities for passengers. The DEIR site plan should show, and the DEIR narrative should describe, how customers and employees arriving by buses, the Blue Line, and other transit modes will have accommodations at least equivalent to those for customers and employees arriving by private automobile.

The Proponent recognizes the importance of transit access, and transit is incorporated as a key mode for the Project by enhancing the connection with Suffolk Downs Station in the site plan and robust TDM commitments to encourage transit use. A comprehensive transit analysis is presented in Sections 5.2.1 and 5.8.1 for existing and future Build conditions, respectively.

DOT 27 What will the ridership impacts be on the MBTA Blue Line and bus network, and what changes to the current operational system, if any, will be required to accommodate this additional demand?

Potential impacts to the MBTA network and operations are described in Section 5.8.1.

DOT 28 How will this additional demand affect Suffolk Downs Station given its size and existing condition?

An analysis of Project demand at Suffolk Downs Station is presented in Section 5.8.1.

DOT 29 What will the traffic impacts on the local and regional roadways be and how will MBTA buses currently operating in the area be affected by this additional traffic and/or proposed roadway changes?

An analysis of potential traffic impacts to MBTA buses is presented in Section 5.8.1.3.

DOT 30 What measures and steps will the Proponent take to encourage, to the greatest degree possible, facility employees and customers to arrive by transit?

In addition to enhancing the shuttle connection with Suffolk Downs Station, and including a potential MBTA bus stop at the Resort, should the MBTA wish to route buses through the site the Proponent offers a TDM plan in Section 5.9 that includes many actions and strategies to encourage transit use by patrons and employees.

DOT 31 **How will the day-to-day operations of the resort facility impact MBTA stations and operations other than Suffolk Downs Station?**

A comprehensive analysis of potential impacts to the MBTA stations and operations is presented in Section 5.8.1.

DOT 32 **The DEIR should contain an assessment of how riders, particularly in the MBTA peak period, are expected to board and alight at Suffolk Downs Station... The DEIR should estimate what additional new ridership on the Blue Line can be anticipated and what time of day those impacts will occur.**

An analysis of boardings and alightings at Suffolk Downs Station is included in the transit analysis in 5.8.1, which also identifies new ridership and potential impacts by time of day for a weekday and Saturday.

DOT 33 **The DEIR should address what the additional ridership demand is on Suffolk Downs Station (or other related Blue Line station such as Beachmont Station) and how that ridership compares not only to current usage but also to station capacity and station functionality. The DEIR should determine which current building and safety codes could be affected by adding potentially large numbers of riders to the station. A code analysis that compares existing station conditions to current codes (i.e., those relating to life safety, emergency egress, accessibility or other critical functions) should be performed to determine what, if any, upgrades need to be made to the station... The Proponent should present in the DEIR what the current accessibility conditions of the station are and how those conditions should be upgraded given the potentially large number of additional riders being added to this small station.**

Additional Project-related ridership demand is described in Section 5.4.6, and the use of MBTA stations is presented in Section 5.8.1.1. The Proponent has had preliminary discussions with MBTA staff, and will continue to explore station code and accessibility issues at Suffolk Downs Station in coordination with the MBTA to identify needed improvements.

DOT 34 **As part of the DEIR, the MBTA would like to see a detailed presentation of the impact to the MBTA bus network. Specifically, the MBTA asks that the DEIR be prepared so that the document can identify the future build demand for the #119 and #120 buses and how it compares to the future No-Build demand for local bus services. Based on this assessment, the DEIR should present the anticipated demand in terms of MBTA service standards for bus volumes and capacity to**

determine what the impacts to the MBTA bus network will be. The DEIR should determine what if any additional service would need to be added to the bus network to ensure that the MBTA bus routes would meet existing MBTA service standards. Using current MBTA standards for labor, fuel, maintenance costs, etc., the Proponent should calculate what the cost to the MBTA would be to accommodate all of the unmet transit demand and to do so in a way that meets MBTA service standards.

Potential Project impacts to the MBTA bus network are included in the transit analysis presented in Sections 5.2.1 and 5.8.1 for existing and future Build conditions, respectively.

DOT 35 The DEIR should specifically address what the operational impacts to MBTA bus service would be due to traffic generated by the Project. The MBTA assumes that the DEIR will provide a LOS analysis for all affected intersections. The MBTA requests that the DEIR present, in a tabular format, an assessment of which of these intersections are utilized by MBTA buses and how their timing or turning movements may be affected by the increased traffic and/or proposed roadway changes generated by the Project.

Potential impacts to MBTA bus service due to Project-related roadway improvements are presented in Sections 5.8.1.4.

DOT 36 For both rapid transit and bus service, the MBTA is currently constrained from offering more service during the AM and PM weekday rush hours... due to limitations of existing infrastructure... Existing ridership at these peak periods already results in overcrowded conditions throughout the MBTA network. Therefore, special note should be taken of any impacts to MBTA service from the proposed resort facility during weekday rush hours, and the DEIR should describe how any negative impacts could be mitigated.

The transit analysis in Section 5.8.1 identifies potential Project-related impacts to MBTA service during weekday rush hours.

DOT 37 The DEIR should identify, preferably in graphic format, how the facility's shuttle buses will access the Blue Line Station at Suffolk Downs... The Proponent should develop its site plan to ensure that the pickup and drop off of transit and shuttle bus passengers is seamless and easy for passengers, particularly those passengers with limited mobility.

The narrative and site plans in Section 1.1.1.5 illustrate how the shuttle bus connection at Suffolk Downs station will be enhanced.

DOT 38 The DEIR should identify, also preferably in graphic format, how pedestrians who choose to walk from the Blue Line Station or the local bus service will access the facility. The DEIR should demonstrate what the path of travel will be, and what steps will be taken to design and maintain a path of travel that is safe, accommodating, accessible and inviting.

Pedestrian connections to the Blue Line stations are presented in Section 1.1.1.5.

DOT 39 The Project site appears to be located within protected airport approach and/or transitional airspace areas as defined by state law (MGL c90 §35B) and Federal regulations (Federal Aviation Regulation Part 77)... Therefore, state and federal notice is required for the following:

- Proposed buildings;
- Proposed parking lots/parking structures;
- Proposed parking lot lights;
- Proposed permanent street lights and/or traffic lights;
- Proposed temporary installation of cranes that may be used to construct the structure/structures; and
- Proposed temporary lights that may be used during nighttime construction.

Table 3-1 identifies the anticipated permits, reviews, and approvals required for the Project; this table includes a Notice of Proposed Construction/Determination, as requested.

DOT 40 Any temporary lights that may be used during nighttime construction must be placed and aimed in such a way as to minimize glare to aircraft pilots. Light shielding must be incorporated into the design of all temporary lighting such as cranes and lighting used during nighttime construction and permanent lighting such as parking lot and traffic lights to reduce potential visual impact.

Construction-period lighting will be properly directed to minimize glare to aircraft pilots. Section 4.4 describes full-cutoff, energy-efficient site lighting.

DOT 41 Lighting and glare could occur if the Project employs reflective building materials or green technologies such as solar panels. Please ensure that any such materials are discussed with both Massport and MassDOT Aeronautics Division.

The Proponent has met with Massport and reviewed the proposed locations of the solar panels. A solar glare study is currently in progress and is discussed in Section 6.4. These issues will continue to be discussed with Massport and with MassDOT's Aeronautics Division.

DOT 42 Construction activities should be closely coordinated with Massport and the MassDOT Aeronautics Division. If temporary cranes, construction lights, or other heavy equipment will be used, or if dust and/or smoke are generated, Massport and the MassDOT Aeronautics Division must be able to ensure that appropriate notices to airmen can be issued (NOTAMS). Additionally, if cranes are to be used for construction purposes, the cranes must be appropriately marked and lighting according to U.S. Department of Transportation/FAA Advisory Circular 70/7460-1K... The temporary cranes shall also be lowered to the ground at night and/or when not in use.

The Proponent will coordinate construction activities with Massport and MassDOT and will maintain open communications with both agencies throughout the construction process. The Proponent will also comply with all federal, state, and local requirements for the transportation, erection, lighting, marking, and lowering of crane booms at night.

DOT 43 Although the Project is reducing the number of spaces compared to existing conditions, the DEIR should clarify how the parking needs of the Project were determined and explain the methodology used to determine the total parking required.

An analysis of parking demand and supply for the Project is presented in Section 5.10.

DOT 44 The DEIR should analyze the anticipated parking demand based upon parking needs and supplies for comparable facilities (based on multiple data sources, and discounted to allow for the urban location and available transit), the projected traffic demand at different times of day, the expected parking duration, and the different types of parking demand (e.g., casino patron, employee, hotel guest, etc.). The Proponent should propose parking policies that are designed to minimize parking demand and automobile use, such as fees for parking, parking cash-out policies, and other demand-reduction measures for employees.

The parking demand and supply analysis presented in Section 5.10 addresses patron and employee parking separately and takes into consideration the nature and context of the Project. Additional parking management actions and strategies are included in the TDM plan presented in Section 5.9.

DOT 45 The DEIR must include a proposed TDM program based on the Project proposal that would implement measures aimed at reducing site trip generation. The DEIR should further refine the TDM program in light of the regional context of the Project. The TDM plan should be based on the specific measures that have been successful in reducing trip generation for similar facilities, and should further investigate measures that would maximize usage of existing and new pedestrian,

bicycle, and transit facilities. Such measures should include subsidizing transit passes for both employees and patrons/hotel guests, limiting the available parking supply, providing on-site amenities and conveniences that would reduce the need for automobile travel, and shuttle services that fill unmet gaps in transit access for the proposed Project. The Proponent should provide a central, climate-controlled transit hub that is integrated into the facility so that transit provides access that is equivalent to or better than provided to patrons arriving by automobile.

A robust TDM plan is presented in Section 5.9, along with supporting site design and program elements identified elsewhere in Section 5.0 and described in more detail in Sections 1.0 and 4.0.

DOT 46 The Proponent should commit to hiring a full-time, dedicated Transportation Coordinator for the Project.

The TDM plan presented in Section 5.9 includes a commitment to designate a full-time employee as a Transportation Coordinator.

DOT 47 The DEIR should evaluate the feasibility of providing shuttle services that would run from remote parking locations within the casino market area, similar to the Logan Express Bus program that serves travelers and employees going to Logan Airport. MassDOT recommends that the Proponent investigate opportunities for partnering or emulating the existing program at Braintree, Framingham, Peabody and Woburn or other MBTA parking locations as mentioned above. To that end, the Proponent should develop a strong incentive program that would encourage both casino patrons and employees to use such services.

The proposed HOV shuttle plan for the Project is described in Section 5.8.3.2.

DOT 48 The Proponent should also seek to address the gap in overnight transportation service by reaching out to other transportation service providers such as the Massport Logan Express, internal airport shuttles, the MBTA sunrise service, the large shuttle operations within the Boston area, and the private regional/intercity bus lines that already serve South Station and other downtown destinations.

The shuttle plan described in Section 5.8.3.2 will be the primary approach to addressing the gap in overnight transit service. As part of that plan, the Proponent is committed to collaborating with other transportation providers including Massport, the MBTA, and private entities in the region.

DOT 49 The DEIR should identify what type of TDM programs will be implemented to ensure that employee use transit to the greatest degree possible. Specifically, the DEIR should identify how shifts will be scheduled so that all three shifts can utilize transit... The DEIR should describe how shifts will be laid out, and how tenants and

vendors at the facility will be encouraged to schedule shifts as well so as to promote transit usage as much as possible, while also being mindful of the weekday rush hour...

TDM measures to encourage use of transit by employees are included in the TDM plan in Section 5.9. As described in Section 5.4.2, the Resort will not have three traditional employee shifts; rather, there will be multiple shift changes throughout the day. Notwithstanding this, the Proponent has committed to adjusting employee shift times to the extent possible to reflect transit availability in the TDM plan, and to significantly limiting on-site employee parking as described in Section 5.0.

DOT 50 The DEIR should identify whether or not employee shuttles from remote locations will be used to allow employees to park and take shuttle buses to the facility. If so, the Proponent should work with the MBTA to see if a joint usage of parking facilities can be arranged at the MBTA parking locations such as the Lynn parking garage, Wellington Station, Anderson Intermodal Facility in Woburn, or other remote locations. The Proponent should work with the MBTA Parking Department to identify appropriate remote locations where a shared usage agreement can be arranged.

As described in Section 5.10.3, the Proponent proposes to shuttle employees from multiple remote locations, and will coordinate this plan with MassDOT, MBTA, Massport, and other entities to take advantage of any potential shared usage.

DOT 51 The DEIR should describe the full range of TDM proposals being considered by the Proponent and how those TDM concepts will be incorporated into the operations of the facility. The DEIR should also propose how these TDM ideas can be tracked and evaluated during operations so that they can be regularly reviewed and updated as appropriate.

The TDM plan presented in Section 5.9 incorporates a diverse range of actions, strategies, and policies including monitoring commitments to be developed in coordination with MassDOT, BTD, and others.

DOT 52 The TDM program should identify existing and proposed connections for pedestrians and bicyclists, analyze their existing and future conditions based on the Project's impacts, and commit to making improvements that will increase usage of those modes. The site plan should also provide pedestrian and bicycle connections t existing land uses within close proximity to the Project site, maximize the connectivity and permeability of the site edges, and provide excellent pedestrian and bicycle connections within the Project site. The Proponent should provide ample bicycle parking, including both secure, weather-protected bicycle parking for

employees and highly-visible bicycle parking near the entrances for customers, on-site showers, lockers, and changing facilities, and financial incentives to encourage employees and customers to walk, bicycle, or ride public transit to the site.

The TDM plan in Section 5.9 incorporates incentives for pedestrian and bicycle travel, including off-site improvements described in Sections 5.8.2 and 5.8.3. As described in Section 1.1.1.5, the Project site plan has been designed to incorporate accommodations and linkages for pedestrians and bicycles within and through the site, complemented by strong connections to surrounding land uses. Bicycle parking will be provided in accordance with BTD guidelines (see Section 5.8.3).

DOT 53 The Project Proponent should consult with MassRides, the Commonwealth's travel options service, as well as the Logan Transportation Management Association. These travel options services can help the Proponent identify potential trip reduction measures, especially those targeting employees, and support implementation of the TDM program.

The Proponent is committed to working with MassRides and the Logan TMA in the further development and refinement of the Project's TDM plan.

DOT 54 The Proponent should provide charging stations for plug-in electric vehicles, and reserve these spaces for such vehicles.

As described in Section 2.2.1, the Project includes charging stations with designated parking spaces.

DOT 55 The DEIR should identify incentives for both patrons and employees to use high occupancy vehicles, either in the form of financial incentives or priority treatments such as preferred parking spaces. The Proponent should also promote ridesharing through NuRide, the Commonwealth's web-based trip planning and Ridematching service that enables participants to earn rewards for taking "green" trips.

The TDM plan for the Project includes a variety of incentives for HOV use and ridesharing (see Section 5.9).

DOT 56 As part of the Project mitigation program, the Project Proponent should commit to implement a transportation monitoring program to be conducted upon the occupancy of the Project. The goals of the transportation monitoring program will be to evaluate the assumptions made in the DEIR and the adequacy of the transportation mitigation measures, as well as to determine the effectiveness of the TDM program. The Project Proponent shall discuss with MassDOT an appropriate timeframe for the monitoring program, or commit to initiating the monitoring program upon MassDOT's request... If the traffic monitoring program indicates that the proposed mitigation is not effective in accommodating the future traffic volumes

at key area intersections impacting the state highway system, the Project Proponent will be responsible for identifying and implementing operational improvements at these constrained locations.

The TDM plan includes monitoring commitments to be developed in coordination with MassDOT, BTD, and others (see Section 5.9).

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS
OFFICE OF COASTAL ZONE MANAGEMENT
251 Causeway Street, Suite 800, Boston, MA 02114-2136
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MEMORANDUM

TO: Richard K. Sullivan, Secretary, EEA
ATTN: Deirdre Buckley, MEPA Unit
FROM: Bruce Carlisle, Director, CZM
DATE: March 26, 2013
RE: EEA 15006 – Caesars Resort at Suffolk Downs

The Massachusetts Office of Coastal Zone Management (CZM) has completed its review of the above-referenced Environmental Notification Form (ENF), noticed in the *Environmental Monitor* dated February 6, 2013 and recommends that the following issues be addressed in the Draft Environmental Impact Report (DEIR).

Project Description

The project site is the 161 acre Suffolk Downs site, New England's only operating thoroughbred racetrack, located in East Boston and Revere. The site includes a grandstand and clubhouse buildings, one-mile racetrack, horse stables for approximately 1,000 horses, parking, and maintenance facilities. Portions of the project site are located in the Rumney Marshes Area of Critical Environmental Concern (ACEC) including Sales Creek as it flows through the site and discharges into the Belle Isle Inlet. The ENF states that a previous ENF for the site filed in May 2011 included a stormwater separation project that was completed in 2012 as required by the U.S. Environmental Protection Agency for an Individual National Pollutant Discharge Elimination System Permit for Concentrated Animal Feeding Operations. The new wastewater drainage system provides drainage from the stable area to a retention pond inside the racetrack, within both the 100 foot buffer zone and the Riverfront Area. The wastewater is then pumped from the retention pond to the Boston Water and Sewer Commission's (BWSC) sanitary sewer system within Walley Street. Stormwater from stable rooftops is collected and discharged into existing drain systems to Sales Creek.

The proposed project includes the redevelopment of the site and the construction of two gaming areas, up to 450 guest rooms in two hotels, a multi-purpose meeting/entertainment space, dedicated covered parking, a central utility plant, fine dining, and retail space. The ENF states that the racetrack will continue to operate and the project will also involve ongoing maintenance in the existing horse barn area which will include replacing or improving horse barns as necessary. Primary access to the site is from Route 1A in East Boston. Additional access is provided from Winthrop Avenue at the northern end of the property. The site is also served by the MBTA Blue Line with both the Suffolk Downs and Beachmont stops adjacent to the site. The project includes roadway improvements, landscaping, and an on-site stormwater management system.

Project Comments

CZM commends the proponent for their commitment to sustainable design with a goal of LEED Gold and sustainable approach on floodplain management, sea level rise, greenhouse gas emissions, and climate change preparedness. A commitment to sustainable design is especially important in this location, as a portion of the project site is located within the Rumney Marshes ACEC, including Sales Creek and a portion of the track and stable areas. As such, a higher level of scrutiny applies to the proposed project and its effects on each of the public interests listed in the Secretary's designation of the Rumney Marshes ACEC; flood control, the prevention of storm damage, the protection of land containing shellfish and fisheries, the prevention of pollution, the protection of wildlife habitat, and the protection of public and private water supplies.

CZM recommends that additional information on the proposed stormwater system be included in the DEIR. Plans should include elevation contours, locations and types of best management practices, existing and proposed drainage patterns, and detailed information about wetland construction and function. **CZM 01** Water quality improvements are listed in the ENF as a public benefit from the proposed project and CZM recommends that the DEIR include details about how the project will provide these water quality improvements on site, particularly in the stable area where stormwater management will directly affect water quality in Sales Creek and the Rumney Marshes ACEC. **CZM 02** While the recent improvements to the stable area to separate stormwater and waste water will provide water quality improvements for the most frequent storm events, a greater than 25 year storm event would result in wastewater spilling over into Sales Creek. **CZM 03** Considering the proponent's commitment to sustainable, green design, CZM recommends that the DEIR include details regarding upgrades to the horse barns and any stable area stormwater improvements proposed to address this issue. Stormwater system design included in the DEIR should consider projections in increased precipitation resulting from climate change. **CZM 04**

CZM commends the project proponent for considering the impacts of sea-level rise on the proposed project. The ENF states that the National Oceanic and Atmospheric Administration estimate a sea level rise of approximately .87 feet over the next century. However, these data actually reflect the .87 feet of sea level rise that has occurred over the last century according to tidal gauge data, and represent historic records, not projections. While the National Coastal Vulnerability Index (CVI) provides insight into the relative potential of coastal change due to sea level rise and highlights regions where various effects of sea level rise may be greatest, the CVI was applied to our region in 1999 and only provides a broad scale view of potential impacts. The Massachusetts Climate Change Adaptation Report (2011) presents projections of sea level rise over a range of scenarios by 2050 and 2100. The Intergovernmental Panel on Climate Change projections are recognized as too conservative, so the Rahmstorf low (20") and middle emissions scenarios (32") by 2100 are reasonable starting points for adaptation efforts. At a minimum, CZM recommends all projects evaluate impacts of two feet of sea level rise. **CZM 05** According to the ENF, the proposed new buildings would have ground floors well above the BFE, but more details are needed to evaluate the effect of sea level rise on the site comprehensively with attention to existing buildings, the track and stable area, and proposed stormwater management system.

Federal Consistency Review

The proposed project may be subject to CZM federal consistency review, and therefore must be found to be consistent with CZM's enforceable program policies. **CZM 06** For further information on this process, please contact Robert Boeri, Project Review Coordinator, at 617-626-1050, or visit the CZM web site at www.mass.gov/czm.

BKC/kg/vg

cc: Kathryn Glenn, CZM
Valerie Gingrich, CZM
Ben Lynch, DEP Waterways
Nancy Baker, MassDEP
Stephanie Kruel, Boston Conservation Commission
Andrew DeSantis, Revere Conservation Commission

CZM 01 **CZM recommends that additional information on the proposed stormwater system be included in the DEIR. Plans should include elevation contours, locations and types of BMPs, existing and proposed drainage patterns, and detailed information about wetland construction and function.**

Section 9.3 describes the Project's drainage design.

CZM 02 **Water quality improvements are listed in the ENF as a public benefit from the proposed project and CZM recommends that the DEIR include details about how the project will provide these water quality improvements on site, particularly in the stable area where stormwater management will directly affect water quality in Sales Creek and the Rumney Marshes ACEC.**

The 2.3-acre portion of the stable area that will be used for parking will no longer be considered part of the CAFO following construction; therefore, stormwater from this area will discharge to the proposed stormwater system and not to the recently-constructed sanitary system (see Section 9.3).

CZM 03 **While the recent improvements to the stable area to separate stormwater and wastewater will provide water quality improvements for the most frequent storm events, a greater than 25-year storm event would result in wastewater spilling over into Sales Creek... CZM recommends that the DEIR include details regarding upgrades to the horse barns and any stable area stormwater improvements proposed to address this issue.**

Suffolk Downs' CAFO generates three water-related discharges. The first stems from precipitation that falls on stable buildings, which is diverted into gutters, downspouts, and drain lines without any contact with horses. The second results from precipitation that falls on the stable grounds (i.e., "process water," and not "wastewater"), which runs into ground-level catch basins and drain lines that lead to a holding pond and thereafter enters the BWSC sewer system. The third consists of a minor amount of sanitary sewage, which remains within dedicated sewer lines at all times. The pond constructed by Suffolk Downs in 2011-2012 is designed to hold all of the process water generated by the CAFO and has the capacity to accommodate a 50-year storm event. The pond's design exceeds EPA regulatory requirements under the federal Clean Water Act, which call for a holding pond sized only for a 25-year event. MassDEP has certified to EPA, in connection with Suffolk Downs' application for a NPDES permit, that use of a holding pond to capture all process water generated up to a 50-year storm event allows Suffolk Downs to meet all applicable state water quality anti-degradation standards.

CZM 04 **Stormwater system design included in the DEIR should consider projections in increased precipitation resulting from climate change.**

The Proponent is reviewing and considering all aspects of climate change as the Project design progresses; Section 2.3 describes climate change adaptation.

CZM 05 **At a minimum, CZM recommends all projects evaluate impacts of two feet of sea level rise. According to the ENF, the proposed new buildings would have ground floors well above the BFE, but more details are needed to evaluate the effect of sea level rise on the site comprehensively with attention to existing buildings, the track and stable area, and proposed stormwater management system.**

Section 2.3 describes the Resort's climate change adaptation measures.

CZM 06 **The proposed project may be subject to CZM federal consistency review, and therefore must be found to be consistent with CZM's enforceable project policies.**

The list of anticipated permits, reviews, and approvals is provided in Table 3-1. As currently proposed, the Project does not require any federal actions that are subject to the CZM's federal consistency requirement. This fact notwithstanding, information demonstrating consistency with CZM's enforceable policies is provided in Section 6.8.

03-28-2013
Caesars Resort at Suffolk Downs
ENF - Stationary GHG Sources
DOER Comments
JJ Ballam

The DOER would like to acknowledge the level of detail of the description included in the ENF. The DOER notes that a "sustainable design / green building "is one of the benefits to be provided to the community by the project. The DOER reminds the proponent that a primary element of any green building design is to limit the amount the emission of greenhouse gasses by adopting measures that will reduce the consumption of electricity and non-renewable fuels to the lowest amount feasible. In addition, the DOER commends the proponent on identifying a related goal of providing a project that will serve an example of sustainable design and operation to the surround communities and visiting public.

Effective Code:
Boston has adopted the Mass Stretch Energy Building Code (SC). For projects to be located in jurisdictions which have adopted the SC, the MEPA Policy and Protocol (Policy) requires that the energy modeling of the baseline and as-proposed (as-designed) cases of all proposed buildings with areas greater than 100,000 sf be performed in compliance with the rules and methods as contained in the ASHRAE standard 90.1 – 2007 appendix G (energy only).

The DEIR:

With respect to the stationary sources of GHG, the DEIR should comply fully with MEPA's GHG Policy and Protocol (the Policy), and include at minimum the following: **DOER 01**

- A detailed description of the as-proposed project with emphasis on the envelope, mechanical and electrical systems for each building.

- A description of all the design and or operating measures that were evaluated. These should categorized as either adopted, under further consideration, to be considered post FEIR, or rejected. Discussion of the reasons for not adopting a measure under consideration should be included.

- A description of the building energy simulation model and procedures utilized.

- A detailed and complete table of modeling inputs showing the item and the input value for both the base and as-designed scenarios. The area of the building should be included.

- The output of the model showing the monthly and annual energy consumption, totalized and by major end use system.

- If e-QUEST is to be used, the project modeling files should be submitted on a flash drive.

Based on the information as submitted, the project as described provides both a challenge and an opportunity. The challenge is due to the presence of factors which drive energy consumption some of which are:

- A 24/7 operating schedule
- Large open gaming rooms with high density occupancy which will drive ventilation, lighting and plug loads.
- A hotel with large hot water and standby loads.
- A large of amount of glass curtain wall.

The opportunities include:

General:

Building Envelope:

- For any wall for which the glazed area exceeds 50% of the total area, select high performance glazing systems with insulating, emissivity and solar heat gain factors which exceed the minimum code performance by at least 30%. **DOER 02**
- Careful analysis of sources and minimization of uncontrolled infiltration

HVAC

- Selection of equipment with rated efficiencies well above the code required minimum. **DOER 03**
- Minimization of pressure drops for all duct and pipe systems.
- Provide enough thermal zones to enable a sufficient level of discreet control.

Electrical:

- Selection of highly efficient (including LED) units **DOER 04**
- Custom (as opposed to plan) layout of lighting fixtures
- Use of Energy Star rated machines and appliances throughout.
- Ensure that energy consumption is a factor in the selection of special equipment (such as slot machines).
- Design of distribution system to minimize feeder losses and maximize power factor.

Adoption of on-site renewable energy

Energy Management System: An EMS will be critical to the success of operating the project to maintain the as-designed performance. **DOER 05**

Independent Commissioning of project systems.

Central Plant:

Adopt CHP (with absorption chillers) sized to meet the heating and cooling loads of the project campus. Include the substantial CAPex and performance based incentives available to qualified CHP systems in Mass. when evaluating the economic feasibility. **DOER 06**

As the resort will be a facility serving a large number of visitors at any given time, careful consideration should be paid to the its ability to withstand the impact of loss of grid power especially in conjunction with a flood condition, such as would be possible in a storm similar to the recent "Sandy". **DOER 07**

Consideration should also be given to the possible use of the buildings as a safe haven for the public use during an extreme event.

In either scenario, adoption of a CHP central plant system that will be able to continue to supply off-grid power, heat and cooling during such an eventuality would be a critical asset.

Oversize cooling towers.

Use variable speed drives for all motors.

Casino

Reduction of ventilation driven HVAC loads: **DOER 08**

- Adoption of both demand controlled and energy recovery ventilation.

Hotel

- Adoption of water source heat pumps for guest rooms

MASSACHUSETTS DEPARTMENT OF ENERGY RESOURCES

DOER 01 With respect to the stationary sources of GHG, the DEIR should comply fully with MEPA's GHG Policy and Protocol (the Policy), and include at minimum the following:

- A detailed description of the as-proposed Project with emphasis on the envelope, mechanical and electrical systems for each building.
- A description of all the design and/or operating measures that were evaluated. These should be categorized as either adopted, under further consideration, to be considered post-FEIR, or rejected. Discussion of the reasons for not adopting a measure under consideration should be included.
- A description of the building energy simulation model and procedures utilized.
- A detailed and complete table of modeling inputs showing the item and the input value for both the base and as-designed scenarios. The area of the building should be included.
- The output of the model showing the monthly and annual energy consumption, totalized and by major end use system.
- If e-QUEST is to be used, the Project modeling files should be submitted on a flash drive.

Please see the GHG analysis in Section 7.0 and Attachment D.

DOER 02 Opportunities [regarding building envelope] include:

- For any wall for which the glazed area exceeds 50% of the total area, select high performance glazing systems with insulating, emissivity and solar heat gain factors which exceed the minimum code performance by at least 30%.
- Careful analysis of sources and minimization of uncontrolled infiltration.

Glazing performance values are provided in Attachment D.1. Infiltration control is an integral part of any design development.

DOER 03 Opportunities [regarding HVAC] include:

- Selection of equipment with rated efficiencies well above the code-required minimum.
- Minimization of pressure drops for all duct and pipe systems.
- Provide enough thermal zones to enable a sufficient level of discrete control.

The HVAC design will include equipment with efficiencies above code-required minimums, relatively low pressure drops through air systems, and a relatively high number of thermostatic control zones (see also Attachment D.1).

DOER 04 Opportunities [regarding electrical] include:

- Selection of highly-efficient (including LED) units.
- Custom (as opposed to plan) layout of lighting fixtures.
- Use of Energy Star rated machines and appliances throughout.
- Ensure that energy consumption is a factor in the selection of special equipment (such as slot machines).
- Design distribution system to minimize feeder losses and maximize power factor.

These items are discussed in the GHG analysis in Section 7.0.

DOER 05 An [Energy Management System] will be critical to the success of operating the Project to maintain the as-designed performance.

EMS are addressed in Section 7.2.8. An EMS is included in the building design and will allow the operator to monitor performance of mechanical and electrical building systems. In addition, provisions for metering of power uses will be incorporated into the electrical design.

DOER 06 Adopt CHP (with absorption chillers) sized to meet the heating and cooling loads of the Project campus. Include the substantial CAPex and performance-based incentives available to qualified CHP systems in Massachusetts when evaluating the economic feasibility.

These items are discussed in the GHG analysis in Section 7.0. CHP is included in the building design. Waste heat will be used to generate domestic hot water while the generated electricity will power building systems. This configuration will result in high overall efficiency because the domestic water heat load is a good "base load," available throughout the year as a heat sink. Larger CHPs and absorption chilling were considered but were rejected due to aesthetic, maintenance, and reliability concerns, CUP facility concept mismatch, and economics (see Section 7.4.2).

DOER 07 As the resort will be a facility serving a large number of visitors at any given time, careful consideration should be paid to its ability to withstand the impact of loss of grid power especially in conjunction with a flood condition... Consideration should also be given to the possible use of the buildings as a safe haven for the public use

during an extreme event. In either scenario, adoption of a CHP central plant system that will be able to continue to supply off-grid power, heat and cooling during such an eventuality would be a critical asset.

The facility will have emergency, life safety, and select additional loads (e.g., heating capacity, critical space cooling [e.g., server rooms], and some refrigerated food storage) backed up by emergency generators (4 megawatts of installed capacity are anticipated). In addition, the critical infrastructure (e.g., generators, heating plant, cooling plant, and air handling capacity) will be located above the 100-year floodplain. These measures will help the facility withstand a flood in conjunction with loss of grid power, and help the facility serve as a safe haven.

DOER 08 [Opportunities for the casino building associated with] reduction of ventilation-driven HVAC loads [include]: adoption of both demand-controlled and energy recovery ventilation.

These items are discussed in the GHG analysis in Section 7.2. Both demand-controlled ventilation and energy recovery will be used in the HVAC design associated with the casino and other buildings.

DOER 09 [Opportunities for the hotel include] adoption of water source heat pumps for guest rooms.

WSHPs are discussed in the GHG analysis in Section 7.4.2.

DB

The Commonwealth of Massachusetts

William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

RECEIVED
MAR 26 2013
MEPA

March 26, 2013

Secretary Richard K. Sullivan, Jr.
Executive Office of Energy and Environmental Affairs (EEA)
100 Cambridge Street, Suite 900
Boston MA 02114

ATTN: Dierdre Buckley, MEPA Unit

RE: Caesars Resort at Suffolk Downs, Suffolk Downs Racecourse, Rt 1A McCellan Hwy, Boston (East Boston) & Revere, MA; MHC# RC.53753, **EEA# 15006**

Dear Secretary Sullivan:

The Massachusetts Historical Commission (MHC) is in receipt of an Environmental Notification Form (ENF) for the project referenced above. The staff of the Massachusetts Historical Commission (MHC) has reviewed the information submitted and has the following comments.

This project proposes the construction of two distinct gaming areas, referred to as Casino Area I and Casino Area II, to include up to 450 guestrooms in two hotels, a multi-purpose meeting/entertainment space, dedicated covered parking, fine dining, and retail space. The ENF discloses that the project will require permits and/or licenses from the Massachusetts Gaming Commission, the Massachusetts Department of Transportation (MassDOT) Highway Division, the Department of Conservation and Recreation (DCR), and the Massachusetts Water Resources Authority (MWRA).

The proposed project also involves changes to the existing buildings associated with the Suffolk Downs racetrack, including renovation of the Grandstand and Clubhouse, demolition of the existing link between the Grandstand and Clubhouse, demolition of the Office Building and Utility Building, and retention of the existing horse barns.

The Suffolk Downs Clubhouse, Grandstand, and Racetrack (BOS.209) are included in MHC's *Inventory of Historic and Archaeological Assets of the Commonwealth* and may meet the criteria of eligibility for listing in the State and National Registers of Historic Places. Additional information would be required for the MHC to fully evaluate the property, including an updated MHC Form A (Area Form) complete with current color photographs of all extant buildings and features, together with dates of construction and alterations, if available. The MHC requests that this information be submitted prior to the filing of the Draft Environmental Impact Report (DEIR), if possible, in order for the MHC to determine whether these historic properties are eligible for listing in the National and State Registers of Historic Places. **MHC 01**

The project location is immediately adjacent to the Revere Beach Parkway (REV.H), which is listed in the State and National Registers of Historic Places. It is unclear from the submission if the proposed project will require alterations to this historic resource. The MHC requests that the DEIR clearly identify any and all potential alterations to the Revere Beach Parkway. **MHC 02**

220 Morrissey Boulevard, Boston, Massachusetts 02125
(617) 727-8470 • Fax: (617) 727-5128
www.sec.state.ma.us/mhc

These comments are offered to assist in compliance with Section 106 of the National Historic Preservation Act of 1966 (36 CFR 800), M.G.L. Chapter 9, Section 26-27C, (950 CMR 71.00) and MEPA (301 CMR 11). Please do not hesitate to contact Brandee Loughlin of my staff if you have any questions.

Sincerely,

Brona Simon

Brona Simon
State Historic Preservation Officer
Executive Director
Massachusetts Historical Commission

xc: Chip Tuttle, Chief Operating Officer, Suffolk Downs
Patrice Kish, DCR
MassDOT District 6
Boston Landmarks Commission
Revere Historical Commission
Corinne Snowdon, Epsilon Associates, Inc.

MASSACHUSETTS HISTORICAL COMMISSION

MHC 01 **The Suffolk Downs Clubhouse, Grandstand, and Racetrack (BOS.209) are included in MHC's *Inventory of Historic and Archaeological Assts of the Commonwealth* and may meet the criteria of eligibility for listing in the State and National Registers of Historic Places. Additional information would be required for the MHC to fully evaluate the property, including an updated MHC Form A (Area Form) complete with current color photographs of all extant buildings and features, together with dates of construction and alterations, if available. The MHC requests that this information be submitted prior to the filing of the DEIR, if possible, for the MHC to determine whether these historic properties are eligible for listing in the National and State Registers of Historic Places.**

An updated MHC Form A was submitted to the MHC and BLC on July 3, 2013. A copy of the inventory form is included as Attachment J.

MHC 02 **The Project location is immediately adjacent to the Revere Beach Parkway (REV.H), which is listed in the State and National Registers of Historic Places. It is unclear from the submission if the proposed Project will require alterations to this historic resource. The MHC requests that the DEIR clearly identify any and all potential alterations to the Revere Beach Parkway.**

Potential alterations to the Revere Beach Parkway associated with the Project are described in Sections 5.0 and 8.0.

MASSACHUSETTS WATER RESOURCES AUTHORITY

Charlestown Navy Yard
100 First Avenue, Building 39
Boston, MA 02129

Frederick A. Laskey
Executive Director

Telephone: (617) 242-6000
Fax: (617) 788-4899
TTY: (617) 788-4971

February 26, 2013

Richard K. Sullivan Jr., Secretary
Executive Office of Energy and Environmental Affairs
100 Cambridge St, Suite 900
Attn: MEPA Office, Deirdre Buckley
Boston, MA 02114

Subject: Environmental Notification Form - EOEEA #15006
Caesars Resort at Suffolk Downs, East Boston and Revere, MA

Dear Secretary Sullivan:

The Massachusetts Water Resources Authority (MWRA) appreciates the opportunity to comment on the Environmental Notification Form (ENF) for the Caesars Resort at Suffolk Downs (the Project) in East Boston and Revere proposed by Sterling Suffolk Racecourse, LLC, (the Proponent). The Proponent is the owner of the 161-acre site where it currently operates the historic Suffolk Downs, a thoroughbred horse racing facility (the property). The proposed mixed use development would use the majority of the open space at the site, including the racetrack and infield area (which will be preserved as part of the proposed casino development. The Project calls for the development of two distinct gaming areas (referred to as "Casino Area I" and "Casino Area II"), up to 450 guestrooms in two hotels, a multi-purpose meeting/entertainment space, dedicated covered parking, fine dining, and retail space. The project construction will commence following receipt of the gaming license and necessary permits.

The project includes major off-site roadway, traffic and safety improvements which are in the planning stage to be designed in consultation with the Massachusetts Department of Transportation (MassDOT) and City of Boston including Boardman Street improvements and a Route 1A flyover, and an additional southbound lane on Route 1A. Improvements are also proposed to the Route 1/ Route 16 interchange along Revere Beach Parkway, and in the cities of Revere and Chelsea to address long-standing regional traffic issues and these issues will be addressed in the Draft Environmental Impact Report (DEIR).

MWRA comments focus on issues related to wastewater flows, sewer discharge permitting within the Toxic Reduction and Control (TRAC) Department and the potential need for an 8 (M) Permit from the Water Permitting Field Operations Group.

Wastewater Flows

According to the ENF, sanitary sewage generated by the Project will be collected at two proposed on-site sewage pumping stations, which will discharge their flows to Boston Water and Sewer Commission (BWSC) sewers that drain to BWSC's East Boston Low Level

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Sewer (EBLLS), along with the flows from Concentrated Animal Feed Operations (CAFO) associated with the horse racing. The EBLLS is a 24-inch sewer at its upstream end near the MBTA Suffolk Downs station and becomes a 30-inch sewer a short distance away on Leverett Avenue, then proceeds as a 36-inch sewer in an easterly direction generally parallel to or within the right of way of Bennington Street. Along the way, the EBLLS collects sanitary flows from lower lying areas of East Boston, many created by historical land filling.

The EBLLS increases to a 39-inch by 54-inch sewer and eventually discharges its accumulated flows to MWRA's Caruso Pump Station located adjacent to the Chelsea Creek at the Chelsea Street Bridge. Caruso Pump Station lifts its flows into MWRA's North Metropolitan Trunk Sewer, which conveys the flows to the Deer Island treatment plant. There are no combined sewer overflows (CSO) along the EBLLS or along local systems connected to the EBLLS, though there once was a CSO outfall (BOS002/MWR207) on the tributary BWSC Moore Street Interceptor. This CSO was closed by BWSC in 2000 in accordance with MWRA's long-term CSO control plan which called for eliminating CSO discharges to Constitution Beach. The closing of this outfall ended CSO discharges to the beach and allowed MWRA to decommission its Constitution Beach CSO treatment facility.

In addition to receiving flows from the EBLLS, the Caruso Pump Station receives flows from MWRA's East Boston Branch Sewer (EBBS), as well as wet-weather related overflows from MWRA's Chelsea Screen House and Chelsea Creek Headworks, both located on the Chelsea side of Chelsea Creek, in large storms. The EBBS in East Boston and sewers tributary to the Chelsea facilities can overflow at several BWSC and City of Chelsea CSO outfalls to the Chelsea River and the Inner Harbor when flows exceed pipe capacities or when total flow to the Caruso Pump Station exceeds its pumping capacity. Higher flows to the tributary systems, including higher flows to the EBLLS from the Project, will contribute higher flows to Caruso Pump Station in large storms, potentially increasing CSO discharges. **MWRA 01**

The results of hydraulic model investigations conducted last year by MWRA when Suffolk Downs proposed to add CAFO flows to the BWSC and MWRA systems also show that the capacity of the EBLLS can be exceeded in large storms, due to high volumes of infiltration (groundwater) and inflow (stormwater) that can enter the otherwise separate sanitary sewer system. Surcharging of the EBLLS potentially contributes to local system backups that could put lower lying areas, like the neighborhoods tributary to the Moore Street Interceptor, at risk. In large storms, the primary contributors to surcharging are backwater from Caruso Pump Station and local capacity limitations in the EBLLS, especially immediately downstream of the Moore Street Interceptor Connection. MWRA responded to these findings and potential risks by including in the CAFO discharge permit a condition requiring Suffolk Downs to install a flow depth sensor, monitor hydraulic conditions in the EBLLS, and suspend its CAFO discharges when wet weather flows in the EBLLS rise to near-full-pipe capacity. According to the ENF, the Proponent plans to work with BWSC to evaluate the performance of the BWSC sewer system and the effects of the higher sanitary flows that will be generated by the Suffolk Downs project. **MWRA 02**

The ENF reports that the project will increase wastewater flow from the Suffolk Downs site by 307,080 gallons per day (gpd) – 185% of the current 166,020 gpd sanitary

flow. The ENF also reports that Suffolk Downs discharges 150,000 gpd of CAFO flow to the EBLLS system. MWRA is implementing an $860 million program of local and regional wastewater system improvements to control CSOs and improve receiving water quality, including water quality in Chelsea Creek and Boston Inner Harbor. The impacts of new sanitary flows to the local sewers and MWRA facilities should be fully offset to help ensure that the benefits of CSO control, including water quality improvement, will be realized and sustained for the long term.

To avoid increasing CSO discharges or otherwise compromising CSO control goals, the Proponent should fully offset new flows to the sewer system with infiltration/inflow ("I/I") removal or sewer separation (i.e. stormwater inflow reduction) in a hydraulically related sewer system(s). Any net increase of flow should be mitigated in strict compliance with MassDEP's Policy on Managing Infiltration and Inflow in MWRA Community Sewer Systems (BRP 09-01) and with BWSC policy and regulations. BWSC has offset requirements that should be satisfied to ensure that the new sanitary flows will not contribute to higher CSOs or other system problems. The DEIR should describe how the Proponent will satisfy these requirements. **MWRA 03**

TRAC Discharge Permitting

The MWRA prohibits the discharge of groundwater to the sanitary sewer system, pursuant to 360 C.M.R. 10.023(1) except in a combined sewer area when permitted by the Authority and the municipality. The proposed Project will have access to a storm drain and it is not located in a combined sewer area; therefore, the discharge of groundwater to the sanitary sewer system is prohibited. The Proponent will need to secure a USEPA-NPDES General Permit for Storm Water Discharges from its construction activities. **MWRA 04**

The Proponent currently holds an MWRA Sewer Use Discharge Permit (#49403698, Category 01, Significant Industrial User), and is subject to the National Categorical Pretreatment Standards, 40 C.F.R. 412 - Concentrated Animal Feeding Operations (CAFO) Point Source Category, Subpart A-Horses and Sheep Subcategory 412.10. Sterling Suffolk Racecourse, LLC, will need to continue to adhere to its Sewer Use Discharge Permit that authorizes the discharge from the animal feeding and handling areas. If Sterling Suffolk Racecourse, LLC, intends to change its current operation(s) and/or discharge(s) such as increasing its daily wastewater discharge flow from the animal feeding and handling areas and support activities, the Proponent must provide at least 30 days advance written notification to John Norton, Jr., Industrial Coordinator, MWRA, TRAC, 2 Griffin Way, Chelsea, MA 02150. The notification is required before it takes any action which may substantially change the volume or nature of its discharge including an increase of daily discharge flow or character of pollutants in its discharge, from any compliance measurement location or any sewer connection. **MWRA 05**

Once the hotels are completed and if the Proponent intends to operate a laundry on the premises, a Sewer Use Discharge Permit is required from the MWRA for the discharge of laundry effluent into the sanitary sewer system. For assistance in obtaining this permit, a representative from the hotel should contact Mr. John Norton, Jr., Industrial Coordinator within the TRAC Group at (617) 305-5656. The Proponent must have an MWRA Sewer Use Discharge Permit prior to discharging wastewater from its laundry operations into the MWRA sanitary sewer system. **MWRA 06**

Lastly, the Proponent must also comply with 360 C.M.R. 10.016, if it intends to install gas/oil separator(s) in the enclosed car parking garages. In addition to complying with 360 C.M.R. 10.000, the Proponent will need to conform to the regulations of the Board of State Examiners of Plumbers and Gas Fitters, 248 C.M.R. 2.00 (State Plumbing Code), and all other applicable laws. The installation of the proposed gas/oil separator(s) will require MWRA approval and may not be back filled until inspected and approved by the MWRA and the Local Plumbing Inspector. For assistance in this approval, the Proponent should contact Mr. Thomas J. Coffey, Source Coordinator at (617) 305-5624. **MWRA 07**

Section 8 (m) Permitting

Section 8 (m) of Chapter 372 of the Acts of 1984, MWRA's Enabling Legislation, enables the MWRA to issue permits to build, construct, excavate, or cross within or near an easement or other property interest held by the MWRA, with the goal of protecting Authority-owned infrastructure. The project includes an upgrade to the existing water connection in Waldemar Avenue and a second connection located near Route 1A entrance.

MWRA has section 97A and Section 55 water mains near the entrance to the project in Boston. There are also Sections 16, 69 and 97 and 97A in Revere. It is likely that the Proponent will need an MWRA 8(m) permit. We encourage the Project Proponent and/or their consultants to contact Mr. Ralph Francesconi within MWRA's Water Permitting Group at (617) 350-5827 for permitting assistance early in the design process. **MWRA 08**

Should you have any questions or need additional information on these comments please feel to contact me at (617) 788-1165.

Sincerely,

Marianne Connolly

Marianne Connolly,
Senior Program Manager, Environmental Review and Compliance

cc: David Kubiak, MWRA Engineering and Construction
Kattia Thomas, MWRA TRAC
Ralph Francesconi, Water Operations
Kevin Brander, DEP

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MASSACHUSETTS WATER RESOURCES AUTHORITY (MWRA)

MWRA 01 In addition to receiving flows from the EBLLS, the Caruso Pump Station receives flows from MWRA's East Boston Branch Sewer (EBBS), as well as wet-weather-related overflows from MWRA's Chelsea Screen House and Chelsea Creek Headworks, both located on the Chelsea side of Chelsea Creek, in large storms. The EBBS in East Boston and sewers tributary to the Chelsea facilities can overflow at several BWSC and City of Chelsea CSO outfalls to the Chelsea River and the Inner Harbor when flows exceed pipe capacities or when total flow to the Caruso Pump Station exceeds its pumping capacity. Higher flows to the tributary systems, including higher flows to the EBLLS from the Project, will contribute higher flows to Caruso Pump Station in large storms, potentially increasing CSO discharges.

The Proponent is continuing to work with BWSC and the MWRA regarding mitigation for increases in wastewater flows (see Section 9.1).

MWRA 02 The results of hydraulic model investigations conducted last year by MWRA... also show that the capacity of the EBLLS can be exceeded in large storms due to high volumes of infiltration (groundwater) and inflow (stormwater) that can enter the otherwise separate sanitary sewer system. Surcharging of the EBLLS potentially contributes to local system backups that could put lower lying areas... at risk... The ENF reports that the Project will increase wastewater flow from the Suffolk Downs site by 307,080 gpd – 185% of the current 166,020 gpd sanitary flow. The ENF also reports that Suffolk Downs discharges 150,000 gpd of CAFO flow to the EBLLS system. MWRA is implementing an $860 million program of local and regional wastewater system improvements to control CSOs and improve receiving water quality... The impacts of new sanitary flows to the local sewers and MWRA facilities should be fully offset to help ensure that the benefits of CSO control, including water quality improvement, will be realized and sustained for the long term.

The Proponent is continuing to work with BWSC and the MWRA to provide mitigation for increases in wastewater flows (see Section 9.1).

MWRA 03 To avoid increasing CSO discharges or otherwise compromising CSO control goals, the Proponent should fully offset new flows to the sewer system with I/I removal or sewer separation (i.e., stormwater inflow reduction) in a hydraulically related sewer system(s). Any net increase of flow should be mitigated in strict compliance with MassDEP's Policy on Managing Infiltration and Inflow in MWRA Community Sewer Systems (BRP 09-01) and with BWSC policy and regulations.

The Proponent is continuing to work with BWSC and the MWRA to provide mitigation for increases in wastewater flows (see Section 9.1).

MWRA 04 **The proposed Project will have access to a storm drain and it is not located in a combined sewer area; therefore, the discharge of groundwater to the sanitary sewer system is prohibited. The Proponent will need to secure a USEPA NPDES General Permit for Storm Water Discharges from its construction activities.**

The Project will not discharge any stormwater to a sanitary line or a combined sewer overflow. The net stormwater generated from the site will decrease relative to existing conditions. The Proponent will seek a NPDES General Permit from EPA. A draft SWPPP is provided as part of the Stormwater Report included in Attachment F.

MWRA 05 **Sterling Suffolk Racecourse, LLC will need to continue to adhere to its Sewer Use Discharge Permit that authorizes the discharge from the animal feeding and handling areas. If Sterling Suffolk Racecourse, LLC intends to change its current operation and/or discharge such as increasing its daily wastewater discharge flow from the animal feeding and handling areas and support activities, the Proponent must provide at least 30 days in advance written notification to John Norton, Jr., Industrial Coordinator, MWRA, TRAC, 2 Griffin Way, Chelsea, MA 02150. The notification is required before it takes any action which may substantially change the volume or nature of its discharge including an increase of daily discharge flow or character of pollutants in its discharge, from any compliance measurement location or any sewer connection.**

Suffolk Downs understands that it must fully comply with the terms of its Sewer Use Discharge Permit.

MWRA 06 **Once the hotels are completed and if the Proponent intends to operate a laundry on the premises, a Sewer Use Discharge Permit is required from the MWRA for the discharge of laundry effluent into the sanitary sewer system.**

A laundry system will not be operated on the premises.

MWRA 07 **The Proponent must also comply with 360 CMR 10.016 if it intends to install gas/oil separators in the enclosed car parking garage. In addition to complying with 360 CMR 10.000, the Proponent will need to conform to the regulations of the Board of State Examiners of Plumbers and Gas Fitters, 248 CMR 2.00 (State Plumbing Code) and all other applicable laws.**

The Project will include installation of gas/oil separators in the parking garage; these separators will comply with all applicable regulations.

MWRA 08 **MWRA has Section 97A and Section 55 water mains near the entrance to the Project in Boston. There are also Sections 16, 69, 97 and 97A in Revere. It is likely that the Proponent will need an MWRA 8(m) permit.**

The Project will connect to the existing water line in Waldemar Avenue south of the Project site. The Proponent will continue to work with the MWRA and will apply for an 8(m) permit if required.

Massachusetts Port Authority
One Harborside Drive, Suite 200S
East Boston, MA 02128-2909
Telephone (617) 568-5000
www.massport.com

March 26, 2013

Secretary Richard K. Sullivan, Jr.
Executive Office of Energy and Environmental Affairs (EEA)
Attn: MEPA Office
Deirdre Buckley, EEA No. 15006
100 Cambridge Street, Suite 900
Boston, MA 02114

Re: Caesars Resort at Suffolk Downs/EEA 15006 East Boston and Revere, Massachusetts

Dear Secretary Sullivan:

On behalf of the Massachusetts Port Authority (Massport), we thank you for the opportunity to submit comments on the Environmental Notification Form (ENF) submitted by Sterling Suffolk Racecourse, LLC for the proposed Caesars Resort at Suffolk Downs on a 161-acre site in the City of East Boston and the City of Revere. As owners and operators of Boston Logan International Airport and as a property owner of parcels along Route 1A directly abutting the proposed casino site, we are keenly interested in the project and its transportation, facility design and operational features. Our ENF comments are focused on those details and project elements that should be thoroughly evaluated in the forthcoming Draft Environmental Impact Report.

We are pleased that the Suffolk/Caesars has reached out to Massport on several occasions as its project planning has evolved; we also note that we have also coordinated our comments directly with MassDOT through their Highway and Aeronautics divisions. That coordination has provided us with an excellent project understanding. Based on those meetings and our review of the ENF, we understand that the casino resort will include the following major elements:

- Approximately 200,000 square feet of casino gaming space
- 2 high-rise hotels totaling 300-450 rooms; one tower of 135 feet, a second of 166 feet
- Multi-purpose meeting/entertainment space and 16 restaurants
- Approximately 30,000 square feet of retail space
- Central Utility Plant
- A total of 5,150 parking spaces: approximately 2,600-spaces in a seven-story parking garage, one level of underground parking for approximately 450 cars, and approximately 2,100 surface parking spaces. This is a reduction from the existing 6000 surface spaces
- Retained horse race track
- Daily trip generation estimated at 40,500 (24,600 new daily trips compared to existing)
- An estimated 4,000 permanent jobs to be created.

As described below, Massport's principle interests focus on the continued safe and efficient operation of Logan Airport with a high level of customer service. In particular, we look to see that the Draft EIR carefully focuses on local and regional traffic and transportation, building heights as they relate to Logan Airport arrival and departure patterns, lighting and potential solar glare that could be associated with building exteriors or solar panel arrays and energy utilization. We further note that a successful casino resort will add significant new jobs to the regional economy; to the extent those service jobs overlap with airport jobs, it will be critical for Massport and Suffolk/Caesars to closely coordinate.

Our detailed recommendations for the EIR Scope are as follows:

Casino Demographics/Long-Range Plans. The Draft EIR should carefully define the casino resort's customer base. This information will be critical to understanding the market area for the facility and likely access/egress patterns and modes of transportation. It will be important that the planning for the casino be informed by Massport's recent long-range forecasts on air passenger activity through 2030. The Draft EIR should also discuss any potential expansion plans for the 161-acre site; will the proposed site plan be constructed in phases and are there future expansion plans? The Draft EIR should also discuss any current or future plans the resort may have for a helipad. **MPT 01** **MPT 02** **MPT 03**

Traffic/Transportation. Because of Suffolk Downs proximity to Logan Airport, the development of a resort casino could have a direct impact on the transportation system (highways and transit) that provides access to the airport. We share Suffolk/Caesars transportation goals that resort traffic must be encouraged to use major arterials and discouraged from using neighborhood roads. The scope of the transportation analysis should be regional in nature and reflect the catchment area for patrons and employees. The geographic scope should be based on the Caesars marketing study and gravity model, both of which should be documented in the EIR. While the proper geographic scope of the transportation systems analysis is most appropriately defined by MassDOT, we believe that the Route 1A-Ted Williams Tunnel corridor deserves careful attention, as does the capacity and operation of the MBTA Rapid Transit Blue Line. Specific comments are as follows: **MPT 04**

1. A principal focus of the traffic analysis should be the capacity and operation of the Route 1A corridor. The intersection at Boardman St. operates at a poor level of service; the bottleneck at this location can result in traffic queues that extend far enough south to affect access to Logan Airport. The proposed flyover should improve the situation; we would request that the EIR include thorough documentation (level of service estimates, network analysis using VISSIM or a similar tool) that will allow Massport to understand the effects of this proposed improvement. When evaluating off-site signalized intersection improvements, the proponent should consider the use of adaptive signal control technology (ASCT). Adaptive signal control is effective under non-traditional traffic conditions where there may be unpredictable traffic flow/fluctuations or unusual off-peak traffic patterns that would require a number of signal timing plans. **MPT 05** **MPT 06**

2. The preliminary plans show three access/egress locations. Please describe the expected split of traffic use for the three locations and document why this information supports the proposal for a northbound-only Route 1A flyover. **MPT 07**

3. The Commonwealth and Massport have made a large investment in the Ted Williams Tunnel /I-90 West Bound. It is important to preserve the ability of this facility to serve Massport's airport, maritime, and real estate assets. Traffic is often heavy Thursday and Friday evenings, resulting in delays that affect access to Logan Airport. We understand that more than half of the anticipated gaming activity will be on Friday, Saturday, and Sunday. The EIR should analyze the extent to which the casino's Friday and Sunday peaks may overlap with peak travel to Logan Airport. Since physical improvements to I-90 are unlikely to be feasible, the EIR should identify operational and demand management strategies that will serve to maintain reasonable levels of regional access to Massport properties. **MPT 08**

4. Trip generation: The ENF states that the Project will generate trips to/from the site over a 24-hour period, 7 days a week. Since the trip generation of an urban casino/resort is unique, the DEIR should thoroughly document the trip generation estimates (as possible without getting into proprietary or market-sensitive information). The intent here is to better understand the expected activity levels (trips) on an aggregate level and their time-of-day/day-of-week distribution. **MPT 09**

5. While most casino patrons are expected to arrive by private vehicle, employees are expected to use public transportation. In order for this to be fully realized, it is likely that both physical and operational improvements will be necessary. Issues such as safety, accessibility, and comfort (e.g., weather protection) influence the desirability and use of public transportation. Although the site is served on the periphery by MBTA rapid transit and bus services, the proposed development itself is not directly served. Thus, the proponent should identify the design elements on the property the will affect travel between the proposed development and the existing MBTA Blue Line Suffolk Downs Station. The EIR should address the operating and physical capacity of the MBTA Blue Line, including the following stations: Airport, Suffolk Downs, and Beachmont, Revere. The study should identify station impacts and potential physical improvements. Moreover, since the casino will operate 24 hours/day with three work shifts, the operating hours of the Blue Line should be acknowledged. The ENF notes that employees may travel to the site by high-occupancy shuttle service. The EIR should provide details, such as routes, frequency, capacity and location of parking facilities. There may be an opportunity to coordinate Massport-sponsored services (e.g., Sunrise Shuttle, shuttle buses serving the employee garage in Chelsea) with the casino. **MPT 10** **MPT 11**

6. Transportation Demand Management: The ENF states the proponent's commitment to an extensive Transportation Demand Management (TDM) program. The EIR should detail the specific plans that the proponent has with regard to both employee and patron TDM programs. Specific areas to address include: **MPT 12**

    a. Incentives for transit usage for both employees and patrons including subsidized transit passes or rides;
    b. Disincentives for driving including market rate paid parking for both employees and patrons;
    c. Marketing and information campaigns to promote access via alternative modes and high occupancy vehicles;

d. Expectations for employee commute patterns and plans for commuting during hours when the MBTA does not operate;
e. Off-site employee parking strategies;
f. Collaboration opportunities for employee transportation (as stated above, there are likely collaboration opportunities with Massport); and
g. Starting or joining a Transportation Management Association (TMA) for the East Boston Area (there may be opportunities to collaborate with the Logan Airport Employee TMA). Not only should a TDM program be specified, but the Project should identify a continuing source of funds to support on-going operations of recommended services and programs.

7. In the past, Suffolk Downs worked collaboratively with Massport to support our emergency airport parking needs; how would the proposed development program affect this? **MPT 13**

8. Will the transportation improvements meet the needs of an emergency evacuation from the East Boston/Revere area? **MPT 14**

9. Taxi Cab Demand. The Logan Airport taxi pool is served by Boston taxis and experiences 6,000 taxi dispatches on an average day and nearly double that rate on peak days. During peak travel periods, the supply of taxis is inadequate. Describe how the taxi demand at the Caesars's resort will be met without adversely affecting Logan customer service. **MPT 15**

10. Parking Demand – Logan parking lots are full approximately 40 days/year. Will the casino customers use Logan Parking specifically if there is an airport shuttle to the resort? **MPT 16**

11. Private/Corporate Aircraft Access - Please describe the percentage of customers that you expect to arrive at Logan in private aircraft? **MPT 17**

Building Heights. The proposed development is located approximately 5,500 feet north of Runway 22R and falls under the Runway 22R/4L Arrival and Departure Surfaces. Based on the preliminary site plan, the two hotels within the Casino Complex are 135 feet tall (Hotel I) and 166 feet tall (Hotel II). Hotel I is approximately 1,400 feet and Hotel II is approximately 1,000 feet from the centerline of Runway 4L/22R. Hotel II is also at the edge of the Runway 4L One Engine Inoperative (OEI) splay as defined by the International Civil Aviation Organization (ICAO).

As such, these concept building heights are at or close to several FAA and ICAO surfaces. Consequently, it will be important for the developer to work closely with Massport to evaluate potential aviation effects of these designs. Massport has previously provided the development team with a copy of the Logan Airspace Map (Version 2.0 dated December 2011) as a guide to help planning the casino development. The Logan Airspace Map defines the critical airspace around Boston Logan International Airport needed to protect arrival and departure flight corridors. **MPT 18**

As with any project close to Logan, as planning proceeds, the Casino proponent must file FAA Form 7460 and indicate the location of the highest points of each of the structure within the Casino Complex so that FAA can determine whether or not the development presents a hazard to air navigation. We recommend early coordination with FAA. **MPT 19**

Lighting and Solar Glare. Structures with extensive exterior lighting, glass facades, significant solar panel arrays or other architectural features have the potential to be a hazard to safe air navigation. The Draft EIR should detail any decorative exterior lighting, moving light displays or lasers and demonstrate that they will not have an impact on aviation. The EIR must carefully assess these issues and present all measures intended to avoid such impacts. **MPT 20**

Wildlife Hazard. We understand that Suffolk Downs is planning a significant composting facility to serve the existing race track. Due to the site's proximity to Logan Airport, the EIR must demonstrate compliance with FAA Wildlife Hazard Advisory Circular AC No. 150/5200, and in particular plans to avoid bird attractants. **MPT 21**

Energy and Site Utilities – Expected load growth and retirement of the Salem Harbor Station, demonstrate a need for additional resources or transmission system upgrades to ensure area electrical infrastructure reliability. (Greater Boston Area Transmission Needs Assessment, July 8, 2010). Pursuant to subsequent system planning developments, new electrical transmission upgrades have been identified. ISO-NE anticipates a four to seven year process for siting to development of new transmission services. Please clarify the electric transmission infrastructure improvements required to maintain system reliability and demonstrate coordination of the proposed casino development schedule with necessary infrastructure improvements required to maintain electric reliability in East Boston. **MPT 22**

Although the ENF states that "spare electric supply" shall be made available, it has been demonstrated through a Transmission Needs Assessment that electric supply capacity in this region requires infrastructure upgrades to maintain reliability – this project must demonstrate spare capacity statements made in the section relating to electric supply. It must be demonstrated that adjacent neighborhood electric supply is not affected by this development versus the statement "supply should not be affected". **MPT 23**

The Draft EIR must also demonstrate that the capacity of the existing water, sewer and stormwater infrastructure is capable of accommodating the substantial proposed new load. Maintenance of pressure on the water supply lines for purposes of both water supply and fire suppression should be confirmed in any proposed installation of either one (1) or two (2) proposed new pumping stations. Evaluation of the use of substantial on-site storage tanks may be required to maintain required system pressure. Proposed system design should be reviewed by MWRA, BWSC and Massport to coordinate current pumping operations for continued support of system pressure. **MPT 24**

Labor Market/Jobs Creation. With 2,500 construction jobs and an estimated 4,000 permanent new jobs, the casino resort expects to have significant positive regional economic impact. In order for the project to have those benefits without adversely affecting existing businesses including Logan Airport, the proponent should outline a strategy for the introduction of these new jobs, training and close coordination with the airport employers. **MPT 25**

Construction Phasing. The construction impact assessment should consider overlaps and potential conflicts with ongoing facility and infrastructure projects at Logan in terms of construction traffic, labor supply and construction materials. **MPT 26**

Thank you again for the opportunity to provide comments and input to the Draft EIR Scope. We would be pleased to answer and questions you might have on these comments and look forward to working with the Sterling Suffolk Racecourse, LLC project team and MassDOT as project planning and analysis proceeds. We look forward to providing similar comments on any other casino proposals in the Boston geographic area.

Sincerely,

Massachusetts Port Authority

James Doolin
Chief Development Officer

cc: MassDOT/Highway and Aeronautics (Attn: Christopher Willenborg,
David Mohler, Lionel Lucien)
Sterling Suffolk Racecourse, LLC (Attn: Chip Tuttle)
City of Boston (Attn: Elizabeth Dello Russo, Esq.)

MASSPORT

MPT 01 **The DEIR should carefully define the casino resort's customer base. This information will be critical to understanding the market area for the facility and likely access/egress patterns and modes of transportation. It will be important that the planning for the casino be informed by Massport's recent long-range forecasts on air passenger activity through 2030.**

Section 5.4 presents the derivation of the Resort's patron trip distribution based largely on Caesars' gravity model of its projected customer base that reflects Massport's long-range forecasts.

MPT 02 **The DEIR should also discuss any potential expansion plans for the 161-acre site; will the proposed site plan be constructed in phases and are there future expansion plans?**

There are no specific expansion plans contemplated at this time. Over the course of the license period, should the Proponent seek to expand the Project, it will return to MEPA and the Massachusetts Gaming Commission as necessary for approval of any expansion plans.

MPT 03 **The DEIR should also discuss any current or future plans the resort may have for a helipad.**

The Proponent has no future or long-range plans for a helipad, since the proximity of Logan International Airport will adequately serve the Project needs.

MPT 04 **The scope of the transportation analysis should be regional in nature and reflect the catchment area for patrons and employees. The geographic scope should be based on the Caesars marketing study and gravity model, both of which should be documented in the EIR... We believe that the Route 1A-Ted Williams Tunnel corridor deserves careful attention, as does the capacity and operation of the MBTA Rapid Transit Blue Line.**

The DEIR/EPNF roadway transportation study area is defined in Section 5.2.6. Analysis of the MBTA Rapid Transit Blue Line is presented in Sections 5.2.1 and 5.8.1 for existing and Build conditions, respectively.

MPT 05 **A principal focus of the traffic analysis should be the capacity and operation of the Route 1A corridor. The intersection at Boardman Street operates at a poor LOS; the bottleneck at this location can result in traffic queues that extend far enough south to affect access to Logan Airport. The proposed flyover should improve the situation; we would request that the EIR include thorough documentation... that will allow Massport to understand the effects of this proposed improvement.**

The DEIR/EPNF analysis is anchored on the flyover concept presented in the ENF, and a detailed traffic operations analysis is presented in Section 5.7.1. In addition, as requested by MassDOT, an alternatives analysis for the Route 1A infrastructure improvements is presented in Section 5.5.

MPT 06 **When evaluating off-site signalized intersection improvements, the Proponent should consider the use of adaptive signal control technology (ASCT). Adaptive signal control is effective under non-traditional traffic conditions where there may be unpredictable traffic flow/fluctuations or unusual off-peak traffic patterns that would require a number of signal timing plans.**

The use of ASCT will be considered during the design development of the concept plans for off-site signalized intersection improvements in coordination with MassDOT, DCR, BTD, and the City of Revere.

MPT 07 **The preliminary plans show three access/egress locations. Please describe the expected split of traffic use for the three locations and document why this information supports the proposal for a northbound-only Route 1A flyover.**

The distribution and assignment of Resort patron and employee trips is described and presented graphically in Sections 5.4.7 and 5.4.8.

MPT 08 **The Commonwealth and Massport have made a large investment in the Ted Williams Tunnel/I-90 Westbound. It is important to preserve the ability of this facility to serve Massport's airport, maritime, and real estate assets... The EIR should analyze the extent to which the casino's Friday and Sunday peaks may overlap with peak travel to Logan Airport... The EIR should identify operational and demand management strategies that will serve to maintain reasonable levels of regional access to Massport properties.**

The issues related to I-90/Ted Williams Tunnel are discussed in Section 5.7.5. Although complete data are not available to facilitate an operational analysis at this stage, the Proponent is committed to working with MassDOT to secure appropriate data and identify potential operational and management strategies.

MPT 09 **Since the trip generation of an urban casino/resort is unique, the DEIR should thoroughly document the trip generation estimates (as possible without getting into proprietary or market-sensitive information). The intent here is to better understand the expected activity levels (trips) on an aggregate level and their time-of-day/day-of-week distribution.**

The trip generation analysis in Section 5.4 is based on extensive research of proprietary data, other studies, and actual counts performed by the Proponent at comparable locations, combined with information specific to the Project site location to inform travel parameters such as mode share. Time-of-day and day-of-week distributions are described and presented.

MPT 10 **Although the site is served on the periphery by MBTA rapid transit and bus services, the proposed development itself is not directly served. Thus, the Proponent should identify the design elements on the property that will affect travel between the proposed development and the existing MBTA Blue Line Suffolk Downs Station. The EIR should address the operating and physical capacity of the MBTA Blue Line, including the following stations: Airport, Suffolk Downs, and Beachmont, Revere. The study should identify station impacts and potential physical improvements.**

An enhanced shuttle connection between Suffolk Downs Station and the Resort entrances is proposed, as noted in Section 5.0 and described in Sections 1.0 and 4.0. Sections 5.2.1 and 5.8.1 present a Blue Line operational analysis and station loadings under existing and Build conditions, respectfully.

MPT 11 **Since the casino will operate 24 hours/day with three work shifts, the operating hours of the Blue Line should be acknowledged. The ENF notes that employees may travel to the site by high-occupancy shuttle service. The EIR should provide details, such as routes, frequency, capacity and location of parking facilities. There may be an opportunity to coordinate Massport-sponsored services (e.g., Sunrise Shuttle, shuttle buses serving the employee garage in Chelsea) with the casino.**

As described in Section 5.4.2, the Project will not have three employee shifts; rather, there will be multiple shift changes throughout the day. The shuttle plan described in Section 5.8.3.2 will be the primary approach to addressing the gap in overnight transit service. As part of that plan, the Proponent is committed to collaborating with other transportation providers including Massport, the MBTA, and private entities in the region.

MPT 12 **The EIR should detail the specific plans that the Proponent has with regard to both employee and patron TDM programs, [including]:**

- **Incentives for transit usage for both employees and patrons including subsidized transit passes or rides;**
- **Disincentives for driving including market rate pair parking for both employees and patrons;**
- **Marketing and information campaigns to promote access via alternative modes and high occupancy vehicles;**

- Expectations for employee commute patterns and plans for commuting during hours when the MBTA does not operate;
- Off-site employee parking strategies;
- Collaboration opportunities for employee transportation (as stated above, there are likely collaboration opportunities with Massport); and
- Starting or joining a TMA for the East Boston Area (there may be opportunities to collaborate with the Logan Airport Employee TMA). Not only should a TDM program be specified, but the Project should identify a continuing source of funds to support ongoing operations of recommended services and programs.

A comprehensive TDM Plan is presented in Section 5.9.

MPT 13 **In the past, Suffolk Downs worked collaboratively with Massport to support our emergency airport parking needs; how would the proposed development program affect this?**

The Proponent will continue to work closely with Massport on coordination issues affecting airport parking needs.

MPT 14 **Will the transportation improvements meet the needs of an emergency evacuation from the East Boston/Revere area?**

By relieving existing regional traffic congestion in the Route 1A corridor well beyond the impact of the Project, the proposed infrastructure improvements will contribute positively to emergency evacuation plans.

MPT 15 **The Logan Airport taxi pool is served by Boston taxis and experiences 6,000 taxi dispatches on an average day and nearly double that rate on peak days. During peak travel periods, the supply of taxis is inadequate. Describe how the taxi demand at the Caesars Resort will be met without adversely affecting Logan customer service.**

The Proponent plans to work collaboratively with Massport and the City of Boston to efficiently coordinate taxi availability at the Resort and the airport. The Proponent's ground shuttle program is designed, in the first instance to reduce the use of taxis at the Resort to the maximum extent possible. The Proponent also expects to take full advantage of the proliferation of alternatives to taxi cabs such as ridesharing and other on demand car services that are now available. To the extent that a good number of taxis will continue to travel to the Resort, as expected, the Proponent's TDM strategy includes a transportation coordinator who will be on-site twenty-four hours a day, seven days a week and whose tasks will include, among other things, monitoring taxi requirements and taxi cab flow. In all cases, the

Proponent is prepared to work collaboratively with Massport and the cities of Boston and Revere to efficiently coordinate taxi availability at the Resort and the airport.

MPT 16 **Logan parking lots are full approximately 40 days/year. Will the casino customers use Logan Parking specifically if there is an airport shuttle to the resort?**

A shuttle between Logan International Airport and the Resort is planned, but Resort patrons are not expected to park at Logan lots since there will be adequate parking for patrons on-site. The parking analysis is presented in Section 5.10.

MPT 17 **Please describe the percentage of customers that you expect to arrive at Logan in private aircraft?**

Less than 1% of customers are expected to arrive by private aircraft.

MPT 18 **[Hotel I at 135 feet tall and Hotel II at 166 feet tall] are at or close to several FAA and International Civil Aviation Organization (ICAO) surfaces. Consequently, it will be important for the developer to work closely with Massport to evaluate potential aviation effects of these designs.**

The Proponent is working closely with Massport and MassDOT's Aeronautics Division to evaluate the Resort's potential effects on aviation, including those associated with the heights of Hotel I and Hotel II.

MPT 19 **As with any project close to Logan, as planning proceeds, the Proponent must file FAA Form 7460 and indicate the location of the highest points of each of the structures within the Casino Complex so that FAA can determine whether or not the development presents a hazard to air navigation. We recommend early coordination with FAA.**

The Proponent intends to file any required notices prior to construction and to engage with the FAA early in the process.

MPT 20 **The DEIR should detail any decorative exterior lighting, moving light displays or lasers and demonstrate that they will not have an impact on aviation. The EIR must carefully assess these issues and present all measures intended to avoid such impacts.**

The Project design is evolving, and the Proponent will be studying all site lighting and signage in the next phase of design to eliminate any aviation impacts. The Proponent continues to work closely with Massport to ensure there are no Project-related impacts.

MPT 21 **We understand that Suffolk Downs is planning a significant composting facility to serve the existing racetrack. Due to the site's proximity to Logan Airport, the EIR must demonstrate compliance with FAA Wildlife Hazard Advisory Circular AC No. 150/5200-33C, and in particular plans to avoid bird attractants.**

In compliance with the FAA Wildlife Hazard Advisory Circular AC No. 150/5200-33C, there will not be any composting on site, any on-site dumpsters will be covered, and there are no new open water stormwater management facilities planned.

MPT 22 **Please clarify the electric transmission infrastructure improvements required to maintain system reliability and demonstrate coordination of the proposed casino development schedule with necessary infrastructure improvements required to maintain electric reliability in East Boston.**

The building will be powered from an existing utility substation which the utility company has indicated has the capacity to support the Resort without impacting the reliability of service to the rest of East Boston.

MPT 23 **Although the ENF states that "spare electric supply" shall be made available, it has been demonstrated through a Transmission Needs Assessment that electric supply capacity in this region requires infrastructure upgrades to maintain reliability – this Project must demonstrate spare capacity statements made in the section relating to electric supply. It must be demonstrated that adjacent neighborhood electric supply is not affected by this development versus the statement "supply should not be affected."**

Please see the response to MPT 22.

MPT 24 **The DEIR must also demonstrate that the capacity of the existing water, sewer and stormwater infrastructure is capable of accommodating the substantial proposed new load. Maintenance of pressure on the water supply lines for purposes of both water supply and fire suppression should be confirmed in any proposed installation of either one or two proposed new pumping stations. Evaluation of the use of substantial on-site storage tanks may be required to maintain required system pressure. Proposed system design should be reviewed by MWRA, BWSC and Massport to coordinate current pumping operations for continued support of system pressure.**

The Proponent will continue to coordinate with BWSC and the MWRA to ensure that adequate capacity exists in the water and sewer system. Previous pressure testing indicated that adequate water pressure exists to service the site. All treated

stormwater will be discharged on-site towards existing wetlands and will not discharge to BWSC stormwater lines. Three large rainwater reuse tanks will be installed to reduce stormwater runoff and reduce potable water demand.

MPT 25 **With 2,500 construction jobs and an estimated 4,000 permanent new jobs, the casino resort expects to have significant positive regional economic impact. In order for the Project to have those benefits without adversely affecting existing businesses including Logan Airport, the Proponent should outline a strategy for the introduction of these new jobs, training and close coordination with the airport employers.**

The Proponent is aware of the existing employment base and will seek to create employment opportunities for underserved and underemployed populations through the programs described in Section 1.10. Unemployment rates in nearby communities, which approach 8% in certain cases, suggest there are available employees in the area. It should also be noted that some employees may work part-time at both locations.

MPT 26 **The construction impact assessment should consider overlaps and potential conflicts with ongoing facility and infrastructure projects at Logan in terms of construction traffic, labor supply and construction materials.**

The contractor will consider these factors when developing the Project construction schedule.

dcr
Massachusetts

March 26, 2013

Secretary Richard K. Sullivan, Jr.
Executive Office of Energy and Environmental Affairs
Attn: Deirdre Buckley, MEPA Office
100 Cambridge Street, Suite 900
Boston, Massachusetts 02114

Re: EOEEA #15006 Caesars Resort at Suffolk Downs ENF

Dear Secretary Sullivan:

The Department of Conservation and Recreation ("DCR" or "Department") is pleased to submit the following comments in response to the Environmental Notification Form ("ENF") submitted by Sterling Suffolk Racecourse LLC ("the Proponent") for the Caesars Resort at Suffolk Downs project (the "Project").

As described in the ENF, the Project proposes to redevelop approximately 161 acres of land to construct a destination resort in East Boston and Revere. The proposal includes two distinct gaming areas, up to 450 guestrooms in two hotels, a multi-purpose meeting/entertainment space, and restaurant and retail space. The ENF presents conceptual roadway improvements, including new ramp connections at the Route 1 / Route 16 interchange intended to reduce traffic volumes on nearby Route 60. A total of 5,150 parking spaces are proposed for the Project site, including approximately 2,600 spaces within a seven-story parking garage. Primary site access is proposed off Route 1A, with a secondary access road off Revere Beach Parkway at Tomesello Way. Bicycle accommodations are proposed along Bennington Street between Saratoga Street and Eliot Circle. The Project requires a full Environmental Impact Report ("EIR").

DCR has care and control of Revere Beach Parkway, including Eliot Circle located approximately ¼ mile north from the proposed development. In addition, DCR has care and control of Belle Isle Marsh Reservation in East Boston, located across Bennington Street from the Project site. DCR's Revere Beach Reservation is located approximately ½ mile to the north of the proposed Project. The ENF states the Project requires a DCR Construction and Access Permit.

DCR submits the following comments related to current vehicle capacity and impacts to Revere Beach Parkway.

Transportation

As part of the EIR, DCR requests that the Proponent prepare vehicle trips estimates to approximate the anticipated distribution of trips between the two proposed site entrances / exits (Route 1A and Revere Beach Parkway). DCR also requests specific information on the requested improvements to traffic signals or other infrastructure on Revere Beach Parkway at Tomesello Way. Additionally, DCR requests details on the proposed alteration to the traffic signal at Garfield Avenue/Webster Avenue/Revere Beach Parkway in Chelsea. **DCR 01** **DCR 02**

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Deval L. Patrick
Governor

Timothy P. Murray
Lt. Governor

Richard K. Sullivan, Jr., Secretary
Executive Office of Environmental Affairs

Edward M. Lambert Jr., Commissioner
Department of Conservation & Recreation

DCR has received requests from the City of Revere to reduce the number of lanes on Revere Beach Parkway between Harris Road and North Shore Road from six lanes (three eastbound / three westbound) to four lanes (two eastbound / two westbound). As part of the EIR, DCR requests that the Proponent evaluate what impacts this change might have, given the anticipated level of traffic during peak periods. **DCR 03**

DCR notes that the existing horse racing activity at Suffolk Downs generates large amounts of traffic on certain Saturdays in May and June, coinciding with Triple Crown horse racing events. DCR's Revere Beach Reservation also generates a significant amount of traffic on these specific Saturdays when temperatures are relatively high. To understand the maximum potential traffic load on Revere Beach Parkway, DCR requests that the Proponent generate expected peak traffic estimates on Revere Beach Parkway between Eliot Circle and Route 16. **DCR 04**

As part of the Project, the Proponent plans to construct a rampway that would improve access between Route 1 and Revere Beach Parkway with the stated goal of addressing existing capacity issues on Route 60 in Revere. As part of the EIR, DCR requests the Proponent demonstrate the impact of the improvement on Revere Beach Parkway by estimating vehicle trips with and without the proposed improvement. This analysis should calculate the net difference of regional vehicle trips that will use Revere Beach Parkway with and without the improvement. Similarly, DCR requests the Proponent estimate the the anticipated increase of vehicle trips generated by the Project. This information will help DCR assess the anticipated net increase of traffic on Revere Beach Parkway resulting from the proposed rampway. **DCR 05**

DCR notes that two bridges along Revere Beach Parkway are scheduled for reconstruction / repair under the Accelerated Bridge Project: one located over the MBTA Blue Line between the Beachmont and Revere Beach stations; the other located over the MBTA Newburyport / Rockport commuter rail line at Winthrop Avenue. DCR requests that in the EIR the Proponent specify whether work on these bridges and any resultant reduced capacity may impact Project construction. **DCR 06**

DCR requests that the EIR include information on how tour buses will access the proposed site, and the anticipated volume of tour buses that can be expected. **DCR 07**

Revere Beach Reservation

DCR notes that the southern extent of Revere Beach Reservation is a half-mile from the Project site, and is two stops away on the MBTA Blue Line. In the EIR, DCR requests that the Proponent include an analysis to anticipated impacts to area open space and recreation facilities, including DCR's Revere Beach Reservation and Belle Isle Reservation. **DCR 08**

Thank you for this opportunity to comment. If you have questions or need further information on DCR parkways, please contact Ken Kirwin at 617-626-1498 or ken.kirwin@state.ma.us.

Sincerely,

Edward M. Lambert, Jr.
Commissioner

cc: Andy Backman, Chris Delaney, Ray Faucher, Susan Hamilton, Dan Hunt, Brian Kelly, Ken Kirwin, Mike Misslin, Joe Orfant, Nathaniel Tipton (DCR)
Paul Tuttle, Sterling Suffolk Racehorse LLC
Elizabeth Grob, Epsilon Associates

DCR 01 **As part of the EIR, DCR requests that the Proponent prepare vehicle trips estimates to approximate the anticipated distribution of trips between the two proposed site entrances/exits (Route 1A and Revere Beach Parkway).**

Projected Project vehicle trips and their distribution and assignment to the Route 1A and Revere Beach Parkway site driveways are presented in Section 5.4.

DCR 02 **DCR also requests specific information on the requested improvements to traffic signals and other infrastructure on Revere Beach Parkway at Tomasello Way. Additionally, DCR requests details on the proposed alteration to the traffic signal at Garfield Avenue/Webster Avenue/Revere Beach Parkway in Chelsea.**

Proposed improvements on Revere Beach Parkway are presented in Section 5.6, and traffic signal operational analysis is presented in Section 5.7.

DCR 03 **DCR has received requests from the City of Revere to reduce the number of lanes on Revere Beach Parkway between Harris Road and North Shore Road from six lanes (three eastbound/three westbound) to four lanes (two eastbound/two westbound). As part of this EIR, DCR requests that the Proponent evaluate what impacts this change might have, given the anticipated level of traffic during peak periods.**

The Proponent has made commitments for traffic, safety, and roadway improvements in the HCAs with the cities of Boston and Revere. The specific improvements referenced have not been requested by the City of Revere, and are not included in the Revere HCA.

DCR 04 **DCR notes that the existing horse racing activity at Suffolk Downs generates large amounts of traffic on certain Saturdays in May and June, coinciding with Triple Crown horse racing events. DCR's Revere Beach reservation also generates a significant amount of traffic on these specific Saturdays when temperatures are relatively high. To understand the maximum potential traffic load on Revere Beach Parkway, DCR requests that the Proponent generate expected peak traffic estimates on Revere Beach Parkway between Eliot Circle and Route 16.**

The transportation study area and analysis in Sections 5.2.6 and 5.7 includes Revere Beach Parkway between Eliot Circle and Route 16. Peak hour traffic projections for this corridor are presented in Section 5.4.8.

DCR 05 **As part of the Project, the Proponent plans to construct a rampway that would improve access between Route 1 and Revere Beach Parkway with the stated goal of addressing existing capacity issues on Route 60 in Revere. As part of the EIR, DCR**

requests the Proponent demonstrate the impact of the improvement on Revere Beach Parkway by estimating vehicle trips with and without the proposed improvement. This analysis should calculate the net difference of regional vehicle trips that will use Revere Beach Parkway with and without the improvement. Similarly, DCR requests the Proponent estimate the anticipated increase of vehicle trips generated by the Project. This information will help DCR assess the anticipated net increase of traffic on Revere Beach Parkway resulting from the proposed rampway.

Analysis of the proposed ramp connections at Route 1 and Route 16 is presented in Section 5.7.4.

DCR 06 DCR notes that two bridges along Revere Beach Parkway are scheduled for reconstruction/repair under the Accelerated Bridge Project: one located over the MBTA Blue Line between the Beachmont and Revere Beach stations; the other located over the MBTA Newburyport/Rockport commuter rail line at Winthrop Avenue. DCR requests that in the EIR the Proponent specify whether work on these bridges and any resultant reduced capacity may impact Project construction.

It is not anticipated that the bridge reconstruction/repairs will impact Project construction. However, the Proponent will coordinate closely with MassDOT and DCR in further developing the Project construction schedule.

DCR 07 DCR requests that the EIR include information on how tour buses will access the proposed site, and the anticipated volume of tour buses that can be expected.

Tour buses will access the site via the Tomasello Drive entrance on Route 1A. It is expected that approximately 10 tour buses will visit the Resort on the busiest days (Saturday).

DCR 08 In the EIR, DCR requests that the Proponent include an analysis of anticipated impacts to area open space and recreation facilities, including DCR's Revere Beach Reservation and Belle Isle Reservation.

The Proponent will continue to coordinate with DCR regarding DCR open space and recreational facilities to ensure that any potential impacts are minimized, and is promoting bicycle access to the beaches.

Commonwealth of Massachusetts

Division of Marine Fisheries

251 Causeway Street, Suite 400
Boston, Massachusetts 02114
(617)626-1520
fax (617)626-1509

Paul J. Diodati
Director

Deval Patrick
Governor
Timothy P. Murray
Lt. Governor
Richard K. Sullivan, Jr.
Secretary
Mary B. Griffin
Commissioner

March 26, 2013

Secretary Richard K. Sullivan, Jr.
Executive Office of Energy and Environmental Affairs (EEA)
Holly Johnson, MEPA Office
100 Cambridge Street, Suite 900
Boston MA 02114

Re: EEA# 15006

Dear Secretary Sullivan:

The Division of Marine Fisheries (*MarineFisheries*) has reviewed the Environmental Notification Form submitted by Sterling Suffolk Racecourse, LLC. The proposal is to construct a casino resort redevelopment located at Suffolk Downs in East Boston and Revere, MA.

The project is located on filled tidelands between Belle Isle Inlet and Chelsea River. A portion of the Rumney Marshes ACEC (Area of Critical Environmental Concern) extends into the Suffolk Downs site along Sales Creek. Belle Isle Inlet contains soft shell clam (*Mya arenaria*) and blue mussel (*Mytilus edulis*) resource and is within the GBH5.12 shellfish growing area, which is currently prohibited for shellfish harvest. This area is potential habitat for winter flounder (*Pseudopleuronectes americanus)* spawning and juvenile development. The creek is utilized for forage and shelter by juvenile striped bass (*Morone saxatilis*) and tomcod (*Microgadus tomcod)* and is a migratory pathway for rainbow smelt (*Osmerus mordax*) and American eel (*Anguilla rostrata*).

The project would result in the reduction of impervious surface and improvement to the stormwater management systems, compared to existing conditions. The application indicates that a mix of LID and conventional stormwater management techniques will be used to provide water quality treatment. *MarineFisheries* recommends that the proponent make every effort to treat stormwater using the best available stormwater management techniques, specifically designed to treat the pollutants and sediments at the site. Biofiltration swales, green roofs and rain gardens, should be explored as possible ways to improve infiltration and flood control as well as filtration and pollution attenuation. Finally, the project site surrounds Sales Creek and the ACEC. Therefore, we recommend that the applicant explore ways to improve the ecological function of Belle Isle Marsh and Sales Creek, such as improvements to the tidal restriction at Bennigton Street, to allow tidal inundation into the wetlands on the project site. **DMF 01**

Thank you for considering our comments. Please contact Tay Evans of my staff at 978-282-0308 x. 168 if you have any questions about our review.

Sincerely,

Paul J. Diodati

cc
Tay Evans, DMF
Kate Ostrikis, DMF

PD/te/ko

MASSACHUSETTS DIVISION OF MARINE FISHERIES

DMF 01 **Marine Fisheries recommends that the Proponent make every effort to treat stormwater using the best available stormwater management techniques, specifically designed to treat the pollutants and sediments at the site. Biofiltration swales, green roofs, and rain gardens should be explored as possible ways to improve infiltration and flood control as well as filtration and pollution attenuation.**

The Project will meet and exceed the MassDEP Stormwater Management Guidelines. LID BMPs will be installed throughout the site, including water quality swales, biofiltration swales, bioretention basins, pervious pavers in pedestrian areas, and rainwater harvesting tanks will provide enhanced water quality treatment and reduce the volume of stormwater leaving the site (see Section 9.3).

DMF 02 **We recommend that the applicant explore ways to improve the ecological function of Belle Isle Marsh and Sales Creek, such as improvements to the tidal restriction at Bennington Street, to allow tidal inundation into the wetlands on the Project site.**

The Project will help restore the ecological functions of Belle Isle Marsh and Sales Creek by improving the quality and quantity of discharges from the Project site. The Project does not include any proposed changes to the tide gates at Bennington Street.

March 26, 2013

Richard K. Sullivan, Jr., Secretary
Executive Office of Energy & Environmental Affairs
Attention: MEPA Office
Deirdre Buckley, MEPA #15006
100 Cambridge Street, Suite 900
Boston, MA 02114

RE: Caesars Resort at Suffolk Downs, MEPA #15006

Dear Secretary Sullivan:

The Metropolitan Area Planning Council (MAPC) regularly reviews proposals deemed to have regional impacts. The Council reviews proposed projects for consistency with *MetroFuture*, the regional policy plan for the Boston metropolitan area, the Commonwealth's Sustainable Development Principles, the GreenDOT initiative, Boston's Complete Streets Initiative, as well as impacts on the environment.

Sterling Suffolk Racecourse, LLC (the Proponent) is the owner of a 161-acre parcel of land located in the cities of Boston and Revere, where it operates Suffolk Downs, a thoroughbred horse racing facility. In addition to retaining horse racing, the Proponent proposes to construct a destination resort casino, Caesars Resort at Suffolk Downs (the Project). Specifically, the Project will contain two distinct gaming areas comprising 200,000 square feet of gaming space and up to 450 guestrooms in two hotels. The gaming space is proposed to contain 4,000-5,000 slot machines, 200 table games, and a World Series of Poker™ room. The Project will also contain multi-purpose meeting/entertainment, dining, and retail space. In sum, an estimated 1.47 million square feet of new development will be added to .33 million square feet of existing development that will be renovated.

The Project site is surrounded by Route 1A to the west, Route 145 (Revere Beach Parkway/Winthrop Avenue) to the north, Bennington Street to the east, and Waldemar Avenue to the south. The Project is accessible from the Suffolk Downs station stop on the Blue Line and is a mile away from Logan Airport.

A total of 5,150 parking spaces are proposed for the Project. Of these spaces, approximately 3,050 will be in a seven-story parking garage (450 spaces will be for valet parking). In addition to the garage, 2,100 surface parking spaces are proposed. The Project is forecast to add 24,600 vehicular trips on an average weekday, increasing the total number of trips to 40,500 onto the area street network.

The Proponent plans to file an application with the Massachusetts Gaming Commission seeking a license to operate a Category I gaming establishment at Suffolk Downs. In addition, a Highway Division Category III Access Permit from MassDOT and an Access Permit from the Department of Conservation and Recreation will be required for this Project.

MAPC has reviewed the Environmental Notification Form (ENF) and has concerns which focus on regional traffic impacts, mode share goals, storm water and water quality, flooding, and wetlands impacts which are all detailed as an attachment to this letter. MAPC respectfully requests that the Secretary incorporate our recommendations and questions into the scope for the Draft Environmental Impact Report (DEIR).

MAPC has a long term-interest in alleviating regional traffic and environmental impacts, consistent with the goals of *MetroFuture*. The Commonwealth also has established a mode shift goal of tripling the share of travel in Massachusetts by bicycling, transit and walking, as well as a statutory obligation to reduce greenhouse gas emissions (GHG) by a 25 percent reduction from 1990 levels by 2020 and an 80 percent reduction from 1990 levels by 2050. This Project, and any Category I gaming establishment, is likely to make all these goals more difficult to achieve. Therefore, the Secretary faces a special obligation to require all actions that will minimize or mitigate the substantial adverse impacts of such projects and keep the Commonwealth on track in meeting its regulatory and statutory goals.

I have also attached MAPC's Policy Statement, 'Locating a Casino: Much at Stake for Host Community and Region', for your information.

Thank you for the opportunity to comment on this project.

Sincerely,

Marc D. Draisen
Executive Director

cc: Kairos Shen, BRA
Thomas Tinlin, BTD
Frank Stringi, Revere

Michelle Ciccolo, *President* • Lynn Duncan, *Vice President* • Marilyn Contreas, *Secretary* • Taber Keally, *Treasurer* • Marc Draisen, *Executive Director*

Metropolitan Area Planning Council (MAPC) comments on Casino Resort at Suffolk Downs ENF, MEPA #15006

Regional Trip Distribution and Traffic Analysis

Casinos are significant and unique traffic generators. Unlike most other uses, casinos generate traffic 24 hours a day, 7 days a week, 365 days a year. More than half of weekly gaming activity for this Project is expected to occur on Friday, Saturday and Sunday combined. MAPC looks forward to reviewing the following components in the DEIR that address the distinctive factors related to this Project:

Regional Trip Distribution

Vehicle trips to and from casinos are usually much longer compared to other types of trips such as driving from home to work or home to shopping. It is important to understand the geographic distribution of patrons and employees for this regional destination. Where will these trips originate and what highways will drivers utilize (e.g., I-90, I-93, Route 1, Route 1A, Route 16)? In addition to the local traffic analysis required in a typical MEPA analysis, this DEIR should address the regional impacts of Project-related traffic. **MAPC 01**

Traffic Projections

While the ENF states the DEIR will include a No-Build traffic analysis based on the projection of traffic volumes for a "horizon" year of 2020, the projections are for the year 2017. At a minimum, the analysis of the traffic impacts should be for ten years (as was done for the Project First Light Destination Resort Casino's ENF in Taunton). **MAPC 02**

Peak Period Traffic Analysis

The peak Project generated traffic is expected to occur after the evening peak commuter period during the week and after the afternoon peak on Saturdays. The ENF states that, accordingly, peak hours for traffic associated with the proposed Project are not expected to coincide with commuter peaks. The DEIR needs to explain the peak periods related to this project as well as analyze the potential for overlap between commuter peak periods and casino peak periods, with particular focus on Fridays. **MAPC 03**

Crash Data Analysis

Casino traffic is more prone to accidents, such as drunk-driving incidents, than regular traffic. The Proponent needs to address the likelihood of an increase in accidents as part of its study of area crash data in the DEIR. The Proponent should take into account accidents involving patrons travelling to and from the Project by vehicle, bicycle and foot, even when those accidents occur relatively far from the site itself. The DEIR should include a clear explanation of steps the Proponent will take to minimize drunk driving and the accidents that occur as a result, especially in regard to patrons leaving the facility. **MAPC 04**

Mode Share Goals

According to the ENF, the majority of patrons are expected to travel by auto and the majority of employees are expected to travel by transit and shuttle service. The DEIR should outline a monitoring program to ensure that specifically defined mode share goals for both patrons and employees are accomplished. Along with specific steps to achieve these goals, the monitoring program should cover a defined period. Mode share goals should result in an increase for employee carpooling, public transportation, shuttles, charter buses, walking, and bicycling, and a decrease for single-occupancy vehicle (SOV) use. **MAPC 05**

Traffic and Roadway Infrastructure

Mitigation

In addition to the regional roadway network, the Proponent has indicated a commitment to assisting with local roadway and safety improvements and has already proposed a strong mitigation program that will improve capacity and vehicular circulation. It is imperative that the increased traffic flow be mitigated, for accessibility and safety concerns. The DEIR should build upon the mitigation described in the ENF and outline when it will be **MAPC 06**

implemented as well as how it will be monitored and enforced. The Proponent will need to continue to work with MassDOT, DCR, Boston, and Revere in addition to the surrounding communities to develop a comprehensive mitigation program. The scope and schedule of proposed mitigation should be clearly outlined as part of the MEPA process. Parties responsible for funding, implementation, and maintenance should be clearly defined as well.

Route 1A

Initial observations indicate that there is significant regional congestion in the Route 1A corridor, which continues north on Route 60 through Revere to Route 1. To that end, the Proponent proposes to construct substantial infrastructure improvements on Route 1A and in the vicinity of the Project site.

The ENF has indicated these improvements could include a Route 1A northbound flyover at Boardman Street, an additional Route 1A southbound lane, and the signalization of the Route 1A/Waldemar Avenue and Route 1A/Tomasello Drive intersections. The design of these improvements will need to be developed in consultation with MassDOT and area communities to address existing local and regional traffic challenges, improve safety, and provide capacity to accommodate Project trips entering and exiting the site. Providing adequate and efficient access/egress points to the Project site will enable the efficient flow of traffic thus potentially reducing adverse impacts to the local community, such as noise and air pollution. **MAPC 07**

Improvements to Route 1A will need to significantly improve safety and traffic capacity in the vicinity of the Project site, with reduced queuing and delays for both local and regional traffic as well as access to the site. Efficient travel along 1A will be challenging and the DEIR needs to address this in more detail. **MAPC 08**

Route 1/Route 16 Interchange

The cities of Revere and Chelsea have asked that existing regional traffic issues along the Route 60 and Route 1 corridors be studied to identify and assist in funding potential improvements. The Proponent has identified new ramp connections at the Route 1/Route 16 interchange and improvements along the Revere Beach Parkway corridor as potential mid-term improvements. These improvements are consistent with the *Boston Metropolitan Planning Organization's Lower North Shore Transportation Improvement Study* (prepared by the Central Transportation Planning Staff for the Massachusetts Highway Department in October 2000).

Proposed changes to Route 1 need to be consistent with MassDOT's proposal to widen and relocate a portion of Route 1 in Revere, Malden, and Saugus This 2.4-mile project begins 1,500 feet south of the Route 1/Route 60 interchange (Copeland Circle) and proceeds north through the Route 1/Route 99 Interchange. **MAPC 09**

Pedestrian and Bicycle Access

Local and Regional Connections

MAPC is pleased the ENF emphasizes strengthening pedestrian and bicycle connections to and within the site, specifically to the Suffolk Downs MBTA station, the Orient Heights neighborhood, and the retail stores located north of the site. MAPC looks forward to reviewing these details as well as how the proposed connections will integrate with other area projects in the DEIR. MAPC applauds the Proponent for proposing to expand the bicycle network which will allow for an almost continuous route between the East Boston waterfront and the front entrance to Belle Isle Marsh and Revere Beach.

Bicycle Parking

While the Proponent has mentioned providing bicycle storage racks near the front doors of the facilities, it is important that the Project have convenient, secure indoor bicycle parking for both patrons and employees. There should be additional consideration to allocating space for showers and changing rooms for the employees in the buildings. **MAPC 10**

Hubway

As part of its mitigation program, the Proponent should fund the expansion of Hubway stations at Suffolk Downs station and other locations in East Boston, Winthrop and Revere. The expansion of the Hubway system will promote increased bicycle use and enable the Proponent to reach its mode share goals. **MAPC 11**

Safety

The pedestrian and bicycle connections should be designed with safety in-mind, especially at night. MAPC looks forward to reviewing more details of a lighting program both in and around the Project. **MAPC 12**

Parking/Circulation

Surface Parking

The Project will create nine acres of additional pervious area and will redevelop an existing impervious parking lot. MAPC strongly encourages the Proponent to explore using innovative permeable paving technologies and other landscaping uses that facilitate drainage and stormwater management. **MAPC 13** It is important that surface parking spaces are well landscaped, pedestrian friendly, and have permeable surfaces. MAPC suggests that the Proponent consider implementing a program that will phase in surface parking spaces as demand warrants subsequent to the construction of the parking garage and full occupancy of the Project. **MAPC 14**

Employee Parking

The ENF mentions that while patron cars will be accommodated on site, it is anticipated that employee cars will be accommodated only during off-peak parking demand periods. Where will employees park during peak demand periods? It is important to keep parked cars associated with the Project out of the area neighborhoods. **MAPC 15**

Fees

The DEIR should explain whether there will be a fee for patrons to park in the garage or surface lots. MAPC strongly encourages the Proponent to consider incorporating a fee for funding the Transportation Demand Management (TDM) program, the Community Improvement Fund, or mitigation for environmental impacts. **MAPC 16**

Events

The Proponent has mentioned that events such as corporate gatherings and weddings will take place at the Project. The DEIR should address what will occur in the event of parking overflow. **MAPC 17**

Trucks

The DEIR should provide information regarding the estimated number, size, and frequency of trucks accessing the Project site. In particular, information regarding how will trucks will access the Project site and where they will originate should be provided (e.g., Will trucks be required to access designated roadways?, What routes will they take?, What is the schedule of regular truck visits?, and What steps can be taken to minimize noise disruption to surrounding neighborhoods?). **MAPC 18**

Transportation Demand Management (TDM) Program

MAPC applauds the Proponent for proposing an aggressive TDM program and looks forward to reviewing strategies to reduce SOV travel and encourage use of alternative transportation modes in the DEIR. While the Project site is well served by public transportation, public transit needs to be strongly promoted for employees and patrons. It is important that the TDM plan be tailored to the differing needs of patrons and employees. For example, due to the 24/7 operations of a casino, employees will be working in shifts. It is important that employee shift changes take place during times when the MBTA is operating. **MAPC 19**

MBTA Passes

In addition to joining the Logan Airport TMA, the Proponent should consider providing patrons with MBTA passes (Day/Week Link Pass) in addition to giving MBTA passes to employees (Monthly Link Pass) as incentives to use public transportation. **MAPC 20**

Shuttle Service Options

The Proponent should explore implementing the following shuttle service options:

Shuttle Service to and from Suffolk Downs Station

In addition to promoting public transportation, the Proponent should provide a high frequency shuttle bus that picks people up at the MBTA station and drops them off directly in front of the casino. The shuttle bus should offer frequent service on a continuous basis at no cost to passengers. **MAPC 21**

Area Shuttle Service

MAPC looks forward to reviewing a more detailed analysis in the DEIR that includes shuttle services that would: **MAPC 22**

- Provide access to and from Logan Airport, water transportation terminals, local area hotels, downtown Boston, the Boston Convention and Exhibition Center, and the Black Falcon Cruise Terminal.

- Connect with other regional entertainment and tourism venues.

Public Transportation

The DEIR should outline how the Proponent will coordinate with the MBTA, specifically regarding how connections between Suffolk Downs station and the Project can be enhanced. In addition, the Proponent should consider partnering with the MBTA by contributing to the operating costs of the Blue Line or area bus lines in an amount that is reasonably related to the Project's additional demand. **MAPC 23**

Water Transportation

The DEIR should describe any plans to coordinate with Massport regarding a potential water/bus shuttle system from downtown Boston to East Boston and the Project site or other water shuttle service connections. **MAPC 24**

Charter Buses

The DEIR needs to analyze the estimated number and peak periods of charter bus activity. While the ENF describes the designated area for charter bus pick-up/drop-off, it does not indicate where and for how long they will layover (e.g., How will the charter buses access the Project site and where will they be coming from?, Will the charter buses be required to access designated roadways?, and What steps will be undertaken to minimize idling?). **MAPC 25**

Signage

While the ENF does not mention any signage programs, the DEIR needs to describe the proposed regional and local signage program. MAPC strongly discourages the installation of digital video display signs or billboards as part of this Project. **MAPC 26**

Housing and Community Business Impacts

While the Project does not include a residential component, there are direct and indirect impacts that will result from the new development associated with the casino. The Project may spur new housing construction in the immediate as well as broader neighborhoods in Boston and Revere. This new development has an impact on the regional housing stock and should provide a range of housing types as well as be available to a broad range of incomes. Additionally, new housing should be located close to existing transit Blue Line and key bus routes in the area, particularly due to the nature of permanent jobs proposed for the Project. The Project will likely have a direct impact on existing housing prices and values. Both Cities should work through their respective Community Advisory Boards to ensure that the community benefits are provided to minimize or mitigate any negative housing and community business impacts, specifically ensuring that residents and local businesses are not displaced and new housing is in keeping with the provision of a range of housing types and available to a range of incomes.

Ancillary Development

Analysis of likely ancillary development activity and related impacts on land owned and not owned by the Proponent should be conducted to understand all potential impacts of the proposed Project. There should be particular attention to new housing, the impact on home values, the retail plaza abutting the Project site on Furlong Drive, and the 34-acre Wonderland Greyhound Park property owned by Suffolk Downs at Wonderland on the Blue Line. It should be noted that Saturday peak periods of retail and supermarket activity on Furlong Drive will most likely overlap with the Saturday peak periods of the proposed Project. **MAPC 27**

Water Quality

As stated in the ENF, the Suffolk Downs site includes one of the only Confined Animal Feeding Operations (CAFO) in Massachusetts. There have been Clean Water Act Violations in the past from the CAFO system. Although wastewater pollution and mitigation measures were briefly described in the ENF, stormwater management of the CAFO was not made apparent, which brings into question whether the site would require an individual National Pollutant Discharge Elimination System (NPDES) permit, as regulated under 33 U.S.C. 1251 § 122.21, or a Notice of Intent under Massachusetts NPDES General Permit, as required by § 122.21(i)(1). In addition, it is unclear whether a nutrient management plan is also required under § 122.42(e), as well as applicable effluent limitations and standards as specified in 40 CFR part 412. **MAPC 28**

Climate Change

Our general observations are that this redevelopment site presents a prime opportunity for the Cities of Boston and Revere to showcase innovative stormwater and green infrastructure techniques that account for climate change/sea level rise impacts. MAPC is currently developing a Regional Climate Change Adaptation Strategy that aims to prepare recommendations for local, regional, and state action to reduce vulnerability to future hazards and impacts of climate change. In addition, The Boston Harbor Association's *Preparing for the Rising Tide* report outlines vulnerabilities specific to Boston's coastline, including sites such as Suffolk Downs, and recommends how the private and public sectors can work together to address them. We are enthusiastic about the Proponent's willingness to maintain the site's natural hydrology, which will provide natural flood storage; however, we have some concerns regarding building, infrastructure, and landscape design statements, as discussed below.

<u>Building Design and Access</u>

Massachusetts' legislation enabling casinos includes guidelines that address community impact and design. It requires the Massachusetts Gaming Commission to issue regulations that include criteria such as "an evaluation of architectural design and concept excellence; integration of the establishment into its surroundings, [and] potential access to multi-modal means of transportation[1]." On December 12, 2012, the Boston Society of Architects and Massachusetts Gaming Commission co-hosted a forum, 'Promoting Sustainability and Strengthening Communities: Design Excellence for Massachusetts Casinos' on design considerations for casino facilities, with the goal of promoting sustainability and design excellence in harmony with local communities.

While MAPC is pleased the Proponent is striving for LEED Gold certification, the ENF does not include information regarding how the building design would meet LEED criteria, nor does it explain how the project will comply with the City of Boston's Article 37: Green Buildings, which is an important factor with regard to mitigating climate change impacts. **MAPC 29**

It is critical that building design and access be properly planned as this will have a direct effect on the economic attractiveness of the site and the future of the affected communities. At a minimum, in addition to pedestrian and bicycle connections and amenities such as benches, the building design should maximize active public uses at the ground level such as retail and restaurants. To promote pedestrian activity, visual transparency into buildings should be included in addition to designing buildings with multiple entrance and egress points. However, the ground floor construction should also be able to adequately accommodate floodwaters, as described below. **MAPC 30**

<u>Flooding</u>

Page 2-14 of the ENF states that "...all building foundations...will be constructed to withstand flood conditions." In order to best determine how the proposed design will affect flooding conditions, the DEIR should include information regarding proposed base flood elevations of new buildings and specific floodproofing measures. At a minimum, we urge the Proponent to refer to FEMA Technical Bulletin 3-93: *Non-Residential Floodproofing* regarding proactive floodproofing design for commercial structures to ensure that investments will withstand extreme precipitation and flooding conditions. **MAPC 31**

The outline of the base flood zone includes a large portion of the existing horse stables. Although this area of the Project site is subject to the CAFO requirements for water quality, as mentioned earlier, there are no current

[1] General Laws, Chapter 23K, Section 5.

requirements for flood controls within an area such as this. We recommend that the DEIR include a discussion regarding the Proponent's research into flood control measures designed specifically for the level of wastewater from this CAFO. **MAPC 32**

Stormwater

We are encouraged by the Proponent's statement that LID (Low Impact Development) drainage BMPs (Best Management Practices) will be included as part of the site's drainage design. However, conventional stormwater design is not adequate at this site. As previously noted, the Project presents a unique opportunity for the Cities of Boston and Revere to showcase innovative stormwater and green infrastructure techniques. MAPC views the concept of green infrastructure not just as "greener" methods of managing stormwater, but the use of greenspaces for multiple benefits such as park and recreation areas, as well as natural flood control pathways. We strongly encourage the Proponent to include these types of practices throughout all public spaces of the Project site. MAPC is in the process of preparing technical guidance for Green Infrastructure within urban areas. In the interim, the EPA's Green Infrastructure guidance (http://water.epa.gov/infrastructure/greeninfrastructure/index.cfm) provides information regarding various uses and design elements. **MAPC 33**

Page 2-14 of the ENF states that "...ongrade parking design for will allow gravity-controlled stormwater flows to exit the Project site." This statement indicates that the design of the stormwater system will move water offsite rapidly to the adjacent properties. This raises significant concerns that this design will exacerbate flood conditions in the surrounding neighborhoods, particularly Crescent Heights to the north and the adjacent Global Oil site to the northwest. The DEIR should include proposed stormwater measures that will contain and control floodwaters onsite. Eventually, conceptual designs created should utilize updated precipitation data for New England such as the Cornell Extreme Precipitation. In addition, design should also include the 100-year flood criteria, as well as the 500-year scenario, to account for more frequent and extreme flooding conditions. **MAPC 34**

Table 4-7 references an additional 58,000 gallons per day of water consumption for irrigation only. This is a significant increase in the use of potable water merely for landscaping. We strongly recommend that the DEIR include a discussion regarding reuse of collected rainwater for landscape irrigation in order to greatly reduce the need for this considerable additional water usage. **MAPC 35**

Wetlands Impacts

Project activities are proposed within the 100-year floodplain, the 100-foot Buffer Zone to Bordering Vegetated Wetlands (BVW) and Inland Bank, and the 25-foot Riverfront Area associated with Sales Creek.

The Proponent references an agreement made by the EEA Secretary on March 12, 1999 regarding a Densely Developed Exemption from the Massachusetts Wetlands Protection Act Riverfront Area performance standards, which impacts this site. This is a critical component of determining resource area boundary and potential impacts. Therefore, the DEIR should include a copy of the EEA letter or agreement pertaining to this exemption. **MAPC 36**

Page 4-5 discusses impacts and mitigation in compliance with the MA Wetlands Protection Act performance standards for Bordering Land Subject to Flooding (BLSF), and further states that such impacts and mitigation will be "explained in further detail in the DEIR." We request that the DEIR provide adequate information to determine whether proposed compensatory storage is provided equally at the same elevation that storage is being removed, and that this is a separate volume than that required for peak rate attenuation under Standard No. 2 of the Stormwater Management Policy. A preliminary plan showing areas of fill within the 100-year floodplain and all areas of proposed storage should be submitted prior to an FEIR document and/or upon submittal of a Notice of Intent with the Boston and Revere Conservation Commissions. **MAPC 37**

The ENF also states that "it is expected that the off-site Project work associated with the Route 1A improvements will likely not occur within any wetland resource areas other than approximately 40,000 sf of Land Subject to Coastal Storm Flowage (LSCSF)." The DEIR should quantify and qualitatively describe impacts to LSCSF, since these are critical areas for flood control. These areas are significant to storm damage prevention and flood control, protection of wildlife habitat and the prevention of water pollution. Generally, LSCSF contains areas where the water table is close to the surface, where pollutants in a flood plain could affect public health and water supplies, groundwater quality, wildlife, and fisheries. **MAPC 38**

Belle Isle and Sales Creeks

The Project site includes portions of Sales Creek and abuts Belle Isle Creek, which are both included in the Rumney Marsh Area of Critical Environmental Concern (ACEC), as regulated under 301 CMR 1200. The Rumney Marshes ACEC has been characterized by the U.S. Fish and Wildlife Service as "one of the most biologically significant estuaries in Massachusetts north of Boston." As such, the Creek and associated wetlands are protected for their unique cluster of natural and human resource values worthy of a high level of concern and guardianship. ACEC's typically include water resources designated as Outstanding Resource Waters (ORW) as defined under the Massachusetts Surface Water Quality Standards; Belle Isle Creek has been designated as Outstanding Resource Waters. The ENF states, "There are no ORWs on the Project site." The ORW associated with the Belle Isle Inlet and Rumney Marshes ACEC is located approximately 400 feet east of the Project site across Bennington Street. The fact that this critical resource area is just outside of jurisdictional boundaries should not exclude the Proponent from meeting the ORW water quality standards, particularly due to the negligible buffer. **MAPC 39**

Greenhouse Gas (GHG) Emissions

The ENF states, "The rationale for not including any of the suggested mitigation measures that would result in a significant reduction of Greenhouse Gas (GHG) emissions will be provided." The proposed Project will generate an approximate additional 24,600 vehicle trips per day (VTD), almost doubling existing conditions and thereby considerably increasing GHG emissions. The DEIR must specify GHG emissions from these proposed increased vehicle trips, in addition to GHG generation from buildings and site use. We encourage the Proponent to fully examine MEPA's revised Greenhouse gas Emissions Policy and Protocol (2010), as well as guidance from EPA's webpage: Measuring Greenhouse Gas Emissions from Transportation (http://www.epa.gov/otaq/climate/measuring.htm). **MAPC 40**

Air Quality

This level of increased VTD will result in an increase in air pollutants; Volatile Organic Compounds (VOC), Nitrite Oxide (NOx), Particulate Matter (PM), and Carbon monoxide (CO). Therefore, we strongly suggest that the DEIR include a scenario that reduces VTD through increased public transportation services, as well as a robust discussion regarding mitigation measures for GHG pollution. Increased public transportation options should include agreements and mitigation towards improved MBTA service and shuttles for both visitors and staff, planning for water transportation via East Boston (Orient Heights), and private bus/shuttle services from points within and outside the Metro Boston area, as described more fully in the Transportation section of this letter. **MAPC 41**

Solid Waste Management/Energy

We support the Proponent's potential inclusion of anaerobic digestion for organic waste diversion and green energy generator. This would provide the Proponent with a significant advantage regarding the proposed organics waste ban in development by MA Department of Environmental Protection. MAPC has been involved as an advisory committee member regarding the ban and reuse of organic material and would be happy to help facilitate the Proponent's conversations and provide technical assistance regarding the subject matter.

Amanda Linehan
Communications Manager
Metropolitan Area Planning Council
617-451-2770 ext. 2030
Cell 617-388-1556

LOCATING A CASINO: MUCH AT STAKE FOR HOST COMMUNITY AND REGION

A POLICY STATEMENT BY THE METROPOLITAN AREA PLANNING COUNCIL
DECEMBER 22, 2011

The recent press coverage about the Foxborough casino proposal reminds us all that Massachusetts faces some challenging decisions about where to locate up to three casinos, how to maximize the benefits of these developments, and how to address adverse impacts that could be serious and long-lasting. The Metropolitan Area Planning Council (MAPC), the regional planning agency for Metro Boston,[1] believes that the location of a new casino — not just its size or format — will in large part determine its transportation and environmental impacts, secondary economic effects, necessary public infrastructure investments, and social welfare consequences. The process of permitting a casino should involve a clear discussion of likely negative impacts, steps to eliminate or minimize such impacts, and the best approaches to assuring that short and long-term mitigation strategies reflect the priority concerns of the host municipality and the surrounding area.

As we prepare for this process, MAPC would like to provide some advice based on close to 50 years of experience in dealing with the impacts of major developments.

Pursue a transparent public process from beginning to end

MAPC values transparency in public process and community dialogue to ensure respectful, candid and straightforward communication among local stakeholders and casino proponents. Development proposals should be shared publicly as soon as they are ready, and whenever critical details or changes are added. The process should involve not only the local and state agencies whose approval is required; it should also engage the residents of neighboring communities that will be seriously impacted by a casino, but are unlikely to receive any of the new tax dollars. The process should involve a clear discussion of what likely negative impacts will be, how to minimize those impacts, and how to mitigate any impacts that cannot be eliminated. Focusing primarily on what a developer will

[1] The mission of MAPC is to promote smart growth and regional collaboration in Metropolitan Boston. Our work is guided by our regional plan, "MetroFuture: Making a Greater Boston Region." A critical component of MAPC's mission is to advance equity and cultural competency both internally and in our work throughout the region.

"give" the host community to obtain their support is not the same as a respectful conversation about benefits and impacts, involving both the host and surrounding communities.

Understand and plan for both positive and negative impacts beforehand

Casinos are huge developments, which by their nature bring both positive and negative impacts to a community and to a region. They pay taxes and provide jobs, but they also increase the need for regional road and transit improvements, public safety services, water and sewer infrastructure, and social services. A location needs to maximize economic benefits (in the short term, construction jobs, and in the long term, permanent jobs and tax revenues) while minimizing a host of possible adverse impacts. These negative impacts can include short-term construction disruptions, such as noise, dust, and truck traffic. More importantly, affected communities must also take the longer term view to assure that resources and practices are in place to address:

- increased traffic and transit impacts;
- increased demand for drinkable water and increased production of wastewater;
- storm water run-off, associated pollutants, and changes in drainage patterns;
- stresses on the regional housing stock across a broad range of incomes;
- changing demands for police, fire, and ambulance services;
- location of ancillary business and commercial services nearby, including in some instances services that the community might consider less-than-desirable; and
- an increased need for social services, especially those related to gambling and other forms of addiction.

No location is perfect. All three locations currently in the news in Eastern Massachusetts (Foxborough, Milford, and Suffolk Downs in Boston/Revere) have their pluses and minuses. The recently-approved casino legislation allows local residents in host communities to vote on whether they want the casino; it also allows surrounding communities (if they are determined eligible by the Gaming Commission) to receive reasonable mitigation for adverse impacts, such as the need for road improvements to address traffic. Nonetheless, the characteristics of proposed casino locations will make some sites inherently more suitable than others.

Deal with traffic and transit

In most locations, we must assume that the majority of casino guests, as well as workers, will arrive by automobile. It is critical to determine if the proposed casino can be served by the existing roadway system. Sometimes roads can be adequately improved with mitigation funds from the developer, but in other cases state and federal resources are required to retrofit the roads adequately. Such public resources are very scarce and they are needed to improve travel safety, to ease traffic flow, or to provide transit for thousands of area residents and businesses. Such projects should have a higher priority in implementing the state's economic development aims.

A hypothetical casino including 175,000 square feet of gaming space, 350 hotel rooms, 30,000 square feet of restaurants, and 30,000 square feet of retail will add some 3,000 vehicle trips during the peak AM and PM commuting times, as well as additional traffic during other times of the day and week.[2] If some of those trips could be made, instead, by transit or other common carriers, traffic

[2] Peak Hour traffic generation is based upon *Trip Generation* (7th edition) by the Institute for Transportation Engineers; traffic volume by guests and employees outside of rush hours is much harder to quantify.

impacts for the host and nearby communities would be less onerous. It could also be less costly for taxpayers who would be asked to fund fewer proposals for new interchanges, roadway widening projects, additional traffic signals, etc. There is also strong reason to believe that the presence of a casino leads to an increase in alcohol-related traffic accidents and fatalities.[3] Locating a casino that is transit-accessible could not only decrease these types of traffic accidents but also conserve police, fire, and medical resources.

Transit availability is especially important for employees, not only during typical commuting hours, but also at other times of the day and week when casino employees are likely to arrive at and leave work. Out-of-area commutes for employees can increase their costs (negatively affecting workers' incomes) and contribute to traffic congestion. A range of transit options (e.g., subway, trains, buses, and limousine vans) could mitigate traffic generated by guests if it is provided in an appropriate manner and with sufficient frequency. In regard to both roadways and transit (including pedestrian facilities), it is important that any casino developer dedicate adequate resources — both at the time of development and over the longer-term — to appropriately upgrade service without burdening either municipal or state resources.

Think about water as well as cars

Hotels, restaurants, and gaming facilities consume large volumes of drinking water. Looking at examples of other casino complexes, water use can exceed 300,000 gallons per day. A municipal water (and wastewater) system that can handle such use would help to make a location more suitable. Many municipal systems would find it difficult or impossible to meet such a demand without taking extraordinary and costly measures.

Access to a labor force is a distinct advantage

This is especially true if that labor force can provide both high skilled and service workers needed for a casino operation. If the casino is built in an area where few workers currently live, it will require long and costly commutes. Additional residential development may be needed to provide local housing for casino workers in the host and surrounding municipalities. While housing production is usually an advantage for a community, large housing developments in small communities can add service demands. There is also the risk of isolating casino workers and their children in developments that are segregated from the community at large. If adequate housing is not built, for-sale and rental costs could rise. Alternatively, locating such a facility near a concentration of workers may provide an opportunity to help some of our more disadvantaged residents to rejoin the economic mainstream.

In conclusion, MAPC is neither for, nor against, casino gambling. Our members include communities and individuals who support casino gambling, and others who oppose it. However, now that the Commonwealth has adopted a statute governing the siting and regulation of such facilities, the question of where to place a casino in Eastern Massachusetts constitutes a major and complicated civic decision for the state, the host community, and surrounding cities and towns. MAPC stands ready to participate in these discussions to choose the best possible location, and to quantify and address all negative impacts.

[3] Buckhurst Fish & Jacquemart Inc. (2001). *Bridgeport Casino Traffic Impacts on the South Western Region of Connecticut, Final Report: July 2001*. (pp. 2-3) New York: Buckhurst Fish Jacquemart, Inc.

METROPOLITAN AREA PLANNING COUNCIL

MAPC 01 **It is important to understand the geographic distribution of patrons and employees for this regional destination. Where will these trips originate, and what highways will drivers utilize (e.g., I-90, I-93, Route 1, Route 1A, Route 16)? In addition to the local traffic analysis required in a typical MEPA analysis, this DEIR should address the regional impacts of Project-related traffic.**

The geographic distribution of patron and employee trips is presented in Sections 5.4.7 and 5.4.8. The transportation study area has been defined by MassDOT to capture regional as well as local traffic impacts, as presented in Section 5.7.

MAPC 02 **While the ENF states the DEIR will include a No-Build traffic analysis based on the projection of traffic volumes for a "horizon" year of 2020, the projections are for the year 2017. At a minimum, the analysis of the traffic impacts should be for ten years (as was done for the Project First Light Destination Resort Casino ENF in Taunton).**

The DEIR/EPNF traffic analysis horizon year is 2022.

MAPC 03 **The DEIR needs to explain the peak periods related to this Project as well as analyze the potential for overlap between commuter peak periods and casino peak periods, with particular focus on Fridays.**

The DEIR/EPNF traffic analysis in Section 5.0 is based on the worst combinations of roadway peak and Project peak, which are identified as the Friday afternoon peak commuter hour (5-6 p.m.) and Saturday afternoon peak hour (4-5 p.m.).

MAPC 04 **The Proponent needs to address the likelihood of an increase in accidents as part of its study of area crash data. The Proponent should take into account accidents involving patrons travelling to and from the Project by vehicle, bicycle, and foot, even when those accidents occur relatively far from the site itself. The DEIR should include a clear explanation of steps the Proponent will take to minimize drunk driving and the accidents that occur as a result, especially in regard to patrons leaving the facility.**

While there will be an increase in traffic on the roadway network supporting the Project site, this does not suggest a corresponding increase in crashes. Significant roadway, traffic, and pedestrian safety improvements will be provided by the Project, some of which will address pre-exiting safety issues (see Section 5.0).

MAPC 05 **According to the ENF, the majority of patrons are expected to travel by auto and the majority of employees are expected to travel by transit and shuttle service. The DEIR should outline a monitoring program to ensure that specifically defined mode share goals for both patrons and employees are accomplished. Along with specific steps to achieve these goals, the monitoring program should cover a defined period.**

The TDM plan presented in Section 5.9 includes monitoring commitments to be developed in coordination with MassDOT, BTD, and others.

MAPC 06 **The DEIR should build upon the mitigation described in the ENF and outline when it will be implemented as well as how it will be monitored and enforced. The Proponent will need to continue to work with MassDOT, DCR, Boston, and Revere in addition to the surrounding communities to develop a comprehensive mitigation program. The scope and schedule of proposed mitigation should be clearly outlined as part of the MEPA process. Parties responsible for funding, implementation, and maintenance should be clearly defined as well.**

The improvements to be made under the HCAs with the cities of Revere and Boston are described in Sections 5.5 and 5.6. The Proponent will work with MassDOT, DCR, Boston, and Revere in developing designs for these improvements, the scope, schedule, and responsibilities for which will be outlined as part of the MEPA process.

MAPC 07 **The ENF has indicated these improvements could include a Route 1A northbound flyover at Boardman Street, an additional Route 1A southbound lane, and the signalization of the Route 1A/Waldemar Avenue and Route 1A/Tomasello Drive intersections. The design of these improvements will need to be developed in consultation with MassDOT and area communities to address existing local and regional traffic challenges, improve safety, and provide capacity to accommodate Project trips entering and exiting the site.**

The Route 1A infrastructure improvements will be developed in consultation with MassDOT, BTD, the City of Revere, and residents of the local communities.

MAPC 08 **Improvements to Route 1A will need to significantly improve safety and traffic capacity in the vicinity of the Project site, with reduced queuing and delays for both local and regional traffic as well as access to the site. Efficient travel along 1A will be challenging and the DEIR needs to address this in more detail.**

Safety and traffic capacity improvements for regional traffic and local access are key objectives of the proposed Route 1A infrastructure improvements.

MAPC 09 **Proposed changes to Route 1 need to be consistent with MassDOT's proposal to widen and relocate a portion of Route 1 in Revere, Malden, and Saugus. This 2.4-mile project begins 1,500 feet south of the Route 1/Route 60 interchange (Copeland Circle) and proceeds north through the Route 1/Route 99 Interchange.**

The proposed improvements to the Route 1/Route 16 interchange are consistent with the proposal to widen and relocate a portion of Route 1 in Revere, Malden, and Saugus.

MAPC 10 **While the Proponent has mentioned providing bicycle storage racks near the front doors of the facilities, it is important that the Project have convenient, secure indoor bicycle parking for both patrons and employees. There should be additional consideration to allocating space for showers and changing rooms for the employees in the buildings.**

Bicycle amenities including valet parking, storage, and showers are described in Section 1.4. As described in Section 5.8.3, the number of bicycle parking spaces to be provided is based on BTD Bicycle Guidelines.

MAPC 11 **As part of its mitigation program, the Proponent should fund the expansion of Hubway stations at Suffolk Downs station and other locations in East Boston, Winthrop and Revere.**

The Project includes two Hubway stations, the locations for which were determined in coordination with BTD and representatives from the City of Revere. Infrastructure will be installed to support the two stations, and they will be deployed at the Proponent's cost when the City deploys its East Boston Hubway system.

MAPC 12 **The pedestrian and bicycle connections should be designed with safety in mind, especially at night. MAPC looks forward to reviewing more details of a lighting program both in and around the Project.**

Section 4.4 describes full-cutoff, energy-efficient site lighting.

MAPC 13 **MAPC strongly encourages the Proponent to explore using innovative permeable paving technologies and other landscaping uses that facilitate drainage and stormwater management. It is important that surface parking spaces are well landscaped, pedestrian-friendly, and have permeable surfaces.**

The Project design will incorporate permeable pavers into pedestrian plazas and walkways to the maximum extent practicable (see Section 4.4). Surface parking lots will utilize conventional pavement due to the high level of vehicle activity and soil conditions in those areas.

MAPC 14 **MAPC suggests that the Proponent consider implementing a program that will phase in surface parking spaces as demand warrants subsequent to the construction of the parking garage and full occupancy of the Project.**

The Proponent currently intends to construct all surface parking spaces during the single construction period.

MAPC 15 **The ENF mentions that while patron cars will be accommodated on site, it is anticipated that employee cars will be accommodated only during off-peak parking demand periods. Where will employees park during peak demand periods? It is important to keep parked cars associated with the Project out of area neighborhoods.**

As described in Section 5.10.3, with the exception of limited parking for management and essential staff, no employee parking will be provided on the Project site. Rather, employees will park in multiple geographically-dispersed locations connected to the Resort by continuous shuttle bus service. Notwithstanding this, the Proponent has committed to supporting host community initiatives to protect neighborhood streets by expanding parking restrictions and the resident parking permit programs.

MAPC 16 **The DEIR should explain whether there will be a fee for patrons to park in the garage or surface lots. MAPC strongly encourages the Proponent to consider incorporating a fee for funding the TDM program, the Community Improvement Fund, or mitigation for environmental impacts.**

While patron parking on-site will be managed to avoid misuse such as commuter park-and-ride activity, the Proponent is not proposing to charge fees for parking.

MAPC 17 **The Proponent has mentioned that events such as corporate gatherings and weddings will take place at the Project. The DEIR should address what will occur in the event of parking overflow.**

Overflow parking will provided on the Project site to accommodate special events. These overflow parking spaces will consist of reinforced turf parking areas near the loading areas to Casino Area I.

MAPC 18 **The DEIR should provide information regarding the estimated number, size, and frequency of trucks accessing the Project site. In particular, information regarding how trucks will access the Project site and where they will originate should be provided (e.g., will trucks be required to access designated roadways? What routes will they take? What is the schedule of regular truck visits? What steps can be taken to minimize noise disruption to surrounding neighborhoods?).**

Trucks accessing the site to service the Resort will be subject to a management plan enforced by the Proponent. Under this plan, state and city idling laws will be enforced and the timing and routes for deliveries will be managed to minimize impacts to surrounding neighborhoods. It is anticipated that approximately 25 trucks will access the site each day from the Winthrop Avenue entrance.

MAPC 19 **It is important that the TDM plan be tailored to the differing needs of patrons and employees. For example, due to the 24/7 operations of a casino, employees will be working in shifts. It is important that employee shift changes take place during times when the MBTA is operating.**

The comprehensive TDM plan presented in Section 5.9 is designed to address the differing needs of patrons and employees. There will be multiple shift changes spread throughout the day, and the Proponent has committed in the TDM plan to adjusting employee shift times to the extent possible to reflect transit availability.

MAPC 20 **In addition to joining the Logan Airport TMA, the Proponent should consider providing patrons with MBTA passes (Day/Week Link Pass) in addition to giving MBTA passes to employees (Monthly Link Pass) as incentives to use public transportation.**

The Proponent has committed to join the Logan TMA and subsidize employee MBTA passes, along with many other incentives included in the TDM plan presented (see Section 5.9).

MAPC 21 **In addition to promoting public transportation, the Proponent should provide a high frequency shuttle bus that picks people up at the MBTA station and drops them off directly in front of the casino. The shuttle bus should offer frequent service on a continuous basis at no cost to passengers.**

The Proponent has committed to providing enhanced continuous shuttle bus service between Suffolk Downs Station and the Resort entrances (see Section 1.1.1.2).

MAPC 22 **MAPC looks forward to reviewing a more detailed analysis in the DEIR that includes shuttle services that would:**

- **Provide access to and from Logan Airport, water transportation terminals, local area hotels, downtown Boston, the Boston Convention and Exhibition Center, and the Black Falcon Cruise Terminal.**
- **Connect with other regional entertainment and tourism venues.**

The proposed shuttle plan for the Project is presented in Section 5.8.4, and includes all of the suggested potential service connections.

MAPC 23 **The DEIR should outline how the Proponent will coordinate with the MBTA, specifically regarding how connections between Suffolk Downs station and the Project can be enhanced. In addition, the Proponent should consider partnering with the MBTA by contributing to the operating costs of the Blue Line or area bus lines in an amount that is reasonably related to the Project's additional demand.**

The Proponent has discussed the enhanced shuttle service at Suffolk Downs Station with the MBTA, including an improved connection between the shuttle stop and the station entrance. Potential impacts to the MBTA Blue Line and bus routes are presented in Section 5.8.1, and the Proponent will continue to coordinate with the MBTA in this regard.

MAPC 24 **The DEIR should describe any plans to coordinate with Massport regarding a potential water/bus shuttle system from downtown Boston to East Boston and the Project site or other water shuttle service connections.**

The Proponent has committed in the Boston HCA to support the City of Boston's initiative to provide water transportation to the East Boston waterfront, and to providing a shuttle connection from the dock to the Resort.

MAPC 25 **The DEIR needs to analyze the estimated number and peak periods of charter bus activity. While the ENF describes the designated area for charter bus pick-up/drop-off, it does not indicate where and for how long they will layover (e.g., How will the charter buses access the Project site and where will they be coming from? Will the charter buses be required to access designated roadways? What steps will be undertaken to minimize idling?).**

Charter buses will access the Project site from the Winthrop Avenue entrance and will be required to use designated roadways. Buses will pick up and drop off in a designated area on the site and will be required to park off-site to avoid unnecessary idling.

MAPC 26 **While the ENF does not mention any signage programs, the DEIR needs to describe the proposed regional and local signage program. MAPC strongly discourages the installation of digital video display signs or billboards as part of this Project.**

The Proponent will work with MassDOT, DCR, and the cities of Revere and Boston to develop appropriate directional signage to the Resort. The Proponent is sensitive to its relationship with host and surrounding communities, and will work to ensure exterior signage and lighting provides visual aesthetics for the Resort without negatively impacting surrounding communities.

MAPC 27 **Analysis of likely ancillary development activity and related impacts on land owned and not owned by the Proponent should be conducted to understand all potential impacts of the proposed Project. There should be particular attention to new housing, the impact on home values, the retail plaza abutting the Project site on Furlong Drive, and the 34-acre Wonderland Greyhound Park property owned by Suffolk Downs at Wonderland on the Blue Line.**

Please see the response to NEC 08.

MAPC 28 **Although wastewater pollution and mitigation measures were briefly described in the ENF, stormwater management of the CAFO was not made apparent, which brings into question whether the site would require an individual NPDES permit…**

In May 2008, EPA directed Suffolk downs to apply for an individual NPDES permit for all discharges from the CAFO to navigable waters; Suffolk Downs submitted its application for a NPDES permit in September 2008. The application included a nutrient management plan pursuant to 40 CFR §122.42(e). EPA published a draft NPDES permit (EPA NPDES Permit no. MA0040282) for public comment as of March 1, 2013, along with a fact sheet that fully describes the Suffolk Downs CAFO stormwater and process water management systems. The draft permit and fact sheet are available at http://www.epa.gov/region1/npdes/permits/draft/2013/draftma0040282permit.pdf. EPA's public comment period on the proposed NPDES permit closed on March 31, 2013.

MAPC 29 **While MAPC is pleased the Proponent is striving for LEED Gold certification, the ENF does not include information regarding how the building design would meet LEED criteria, nor does it explain how the Project will comply with the City of Boston's Article 37: Green Buildings…**

Section 2.2 includes a summary LEED NC 2009 scorecard demonstrating the Proponent's commitment to achieving LEED Gold Certification, a detailed analysis of the LEED NC 2009 prerequisites and credits the Project is targeting for achievement, and a summary statement regarding how the Project complies with the requirements of the City of Boston's Article 37 (Green Buildings).

MAPC 30 **At a minimum, in addition to pedestrian and bicycle connections and amenities such as benches, the building design should maximize active public uses at the ground level such as retail and restaurants. To promote pedestrian activity, visual transparency into buildings should be included in addition to designing buildings with multiple entrance and egress points. However, the ground floor construction should also be able to adequately accommodate floodwaters…**

The Project description in Section 1.0 addresses activation of the ground level. Resort resiliency from flooding and climate change is described in Section 2.3.

MAPC 31 **In order to best determine how the proposed design will affect flooding conditions, the DEIR should include information regarding proposed base flood elevations of new buildings and specific floodproofing measures. At a minimum, we urge the Proponent to refer to FEMA Technical Bulletin 3-93: *Non-Residential Floodproofing* regarding proactive floodproofing design for commercial structures to ensure that investments will withstand extreme precipitation and flooding conditions.**

The proposed first-floor levels of the buildings will be considerably higher than the 100-year flood elevation: the 100-year flood elevation is 15.46 feet (BCB), and the proposed first-floor elevation of the casino buildings is 28 feet. Section 2.3 addresses climate change adaptation, and Sections 2.3.6 and 4.5 describe how the site design is responsive to sea level rise. No building construction is proposed within the flood zone.

MAPC 32 **We recommend that the DEIR include a discussion regarding the Proponent's research into flood control measures designed specifically for the level of wastewater from this CAFO.**

The Project includes construction of a maintenance building and parking area in a part of the existing CAFO. Stormwater generated from this area will no longer be discharge to the CAFO sanitary system; therefore, the existing system will have expanded capacity to accommodate flows. Furthermore, the pond has a capacity to hold a 50-year storm event. Suffolk Downs is required to keep surfaces swept and manure-free, and manure is stored in precipitation-tight containers. Manure trailers would be removed in event of a flood. Section 9.1 describes Resort wastewater.

MAPC 33 **MAPC views the concept of green infrastructure not just as "greener" methods of managing stormwater, but the use of greenspaces for multiple benefits such as park and recreation areas as well as natural flood control pathways. We strongly encourage the Proponent to include these types of practices throughout all public spaces of the Project site.**

Section 4.5 describes the Resort's green infrastructure that will also serve as an aesthetic and civic amenity.

MAPC 34 **Page 2-14 of the ENF states that "… ongrade parking design will allow gravity-controlled stormwater flows to exit the Project site." This statement indicates that the design of the stormwater system will move water off-site rapidly to the adjacent properties. This raises significant concerns that this design will exacerbate flood**

conditions in the surrounding neighborhoods, particularly Crescent Heights to the north and the adjacent Global Oil site to the northwest. The DEIR should include proposed stormwater measures that will contain and control floodwaters onsite.

The Project will not increase the flow of stormwater off-site, and will result in a net reduction in impervious surface on the Project site; therefore, the total stormwater generated by the Project site will decrease relative to existing conditions. A series of BMPs are included in the design of the proposed stormwater management system to improve the quality and reduce the quantity of stormwater flowing from the site. These measures include bioretention basins, water quality swales, pervious pavers, bioswales, and rainwater reuse tanks (see Section 9.3).

MAPC 35 **We strongly recommend that the DEIR include a discussion regarding reuse of collected rainwater for landscape irrigation in order to greatly reduce the need for this considerable additional water usage.**

The Project design includes three large rainwater reuse tanks to collect stormwater from the rooftops. These tanks will collectively have a 270,000-gallon capacity and will result in an annual water savings of over 4.5 million gallons per year. Collected rainwater will be used for on-site landscape irrigation, track watering, and cooling water tower demand.

MAPC 36 **The Proponent references an agreement made by the EEA Secretary on March 12, 1999 regarding a Densely Developed Exemption from the Massachusetts Wetlands Protection Act Riverfront Area performance standards, which impacts this site. This is a critical component of determining resource area boundary and potential impacts. Therefore, the DEIR should include a copy of the EEA letter or agreement pertaining to this exemption.**

To clarify, the Proponent is not claiming any exemptions from the Wetlands Protection Act regulations or performance standards, including but not limited to RFA associated with Sales Creek on the Project site. Information demonstrating compliance with the WPA performance standards is provided in Section 6.9. The DDA designation referenced in the comment letter simply refers to the width of the Sales Creek RFAs as being 25 feet in the City of Revere versus the normal 200 feet prescribed by the regulations. The RFA is also 25 feet wide in the City of Boston, consistent with 310 CMR 10.58(2)(a)3.a. A copy of the Approval of the Secretary of EEA of a Designation of a DDA was provided as Attachment G to the ENF.

MAPC 37 **We request that the DEIR provide adequate information to determine whether proposed compensatory storage is provided equally at the same elevation that storage is being removed, and that this is a separate volume than that required for peak rate attenuation under Standard No. 2 of the Stormwater Management Policy. A preliminary plan showing areas of fill within the 100-year floodplain and all areas**

of proposed storage should be submitted prior to an FEIR document and/or upon submittal of a Notice of Intent with the Boston and Revere Conservation Commissions.

Approximately 615,000 square feet of BLSF will be altered on the Project site (see Section 6.9.1.2). The Project will not result in any loss of flood storage; although grading work will occur in the 100-year floodplain, this work will include both filling and cutting. As demonstrated in Table 6-34, compensatory flood storage will be provided for all flood storage volume that will be permanently lost as a result of Project construction. The volume will be created in an area not previously used for flood storage and will be incrementally equal to the theoretical volume of flood water lost at each elevation, up to and including the 100-year flood elevation, which will be displaced by the Project. Section 2.3 addresses floodplain issues.

MAPC 38 The ENF also states that, "it is expected that the off-site Project work associated with the Route 1A improvements will not likely occur within any wetland resource areas other than approximately 40,000 sf of LSCSF." The DEIR should quantify and qualitatively describe impacts to LSCSF…

Potential impacts to off-site wetlands associated with proposed off-site infrastructure improvements are described in Section 6.9.2.

MAPC 39 The ORW associated with the Belle Isle Inlet and Rumney Marshes ACEC is located approximately 400 feet east of the Project site across Bennington Street. The fact that this critical resource area is just outside of jurisdictional boundaries should not exclude the Proponent from meeting the ORW water quality standards, particularly due to the negligible buffer.

The Project will meet and exceed MassDEP Stormwater Management Guidelines for water quality treatment in critical areas, and the Project will improve the water quality of stormwater discharges into Sales Creek and ultimately Belle Isle Inlet and Rumney Marshes ACEC (see Section 9.3).

MAPC 40 The proposed Project will generate an approximate additional 24,600 vehicle trips per day, almost doubling existing conditions and thereby considerably increasing GHG emissions. The DEIR must specify GHG emissions from these proposed increased vehicle trips, in addition to GHG generation from buildings and site use.

GHG emissions from mobile sources are included in the GHG analysis in Section 7.5.

MAPC 41 This level of increased vehicle trips per day will result in an increase in air pollutants: VOC, NOx, particulate matter, and carbon monoxide. Therefore, we strongly suggest the DEIR include a scenario that reduces vehicle trips per day

through increased public transportation services as well as a robust discussion regarding mitigation measures for GHG pollution. Increased public transportation options should include agreements and mitigation towards improved MBTA service and shuttles for both visitors and staff, planning for water transportation via East Boston (Orient Heights), and private bus/shuttle services from points within and outside the Metro Boston area...

The Proponent is committed to implementing a robust TDM plan, as described in Section 5.9. Benefits of the TDM plan will be accomplished as part of the Project implementation, and these benefits are already assumed under the Build condition. Mitigation measures for GHG emissions are described in Section 7.0.

Environmental and Energy Services
CITY OF BOSTON

THOMAS M. MENINO
Mayor

BRIAN R. SWETT
Chief of Environment and Energy

March 26, 2013

Via U.S. and Electronic Mail
Secretary Richard K. Sullivan
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02214

Subject: *Environmental Notification Form (ENF) Review*
Caesars Resort at Suffolk Downs, EEA No. 15006

Dear Secretary Sullivan:

The City of Boston is pleased to have the opportunity to comment on the Caesars Resort at Suffolk Downs Environmental Notification Form (ENF) filed with the Massachusetts Environmental Policy Act (MEPA) Office on January 31, 2013. The City of Boston (City) is a leader in environmental sustainability and energy efficiency. As such, the City and specifically the Environment and Energy Services cabinet (EES) has very high standards.

General Policy Goals

Below is a list of overarching policies and goals that the City recommends the proponent consider: **BOS 01**

- Reduce energy intensity to the maximum extent possible;
- On-site alternative energy generation to the maximum extent possible;
- Strive to achieve LEED Platinum status;
- Conserve, maximize efficiency and reuse water to the greatest extent possible;
- Seek innovative green attributes;
- Maximize Transportation Demand Management opportunities for all guests and staff; and
- Create a standard for sustainable resort operations and maintenance.

Scope of the Comments

The following comments, prepared by the City and our consultant CDM Smith, offer remarks on the scope of the Draft Environmental Impact Report (DEIR) and on the proponent's latest design concepts, as presented at the March 6, 2013 MEPA consultation session. We note

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that some of these assessments and recommendations may pertain to topics and review that is part of the City's own review process; but we have included it herein to allow your office to understand the City's comments on the proposal.

While the scope of this letter is limited to environmental assessments, the City's interests and review extend well beyond these issues. As such, a second letter is also being submitted to your office by the City commenting on transportation elements of the proposal. *See attached March 26, 2013 City of Boston Transportation Department Letter.*

We have reviewed the Secretary's thorough August 24, 2012 certificate on the Project First Light-Destination Resort Casino (EEA No. 14924) and concur that the DEIR scope requirements and level of detail in the areas listed below also pertain to the Caesars Resort project.

- Alternatives Analysis
- Traffic and Transportation
- Greenhouse Gas Analysis
- Wastewater
- Land
- Wetlands
- Rare Species
- Hazardous Materials
- Historic Resources
- Construction Management
- Mitigation

We suggest similar scope requirements for the Caesars Resort project DEIR.

In addition, we offer the following recommendations on DEIR scope requirements for the Caesars Resort project, presented by topic. Note that while some of these recommendations may pertain to topics that will be part of the City's review process, and/or the Boston Redevelopment Authority (BRA) review process, we have nonetheless included them herein because the filed ENF also addresses them.

General

1. The proponent presented some new design and sustainability concepts at the March 6, 2013 MEPA consultation session that are not reflected in the ENF filed on January 31, stating that the project will connect nature, people and place and that it will be the "greenest" casino in the country. We are encouraged by Suffolk Downs' pledge for a **BOS 02**

particularly green development, including new plans to reduce pavement by 30% and transform current asphalt into a natural landscape. We expect that the DEIR will describe these general comments in more detail.

2. The ENF cites 2017 as the Build Year and 2020 as the Horizon Year. We suggest that the final Horizon Year be selected with MEPA, MassDOT and MassDEP input (for State Implementation Plan target years), and that it be a year that represents full operation of the project plus reasonably foreseeable growth induced by the project. **BOS 03**

3. The study area for each topic in the DEIR should be clearly specified and justified. **BOS 04**

4. Impacts of proposed mitigation, as well as direct and indirect effects, and cumulative effects should be addressed in the DEIR. **BOS 05**

5. The DEIR should include a description of plans for renovating the existing race track and plans during and after construction. Any intensification of use of the race track facilities over existing conditions as induced by increased visitors to the casino should also be identified and included in the impact analysis. **BOS 06**

Energy and Greenhouse Gas Analysis

1. At the March 6 MEPA consultation session, the proponent indicated that anaerobic digestion, solar photovoltaic, and geothermal energy would be part of the project. We encourage the proponent's commitment to renewable energy, and look forward to a more detailed analysis and description in the DEIR of these and other innovative technologies including: **BOS 07**

   - Anaerobic digestion using wastewater sludge, horse manure, food waste and other nearby organic wastes to produce biogas for use in combined heat and power systems or to produce biofuels for on-site vehicle use
   - Combined heat and power (CHP) systems using natural gas and/or digester gas (engine generators, microturbines, fuel cells, etc.)
   - Solar photovoltaic (including power purchase agreements)
   - Solar thermal
   - Building integrated solar
   - Wind turbines
   - Low-impact hydroturbines
   - Geothermal
   - Water source heat pumps
   - Sewer heat recovery
   - Biofuels

- Biomass boilers
- Purchasing green power

2. The ENF states that the proponent will conduct a greenhouse gas (GHG) emissions analysis in accordance with the MEPA GHG Emissions Policy. The list of GHG sources and proposed approach in the ENF appears complete. The ENF states that both Boston and Revere are Energy Stretch Code communities, requiring high standards for efficient energy use in buildings. The ENF then states that these standards will be included in the "preferred case," but not in the "baseline case" that would be used as comparison. The DEIR should examine the Stretch Code requirements in the "baseline case," along with reasonable energy conservation measures that would be encouraged for any new development at the site, and then show how this project may go beyond these measures. **BOS 08**

Climate Change Preparedness

1. The City will consider its own climate change preparedness goals in evaluating the proposal.

2. Although sea level rise is discussed in the greatest detail, the ENF acknowledges that other climate change impacts should also be addressed and indicates that the DEIR will include analysis of the following:

   - Storm surge
   - Increased frequency/severity of storms
   - Rising temperatures
   - Increased frequency of extreme heat days
   - Precipitation changes

Sea Level Rise and Storm Surge

1. In design review, the City will look for protection for the community in relation to sea level rise and storm surge. The ENF used the historic sea level rise value of 2.65 mm/yr. The ENF assumes a linear progression of sea level rise over the 100-year period, which does not account for the potential for future acceleration in the rate of sea level rise. The ENF also states that sea level rise would be 10.44 inches over the next century. The MA Executive Office of Energy and Environmental Affairs (EEA) Climate Change Adaptation Report suggests a more conservative sea level rise range, taking uncertainty associated with United Nations Intergovernmental Panel on Climate Change (IPCC) models into account, of 1 to 6 feet by the end of the century. The proponent has acknowledged the EEA Climate Change Adaptation Report, and has stated that the DEIR will evaluate site design for consistency with this Report. **BOS 09**

2. The ENF looked at the relationship of the first floor elevation to flood elevation. It is more appropriate to compare the ground floor to flood levels, allowing for the protection of all **BOS 10**

critical infrastructure. The proponent has agreed to consider both the ground floor, and critical underground infrastructure, for vulnerability to flooding in the DEIR. We recommend the proponent also consider protection of chemicals, manure and other potential pollutants from a flooding event. The City will pursue from the proponent design plans and analysis for the impacts of sea level rise and storm serve on the transportation and energy reliably of the site.

3. The DEIR should evaluate the floodplain, including the Flood Insurance Rate Maps, the 100-year flood plain in the project area, and coastal storm flood issues. If necessary under storm surge conditions, we also suggest that the DEIR evaluate a potential operation of a pumping station. **BOS 11**

4. 310 CMR 10.57(4) states that the compensatory storage shall have an unrestricted hydraulic connection to the adjacent water body, meaning that the proposed development plans need to be examined to confirm that existing flow paths are not severed, which can result in localized flooding. This issue should be addressed in the DEIR. **BOS 12**

5. The DEIR should also consider and evaluate the impacts on flooding of adjacent sites as it may impact the proposed site. **BOS 13**

Sustainable Design and LEED

1. At the March 6 MEPA consultation session, the proponent stated its intent to make the project the "greenest" casino in the country, yet the ENF indicates that the project will strive for LEED Gold, which is required in the Expanded Gaming Law, *see* M.G.L. c. 23K, § 18 (8). The DEIR should describe in detail how the project will be certified as LEED Gold or higher. **BOS 14**

2. Sustainable strategies should not be limited to or by LEED credit thresholds and certification. The DEIR should include consideration of alternative rating systems and metrics that may provide measurable long-term benefits to the project. **BOS 15**

3. It appears that the LEED scorecard in the ENF needs to be updated in the DEIR to reflect the proponent's additional sustainability commitments as presented at the March 6 MEPA consultation session. We offer the following comments on the ENF scorecard to assist the proponent in making revisions: **BOS 16**

   - The ENF indicates that the project will be LEED Gold certifiable (60 – 79 points); however, the scorecard indicates a total of 58 points. Typically projects attempt several "extra" credits in case USGBC rejects, or the project misses on, any given credit. This is a minimal effort for LEED certification with most credits coming from non-Energy/Water credits. While the ENF states that the project will set a "new standard" for sustainable gaming facilities, the described sustainable strategies and LEED scorecard indicate only the minimum requirements..
   - LEED Scorecard breakdown:

- Only minimal points are attempted in the Energy and Atmosphere category with no points for On-site Renewable Energy even though the project description mentions possible photovoltaic installation. The ENF indicates on-going investigation with regard to installing solar arrays. These may provide the "visual" sustainable image desired by City of Boston but may not provide enough power to make a significant impact on the project's energy consumption of meet the LEED threshold for credit compliance.
- Only minimal points are attempted in Water Efficiency with no points in Wastewater Technologies.
- Sustainable Sites Credit 8 Light Pollution Reduction is not attempted. While it may be difficult for this type of project to achieve the LEED threshold for this credit, there should be some discussion on the strategy to limit light trespass into the adjacent residential neighborhoods.
- Only minimal points are attempted in Materials and Resources.
- Less than half of the Indoor Environmental Quality (IEQ) credits are attempted. The ENF indicates that the project will not meet IEQ credit for low-emitting flooring systems. The majority of flooring manufacturers can meet these threshold limits. Flooring represents the largest indoor surface in the project. This credit should be achieved as it will have significant impact on visitor and employee health, productivity and comfort.

Wastewater/Water

1. The DEIR should include a discussion of the continued coordination with the Boston Water and Sewer Commission (BWSC) to allow for capacity analysis of the downstream sewer system to be performed once those flows are further refined. **BOS 17**

2. If the water and/or wastewater estimates exceed 300,000 gallons per day (gpd), the DEIR should include an analysis of potential GHG emissions related to the treatment and conveyance of wastewater or withdrawal, treatment and conveyance of potable and/or non-potable water. **BOS 18**

3. In the table on page 3 of the ENF Form, the "Change" in "Water Use" and "Water Withdrawal" should be 395,610 gpd (difference between total of 435,810 gpd and 40,200 gpd existing). **BOS 19**

4. The DEIR should address whether there is potential for an increase in the "existing" irrigation or O&M water use based on the overall growth and increase in use proposed at the site. These existing flows are carried forward into the proposed future condition. **BOS 20**

5. The DEIR should clarify whether peak water demands have been factored into the capacity analysis of the existing system. **BOS 21**

6. For existing sewers on the site that are not proposed to be replaced, the proponent should perform a condition assessment to evaluate infiltration/inflow (I/I) and remove I/I as necessary, including separation of inflow sources throughout the site. **BOS 22**

7. The DEIR should include a discussion of I/I mitigation that will be required as part of the BWSC site plan approval process. Note that I/I removal associated with the proposed project will need to be performed in the sewer system downstream of the site and that impacts associated with that work should be considered and addressed. **BOS 23**

8. At the March 6 MEPA consultation session, an East Boston resident reported existing low water pressure in the area. The DEIR should examine the effects of project and cumulative demand on the water supply and delivery system in the area, and identify any constraints and mitigation. **BOS 24**

9. At the March 6 MEPA consultation session, the proponent described rainwater harvesting as possibly displacing water demand for the Central Utility Plant, track maintenance and irrigation. We suggest that the DEIR quantify this benefit. **BOS 25**

Stormwater

1. We are encouraged by the proponent's statements at the March 6 MEPA consultation session about decreasing impervious surfaces and we look forward to additional detail in the DEIR. **BOS 26**

2. While the ENF states that the proposed drainage system will significantly improve the quality of stormwater that discharges to Sales Creek, the means to achieve this goal should be fully described in the DEIR. **BOS 27**

3. Greater description of the stormwater management system for the CAFO is needed in the DEIR to document compliance with the Massachusetts Stormwater Management Regulations, as this is land use with higher potential pollutant loads. **BOS 28**

4. At the March 6 MEPA consultation session, the proponent mentioned the possible use of on-site wetlands for the treatment of stormwater. We look forward to evaluation of this approach in the DEIR. **BOS 29**

Historical Resources

1. We are encouraged by the proponent's statements at the March 6, 2013 MEPA consultation session that the site and building design will be inspired by the history of the site. The ENF includes an inventory of historic and archaeological resources in the project area identified through the National and State Registers. The DEIR should build on this information and provide detail on historic preservation activities and any impacts to historic resources that may occur. **BOS 30**

Travel Demand Management

While the scope of this letter is limited to environmental concerns, the City's interests and review extend well beyond these issues. As such, a second letter is also being submitted to your office by the City commenting on transportation elements of the project's anticipated environmental impacts. *See Attachment A: March 26, 2013 City of Boston Transportation Department Letter.* The following are some comments in addition to that Department's comments on TDM.

1. The ENF states that "the TDM proposals associated with the project are expected to go beyond traditional TDM concepts to include a multi-modal transportation plan." TDM needs should be thoroughly addressed in the DEIR, with much more focus on non-motorized transportation options. **BOS 31**

2. The ENF shows that there is little in the way of bicycle infrastructure north of Suffolk Downs in Revere. The City of Revere, working with the Metropolitan Area Planning Commission (MAPC), is in the early stages of developing a bicycle plan (http://mapc.org/resources/bike-transport). The DEIR should provide more detail on the recommended plan. It should also address the condition of current bicycle and pedestrian network in the DEIR, particularly connection points with proposed improvements. The DEIR should contain an analysis of pedestrian connectivity through the site to the access points presented at the March 6, 2013 MEPA consultation session. **BOS 32**

3. The level of service (LOS) analysis should include the development of existing and future pedestrian and bicycle level of service along major corridors and districts adjacent to the site, as well as to transit stops and stations in the vicinity. **BOS 33**

4. The ENF does discuss the possibility of using water transportation to alleviate roadway congestion, which the City of Boston is assessing and encourages. The City is requesting the proponent look at how the project can tie in to the water transportation network to downtown Boston and the Boston Harbor Islands national park. In addition to considering water transport during casino operations, the City has asked the proponent to evaluate the possibility of using water transport during project construction for construction materials and construction workers. **BOS 34**

Alternatives

1. An alternative that involves development of a similar area should be evaluated in the DEIR, as well as any other alternatives, similar to the DEIR scope requirements in the Secretary's Certificate on the Project First Light-Destination Resort Casino. **BOS 35**

Air Quality

1. It is unclear whether Transportation Conformity will be required. Although the proponent states that roadway improvements will not be federally funded or sponsored, if FHWA approval is required for proposed improvements to Routes 1 or 1A, a Transportation Conformity analysis should be included in the DEIR. **BOS 36**

2. The ENF states that a microscale (local) intersection analysis, as required by the BRA, will be conducted. The City and/or BRA will also review a carbon monoxide (CO) impact analysis for 1) intersection most affected by the proposed project, and 2) the "worst" intersection in the study area, based on traffic volume and level of service, determined in accordance with U.S. EPA CO hot spot modeling guidance. This analysis would be required if a Transportation Conformity analysis is required. The cumulative induced traffic impacts of the proposed project in an already congested ozone nonattainment area are important. We agree with the proponent that a detailed analysis of the associated effects on local air quality should be included in the DEIR. **BOS 37**

3. The proponent states that a mesoscale (regional) air quality impact analysis will be conducted in the DEIR "in accordance with triggers set forth by the MEPA regulations and/or the BRA." Both the Build Year traffic impacts and Horizon Year induced growth traffic impacts are expected to be significant in an already congested Route 1 corridor. The effects of this traffic on regional air pollutant emissions and concentrations, and on consistency with the MA State Implementation Plan, should be considered in the DEIR, whether or not the specific triggers are exceeded. **BOS 38**

4. The possibility of dust impacts due to site grading and fill placement is not included in the ENF and should be quantified and evaluated for mitigation in the DEIR. **BOS 39**

5. The DEIR should review the locations of all on-site air emissions sources, such as the CUP stack, idling buses, and engine generators, with respect to adjacent neighborhoods, and site these to minimize potential air quality impacts. For idling buses, the DEIR should reference local and state anti-idling ordinances and regulations, and discuss how enforcement will be managed by the proponent as part of mitigation. **BOS 40**

6. The ENF states that the size of the boilers, generators and other combustion units in the proposed CUP have not been determined, and will not be determined until final design. The DEIR should include a worst-case upper bound estimate of the proposed project's onsite combustion equipment, along with estimates of both air pollutant and greenhouse gas emissions from this equipment. **BOS 41**

7. MassDEP and MEPA encourage all major construction projects to meet requirements for diesel construction equipment in the MassDEP State Revolving Fund (SRF) requirements (http://www.mass.gov/dep/water/ wastewater/diesel.htm). These require that all non-road diesel equipment rated 50 horsepower or greater that will be used on a project site meet EPA's Tier 4 emission limits or be retrofitted with appropriate emission reduction equipment. Emission reduction equipment includes EPA-verified, CARB verified or DEP-approved diesel oxidation catalysts or diesel particulate filters. This should be addressed in the DEIR. **BOS 42**

8. The DEIR should include a discussion of regional air quality and public health. The project study area includes a concentration of major transportation sources - highways, Logan Airport, and port and rail activities. Since the proposed project could add to regional air **BOS 43**

pollutant emissions through increased traffic and induced growth, possible resulting effects on regional air quality and public health should be considered in the DEIR. This should include references to ongoing MA Department of Public Health and Massport studies of air quality and public health in East Boston neighborhoods.

Construction and Demolition Debris

1. Organic deposits that provide a potential source for methane generation are presumably below the groundwater table. Although the groundwater table depth does affect the potential for methane generation and migration, it does not eliminate the potential for methane migration; therefore this potential issue should be addressed in the DEIR. Sampling and analysis of driven vapor points to measure soil gas is an appropriate investigation measure. **BOS 44**

Construction Management

1. The DEIR should discuss why transportation improvements are starting four months after project construction begins. **BOS 45**

2. Substantial site grading and soil movement will likely be necessary at the site to achieve adequate flood protection, stormwater retention and landscaping. We suggest that the DEIR include a soils balance, quantifying how much material will be moved, imported, and exported from the site. The geotechnical section of the ENF states that the proponent intends to keep soils on-site to the extent possible, and that currently the project includes just one level of below-grade parking. We support this approach. **BOS 46**

3. The DEIR should specify whether construction materials will be conveyed to the site via water transportation. **BOS 47**

4. Each of the following aspects of Suffolk Downs ongoing operation should be addressed in the Construction Management Plan, which should be included in the DEIR: **BOS 48**

   - Race track operations
   - Safety – pedestrian and vehicular movement
   - Access – which areas will be closed off due to construction activities
   - Staging areas
   - Worker parking
   - Noise
   - Dust

Construction Noise

1. Demolition/construction-period noise is subject to the Regulations for the Control of Noise in the City of Boston (http://www.cityofboston.gov/Images_Documents/noise_reg_tcm3- **BOS 49**

13127.pdf), implemented by the Boston Air Pollution Control Commission (APCC), a division of the Boston Environment Department. Please see Regulation 3, Restrictions – Construction Sites.

2. Best Available Control Technologies (BACT) and other best management practices (BMP) should be employed at the project site to minimize noise impacts. Measures should include: **BOS 50**
   a. Securing any decking on roadways so that there is no rattling when traffic passes over;
   b. Using vehicles and equipment with either ambient-sensitive or manually adjustable back-up alarms;
   c. Proper sizing of impact equipment such as hoe rams, pile drivers and jackhammers and powering only to the degree needed to perform the work;
   d. Installation of noise suppression enclosures on hoe rams;
   e. Placement of stationary noise producing equipment such as pumps and generators as far away as possible from residential and sensitive receptor locations; and
   f. Keeping engine housing panels on all equipment closed; and when not in use, shutting off equipment.

Construction Air Quality

1. All pre-2007 diesel construction vehicles working on the project should be retrofitted using retrofit technologies approved by the United States Environmental Protection Agency (EPA) and that ultra-low-sulfur diesel (ULSD) fuel (15 ppm) be used for all off-road diesel equipment. **BOS 51**

2. A plan should be put in place to ensure compliance with the Commonwealth of Massachusetts Department of Public Health, Division of Environmental Health, Bureau of Air Quality Control Regulations for the Control of Air Pollution Regulation 11 – Transportation Media (MGL 90 s16A, 310 CMR 7.11). **BOS 52**

3. An enforceable anti-idlng plan should be developed for the project site, the project area and for any vehicle layover/marshaling areas. The plan should be included in the DPIR. **BOS 53**

4. In order to minimize the spread of dust and debris, it is suggested to lay one to two inches of gravel no less than ten (10) feet in length at truck entrances and egresses in addition to a wheel wash, with proper provisions for runoff. The use of the wheel wash is needed. **BOS 54**

5. Regular vacuum cleaning of streets and sidewalks in the project area should be employed to ensure that they remain free streets of dust and debris. The use of a vacuum sweeper is an important measure for preventing construction-related dust and debris from being transported by air or deposited in storm drains. **BOS 55**

6. To the greatest extent possible, aggregate piles and excavated materials should not be allowed to remain on the site overnight and on weekends or holidays. Means to ensure that materials will not blow off site should be identified. **BOS 56**

Chemical Cleaning and Abrasive Blasting

1. If work at the site will include interior or exterior abrasive blasting or chemical cleaning, a permit must first be obtained from the APCC. **BOS 57**

Contaminated Materials and Hazardous Waste Considerations

1. The Environmental Site Assessment (ESA) referenced in the ENF notes that the Method 3 Risk Characterization supporting the site Response Action Outcome excluded contaminants associated with background conditions and that a Health and Safety Plan for protection of construction workers and a Soil Management Plan for management and disposal of site soils would be prudent for any future site development. These should be provided in the DEIR. **BOS 58**

2. The DEIR should consider the regulatory requirements included in the MassDEP policy regarding Construction of Buildings in Contaminated Areas. **BOS 59**

3. The ENF text on Non-Structural Controls mentions that onsite storage of hazardous materials or toxic chemicals during construction will be limited to what is absolutely necessary. Additional details regarding the nature of these materials should be provided in the DEIR, as well as spill prevention and control procedures, especially for construction equipment and vehicles. **BOS 60**

4. The ENF text on Dewatering notes that dewatering discharges will be infiltrated into the ground where possible. This may be difficult due to the shallow groundwater table at the site as well as the potential for contamination as noted in the ESA. The DEIR should include: **BOS 61**

   - Locations where significant dewatering efforts are anticipated such as the parking garage
   - Best management practices/groundwater treatment options and disposal locations
   - Applicable regulatory requirements

5. Contaminated material management issues that are likely to be encountered during project construction and should be addressed in the DEIR include: **BOS 62**

   - Above ground storage tanks
   - Underground storage tanks
   - Existing hazardous materials in the maintenance garage

- Polychlorinated biphenyls (PCBs) – management and disposal of PCB contaminated materials including building materials (e.g. window caulking) and electrical transformers

Noise

1. We are pleased to see that the proponent has agreed to address operational noise for stationary and traffic sources, and to evaluate the effects of this new 24-hour activity on bordering residential areas. The ENF states that based on a review of hourly traffic data over a 24-hour period, the proponent will conduct noise impact analysis for two scenarios, a daytime off-peak hour and a nighttime hour. In the DEIR, 24-hour casino equipment and operational noise, and not just traffic noise, should be used in selecting these scenarios. At a minimum, the two scenarios should be: 1) hour of greatest increase over existing background monitored noise level; and 2) hour of highest combined total noise impact. If neither of these occurs during a nighttime hour, a nighttime hour should be added to assess sleep disturbance impact. A better and more informative analysis would also include a complete hour-by-hour 24-hour noise profile of the facility at build-out. **BOS 63**

2. The ENF states that a baseline sound level monitoring program will be conducted in and around residential neighborhoods to the north, east and south of the project site. The DEIR should include the results of 24-hour monitoring for a representative weekday and weekend day at potentially affected sensitive receptor locations in these neighborhoods. Potentially affected sensitive receptors could be those near the project site, near traffic noise sources, and those farther away, but with direct line of site to the proposed facility. **BOS 64**

3. The proposed Boardman Street fly-over and increased bus activity in the Suffolk Downs parking areas should be included as possible new noise sources in the DEIR noise assessment. **BOS 65**

4. The DEIR should include construction noise impact modeling and not be limited to a generic discussion of mitigation measures. Since the construction period will be 30 months or more adjacent to residential areas, the modeling could inform specific mitigation measures related to activity siting, enclosures, and specifications for equipment muffling. **BOS 66**

5. The ENF states that noise impact will be evaluated based on City of Boston noise regulations and Federal Highway Administration (FHWA) Noise Abatement Criteria. The DEIR should also compare project equipment noise levels to MassDEP sound level criteria, and compare total modeled combined noise impacts (equipment, idling buses, other site activity, and increased traffic) at nearby residential sensitive receptors to EPA and HUD day-night residential noise impact criteria. **BOS 67**

Operational Solid and Hazardous Wastes

1. The ENF does not mention any additional protection to prevent exposure to adjacent tank farms or the onsite landfill in a flooding event. A review of the adequacy of existing protection should be included in the DEIR. **BOS 68**

2. The DEIR should describe how and where potentially hazardous materials will be stored on the site. **BOS 69**

3. The DEIR should include a detailed discussion of post-construction solid waste management and recycling, as well as abatement of asbestos containing materials and lead based paint. The ENF states that the proponent is committed to studying anaerobic digestion for both solid organic waste diversion and for on-site energy production. We support this approach, and encourage the proponent to commit to implementation, as well. **BOS 70**

Socioeconomics and Environmental Justice

1. The City is interested in reviewing socioeconomic studies related to induced growth and community impacts, including those referenced in MEPA regulations. **BOS 71**

2. Pursuant to the Environmental Justice Policy of the Executive Office of Environmental Affairs this project is within an environmental justice population (see paragraphs 14 and 15 of the Policy). The scope of the DEIR should include provisions to comply with this policy. **BOS 72**

Land Use

1. The DEIR should include discussion of current land use and character of adjacent areas (within a defined study area) to assess compatibility and visual character. **BOS 73**

2. The DEIR should describe in greater detail how the massing and building heights within the project will compare to surrounding neighborhood. **BOS 74**

Wetlands

1. The ENF presents very general information about wetland impacts and mitigation, although we are encouraged by the new landscaping information provided at the March 6 MEPA consultation session, which indicates that portions of the site will be returned to their natural state as wetland. We look forward to reviewing more detailed information in the DEIR. **BOS 75**

2. The ENF indicates that there will be approximately 480,000 square feet of filling within bordering land subject to flooding and that compensatory storage will be provided. The DEIR should provide the locations and plans for providing required flood storage. **BOS 76**

Thank you again for this opportunity. Please let us know if you have questions or comments.

Very truly yours,

Brian Swett
City of Boston
Chief of Environment and Energy

Attachments:

A. City of Boston Transportation Department Comment Letter

CITY OF BOSTON – ENVIRONMENTAL AND ENERGY SERVICES (BOS)

BOS 01 **Below is a list of overarching policies and goals that the City recommends the Proponent consider:**

- **Reduce energy intensity to the maximum extent possible;**
- **On-site alternative energy generation to the maximum extent possible;**
- **Strive to achieve LEED Platinum status;**
- **Conserve, maximize efficiency and reuse water to the greatest extent possible;**
- **Seek innovative green attributes;**
- **Maximize TDM opportunities for all guests and staff; and**
- **Create a standard for sustainable resort operations and maintenance.**

The Proponent has been dedicated to designing a world-class destination resort that incorporates a variety of sustainable design elements and "green" features. Section 2.0 describes the process and results from this commitment to being green.

BOS 02 **The Proponent presented some new design and sustainability concepts at the March 6, 2013 MEPA consultation session that are not reflected in the ENF filed on January 31, stating that the Project will connect nature, people and place and that it will be the "greenest" casino in the country. We are encouraged by Suffolk Downs' pledges for a particularly green development, including new plans to reduce pavement by 30% and transform current asphalt into a more natural landscape. We expect that the DEIR will describe these general comments in more detail.**

Section 2.0 describes the Proponent's commitment to designing, constructing, and operating a LEED Gold "green" Project. As described in Section 4.4, the Project will reduce impervious surfaces and increase open space on the Project site relative to existing conditions.

BOS 03 **The ENF cites 2017 as the Build Year and 2020 as the Horizon Year. We suggest that the final Horizon Year be selected with MEPA, MassDOT, and MassDEP input (for State Implementation Plan target years), and that it be a year that represents full operation of the Project plus reasonably foreseeable growth induced by the Project.**

As required by MassDOT, the DEIR/EPNF traffic analysis horizon year is 2022. For Route 1A infrastructure improvement alternatives, a design year 2032 analysis is included.

BOS 04 **The study area for each topic in the DEIR should be clearly specified and justified.**

The study areas for all analyses are defined in respective sections of the DEIR/EPNF.

BOS 05 **Impacts of proposed mitigation, as well as direct and indirect effects, and cumulative effects should be addressed in the DEIR.**

Potential environmental impacts are described in Section 6.0, and transportation is addressed in Section 5.0.

BOS 06 **The DEIR should include a description of plans for renovating the existing racetrack and plans during and after construction. Any intensification of use of the racetrack facilities over existing conditions as induced by increased visitors to the casino should also be identified and included in the impact analysis.**

If the Proponent receives a Category 1 gaming license and the Project moves forward, the track will continue to operate as it does today; no modifications to the racetrack are planned as part of this Project. Assuming Project completion, intensification of track activity is likely to occur around special events.

BOS 07 **We encourage the Proponent's commitment to renewable energy, and look forward to a more detailed analysis and description in the DEIR of [anaerobic digestion, solar PV, and geothermal energy] and other innovative technologies including:**

- **Anaerobic digestion using wastewater sludge, horse manure, food waste and other nearby organic wastes to produce biogas for use in CHP systems or to produce biofuels for on-site vehicle use;**
- **CHP systems using natural gas and/or digester gas (engine generators, microturbines, fuel cells, etc.);**
- **Solar PV (including power purchase agreements);**
- **Solar thermal;**
- **Building-integrated solar;**
- **Wind turbines;**
- **Low-impact hydroturbines;**
- **Geothermal;**
- **Water source heat pumps;**
- **Sewer heat recovery;**
- **Biofuels;**

- Biomass boilers; and
- Purchasing green power.

These technologies and strategies are addressed in the GHG analysis in Section 7.0.

BOS 08 **The ENF states that both Boston and Revere are Energy Stretch Code communities, requiring high standards for efficient energy use in buildings. The ENF then states that these standards will be included in the "preferred case," but not in the "baseline case" that would be used as comparison. The DEIR should examine Stretch Code requirements in the "baseline case," along with reasonable energy conservation measures that would be encouraged for any new development at the site, and then show how this Project may go beyond these measures.**

The MEPA GHG Emissions Policy and Protocol requires that the baseline case (for stationary sources) reflect a building designed to meet the current Massachusetts Building Code. Mitigation measures adopted to achieve or exceed the Stretch Code are included in the Preferred case. Section 7.0 describes all mitigation measures incorporated into the Project design and demonstrates that the resulting Project will go well beyond the requirements of the Stretch Code.

BOS 09 **In design review, the City will look for protection for the community in relation to sea level rise and storm surge. The ENF used the historic sea level rise value of 2.65 mm/yr. The ENF assumes a linear progression of sea level rise over the 100-year period, which does not account for the potential for future acceleration in the rate of sea level rise. The ENF also states that sea level rise would be 10.44 inches over the next century. The EEA Climate Change Adaptation Report suggests a more conservative sea level rise change, taking uncertainty associated with the United Nations IPCC models into account, of 1 to 6 feet by the end of the century.**

The Project design comprehensively accommodates sea level rise. The 100-year floodplain elevation on the site is at elevation 15.46 feet (BCB), and MHHW is elevation 10.44 feet. Consistent with TBHA's sea level rise analysis, the Project team applied a sea level rise of 7.5 feet to MHHW to obtain a sea level rise "mitigation elevation" of 18.7 feet, and has located proposed buildings, the entrance road, and critical infrastructure above this elevation to provide resiliency to sea level rise (see Section 2.3).

BOS 10 **The ENF looked at the relationship of the first floor elevation to flood elevation. It is more appropriate to compare the ground floor to flood levels, allowing for the protection of all critical infrastructure. The Proponent has agreed to consider both the ground floor and critical infrastructure for vulnerability to flooding in the DEIR. We recommend the Proponent also consider protection of chemicals, manure, and other potential pollutants from a flooding event.**

Please see the response to BOS 09. The ground-floor elevation of the parking garage will be at elevation 16.4 feet; therefore, it is anticipated that this area may experience flooding during extreme storm events. The facility will have procedures in place to evacuate vehicles if necessary. CAFO operations will remain at current elevations. Section 2.3 addresses climate change and adaptation.

BOS 11 **The DEIR should evaluate the floodplain, including the Flood Insurance Rate Maps, the 100-year floodplain in the Project area, and coastal storm flood issues. If necessary under storm surge conditions, we also suggest that the DEIR evaluate a potential operation of a pumping station.**

The Proponent has evaluated the 10-year floodplain in the Project area and has located all first-floor elevations, access roads, and critical infrastructure above anticipated sea level rise elevations based on conservative assumptions (see Section 2.3).

BOS 12 **310 CMR 10.57(4) states that the compensatory storage shall have an unrestricted hydraulic connection to the adjacent water body, meaning that the proposed development plans need to be examined to confirm that existing flow paths are not severed, which can result in localized flooding. This issue should be addressed in the DEIR.**

The Project has been designed to result in no net filling of floodplain. Work will be performed within the floodplain, including filling and cutting activities. All floodplain areas will be hydraulically connected to Sales Creek and other wetlands to prevent isolated ponding of water (see Section 2.3 for a discussion of climate change and adaptation). Information demonstrating compliance with the referenced performance standard is provided in Section 6.9.

BOS 13 **The DEIR should also consider and evaluate the impacts on flooding of adjacent sites as it may impact the proposed site.**

The Project will reduce impervious surface on the site, thereby decreasing stormwater flows leaving the site. All stormwater generated by the site will be collected, treated, and ultimately discharged to either Sales Creek or on-site wetlands systems. There will be no direct discharges to adjacent properties (see Section 9.3). Information demonstrating compliance with the BLSF performance standard is provided in Section 6.9.

BOS 14 **At the March 6 MEPA consultation session, the Proponent stated its intent to make the Project the "greenest" casino in the country, yet the ENF indicates that the Project will strive for LEED Gold, which is required in the Expanded Gaming Law... The DEIR should describe in detail how the Project will be certified as LEED Gold or higher.**

Attachment E includes a summary LEED NC 2009 scorecard demonstrating the Proponent's commitment to achieving LEED Gold Certification and a detailed analysis of the LEED NC 2009 prerequisites and credits the Project is targeting for achievement.

BOS 15 Sustainable strategies should not be limited to or by LEED credit thresholds and certification. The DEIR should include consideration of alternative rating systems and metrics that may provide measurable long-term benefits to the Project.

Additional rating systems and metrics are described in Section 2.2.7.

BOS 16 It appears that the LEED scorecard in the ENF needs to be updated in the DEIR to reflect the Proponent's additional sustainability commitments as presented at the March 6 MEPA consultation session. We offer the following comments on the ENF scorecard to assist the Proponent in making revisions:

- The ENF indicates that the Project will be LEED Gold certifiable (60-79 points); however, the scorecard indicates a total of 58 points. Typically projects attempt several "extra" credits in case USGBC rejects, or the project misses on, any given credit. This is a minimal effort for LEED certification with most credits coming from non-Energy/Water credits…
- LEED Scorecard breakdown:
  - Only minimal points are attempted in the Energy and Atmosphere category with no points for On-site Renewable Energy even though the project description mentions possible PV installation. The ENF indicates an on-going investigation with regard to installing solar arrays. These may provide the "visual" sustainable image desired by the City of Boston but may not provide enough power to make a significant impact on the project's energy consumption or meet the LEED threshold for credit compliance.
  - Only minimal points are attempted in Water Efficiency with no points in Wastewater Technologies.
  - Sustainable Sites Credit 8 Light Pollution Reduction is not attempted. While it may be difficult for this type of project to achieve the LEED threshold for this credit, there should be some discussion on the strategy to limit light trespass into the adjacent residential neighborhoods.
  - Only minimal points are attempted in Materials and Resources.
  - Less than half of the Indoor Environmental Quality (IEQ) credits are attempted. The ENF indicates that the Project will not meet IEQ credit for low-emitting flooring systems. The majority of flooring manufacturers can meet these threshold limits. Flooring represents

the largest indoor surface in the Project. This credit should be achieved as it will have significant impact on visitor and employee health, productivity and comfort.

Attachment E includes a summary LEED NC 2009 scorecard demonstrating the Proponent's commitment to achieving LEED Gold Certification and a detailed analysis of the LEED NC 2009 prerequisites and credits the Project is targeting for achievement.

The Project design includes installation of a significant PV array that will provide approximately 10% of the Resort's estimated annual energy use. Regarding water and wastewater efficiencies, the Proponent is striving to reduce potable water use for sewage conveyance, including measures such as waterless urinals and ultra-low-flow metered lavatory faucets.

Efforts to minimize potential light pollution are described in Sections 2.0 and 4.4.

In terms of materials and resources, the Proponent intends to specify the use of products and materials with recycled content and those that are extracted, harvested, or manufactured regionally.

For indoor environmental quality, the Proponent is attempting 11 of the 15 available credits, including the credit for low-emitting flooring systems. The Proponent intends that standard flooring materials will met the CRI Green Label Plus and Floorscore criteria as required for IEQc4.3, Low Emitting Materials, Flooring Systems. However, it should be noted that some carpets planned for installation in the gaming areas will be custom-fabricated, and may not meet specific CRI Green Label Plus requirements.

BOS 17 The DEIR should include a discussion of the continued coordination with the BWSC to allow for capacity analysis of the downstream sewer system to be performed once those flows are further refined.

The Proponent continues to coordinate with the BWSC regarding wastewater discharges as well as any mitigation that may be required (see Section 9.1).

BOS 18 If the water and/or wastewater estimates exceed 300,000 gpd, the DEIR should include an analysis of potential GHG emissions related to the treatment and conveyance of wastewater or withdrawal, treatment and conveyance of potable and/or non-potable water.

The GHG analysis in Section 7.0 does incorporate water and wastewater volumes.

BOS 19 **In the table on page 3 of the ENF Form, the "Change" in "Water Use" and "Water Withdrawal" should be 395,610 gpd (difference between total of 435,810 gpd and 40,200 gpd existing).**

The Proponent agrees with this statement.

BOS 20 **The DEIR should address whether there is potential for an increase in the "existing" irrigation or O&M water use based on the overall growth and increase in use proposed at the site.**

Water use for track watering and operations in the stable area is expected to remain consistent with past water use figures. Irrigation flows for landscaped areas will increase since the Project site will contain more green space and landscaped areas than it does under existing conditions; however, water-efficient plantings will be used to minimize this increase in landscape irrigation water use.

BOS 21 **The DEIR should clarify whether peak water demands have been factored into the capacity analysis of the existing system.**

Water demands expressed in the ENF were based on Title V flow factors, which include a daily peak factor. Additional hourly peaking estimates are being developed to estimate peak flows that will be discharged to the City sewer system (see Section 9.1).

BOS 22 **For existing sewers on the site that are not proposed to be replaced, the Proponent should perform a condition assessment to evaluate I/I and remove I/I as necessary, including separation of inflow sources throughout the site.**

The Project will not use any existing sewer lines on the Project site. All sanitary sewer lines serving the Resort will be newly-constructed.

BOS 23 **The DEIR should include a discussion of I/I mitigation that will be required as part of the BWSC site plan approval process. Note that I/I removal associated with the proposed Project will need to be performed in the sewer system downstream of the site and that impacts associated with that work should be considered and addressed.**

The Proponent is continuing to coordinate with BWSC and MWRA to provide adequate mitigation for the Project (see Section 9.1).

BOS 24 **At the March 6 MEPA consultation session, an East Boston resident reported existing low water pressure in the area. The DEIR should examine the effects of Project and cumulative demand on the water supply and delivery system in the area, and identify any constraints and mitigation.**

The Proponent is continuing to coordinate with BWSC and MWRA to provide adequate mitigation for the Project. Water testing was performed on Waldemar Avenue on June 29, 2012 to measure water pressure in the area; results indicated that adequate pressure exists in the site vicinity to provide service to the Resort, and a booster pump will be used to ensure that Hotel I has adequate water pressure.

BOS 25 **At the March 6 MEPA consultation session, the Proponent described rainwater harvesting as possibly displacing water demand for the CUP, track maintenance and irrigation. We suggest that the DEIR quantify this benefit.**

The Project design includes three large rainwater reuse tanks that will collect stormwater generated by building roofs. This water will be used for on-site irrigation of landscaped areas, track watering, and cooling tower water, which will save approximately 4.5 million gallons of water per year (see Section 9.0).

BOS 26 **We are encouraged by the Proponent's statements at the March 6 MEPA consultation session about decreasing impervious surfaces and we look forward to additional detail in the DEIR.**

The Project will decrease impervious surfaces on the site by approximately 14 acres relative to existing conditions (see Section 1.0). Section 4.0 describes impervious area and open space in the context of site design.

BOS 27 **While the ENF states that the proposed drainage system will significantly improve the quality of stormwater that discharges to Sales creek, the means to achieve this goal should be fully described in the DEIR.**

The Project will not increase the flow of stormwater off-site, and the Project will reduce impervious area on site; therefore, total stormwater generated by the site will decrease relative to existing conditions. A series of BMPs are included as part of the stormwater management system to improve the quality and reduce the quantity of stormwater flowing from the site. These measures include bioretention basins, water quality swales, pervious pavers, bioswales, and rainwater reuse tanks (see Section 9.3).

BOS 28 **Greater description of the stormwater management system for the CAFO is needed in the DEIR to document compliance with the Massachusetts Stormwater Management Regulations, as this is land use with higher potential pollutant loads.**

Stormwater that falls on the ground in the CAFO area is collected, stored, allows to settle, and ultimately discharged to the BWSC system near the Suffolk Downs MBTA station. Stormwater that falls on stable rooftops is routed to a stormwater drainage system and discharged to Sales Creek. This system was approved by the EPA and Boston Conservation Commission and is compliant with the MassDEP Stormwater

Management Regulations. The Project includes construction of a parking lot in a portion of the CAFO that will effectively reduce the size of the CAFO area by approximately 2.3 acres. Therefore, flows from the CAFO will lessen and flows to the CAFO settling pond and the MWRA system will be reduced (see Section 9.3).

BOS 29 **At the March 6 MEPA consultation session, the Proponent mentioned the possible use of on-site wetlands for the treatment of stormwater. We look forward to evaluation of this approach in the DEIR.**

The Project includes construction of bioretention areas for stormwater treatment as well as construction of floodplain compensation areas; these areas will include wetlands plantings, as appropriate. All stormwater generated on site will be treated prior to discharge to wetland areas surrounding the site (see Section 9.3).

BOS 30 **The ENF includes an inventory of historic and archaeological resources in the Project area identified through the National and State Registers. The DEIR should build on this information and provide detail on historic preservation activities and any impacts to historic resources that may occur.**

An updated MHC Form A was submitted to the MHC and BLC July 1, 2013. A copy of the inventory form is included as Attachment J. Impacts to historic resources are described in Section 8.0.

BOS 31 **The ENF states that "the TDM proposals associated with the Project are expected to go beyond traditional TDM concepts to include a multi-modal transportation plan." TDM needs should be thoroughly addressed in the DEIR, with much more focus on non-motorized transportation options.**

A comprehensive TDM Plan including strategies focused on non-motorized transportation is presented in Section 5.9.

BOS 32 **The ENF shows that there is little in the way of bicycle infrastructure north of Suffolk Downs in Revere. The City of Revere, working with the MAPC, is in the early stages of developing a bicycle plan... The DEIR should provide more detail on the recommended plan. It should also address the condition of current bicycle and pedestrian network in the DEIR, particularly connection points with proposed improvements. The DEIR should contain an analysis of pedestrian connectivity through the site to the access points presented at the March 6, 2013 MEPA consultation session.**

As described in Section 5.8.3, the Proponent has committed to provide new on-street bicycle accommodations in the Bennington Street corridor connecting Constitution Beach, Belle Isle Marsh, and Revere Beach, with spur connections to the Project site. The existing and proposed bicycle facilities are presented in Figure 5-5. Pedestrian connectivity through the Project site is described in Section 1.1.1.5.

BOS 33 **The LOS analysis should include the development of existing and future pedestrian and bicycle LOS along major corridors and districts adjacent to the site, as well as to transit stops and stations in the vicinity.**

Relevant pedestrian and bicycle LOS analysis will be developed in coordination with BTD as part of the FEIR/Final Project Impact Report analysis.

BOS 34 **The ENF does discuss the possibility of using water transportation to alleviate roadway congestion, which the City of Boston is assessing and encourages. The City is requesting the Proponent look at how the Project can tie in to the water transportation network to downtown Boston and the Boston Harbor Islands national park. In addition to considering water transport during casino operations, the City has asked the Proponent to evaluate the possibility of using water transport during Project construction for construction materials and construction workers.**

There are currently no plans to convey construction materials to the site via water transportation. The Proponent supports Mayor Menino's vision to enhance water transportation options to East Boston by instituting regular water shuttle service between the South Boston and East Boston waterfronts. As such, the Boston HCA includes a contribution that will assist the City in establishing this service.

BOS 35 **An alternative that involves development of a similar area should be evaluated in the DEIR, as well as any other alternatives, similar to the DEIR scope requirements in the Secretary's Certificate on the Project First Light – Destination Resort Casino.**

An alternatives analysis is provided in Section 1.9.

BOS 36 **It is unclear whether Transportation Conformity will be required. Although the Proponent states that roadway improvements will not be federally funded or sponsored, if FHWA approval is required for proposed improvements to Routes 1 or 1A, a Transportation Conformity analysis should be included in the DEIR.**

Transportation conformity analysis is not required as there is no federal permitting required for the Project.

BOS 37 **The ENF states that a microscale (local) intersection analysis, as required by the BRA, will be conducted. The City and/or BRA will also review a carbon monoxide (CO) impact analysis for (1) intersection most affected by the proposed Project, and (2) the "worst" intersection in the study area based on traffic volume and LOS,**

determined in accordance with USEPA CO hot spot modeling guidance. This analysis would be required if a Transportation Conformity analysis is required. The cumulative induced traffic impacts of the proposed Project in an already congested ozone nonattainment area are important. We agree with the Proponent that a detailed analysis of the associated effects on local air quality should be included in the DEIR.

The methodology and results of the mesoscale analysis are presented in Sections 6.5.4.1 and 6.5.5.1, respectively.

BOS 38 The Proponent states that a mesoscale (regional) air quality impact analysis will be conducted in the DEIR "in accordance with triggers set forth by the MEPA regulations and/or the BRA." Both the Build Year traffic impacts and Horizon Year induced growth traffic impacts are expected to be significant in an already congested Route 1 corridor. The effects of this traffic on regional air pollutant emissions and concentrations, and on consistency with the MA State Implementation Plan, should be considered in the DEIR, whether or not the specific triggers are exceeded.

The methodology and results of the mesoscale analysis are presented in Sections 6.5.4.1 and 6.5.5.1, respectively.

BOS 39 The possibility of dust impacts due to site grading and fill placement is not included in the ENF and should be quantified and evaluated for mitigation in the DEIR.

Construction-period air quality, including potential dust impacts and measures proposed to mitigate those impacts, is described in the Draft CMP in Attachment L.

BOS 40 The DEIR should review the locations of all on-site air emissions sources, such as the CUP stack, idling buses, and engine generators, with respect to adjacent neighborhoods, and site these to minimize potential air quality impacts. For idling buses, the DEIR should reference local and state anti-idling ordinances and regulations, and discuss how enforcement will be managed by the Proponent as part of mitigation.

The methodology and results of an air quality analysis of stationary sources are presented in Sections 6.5.4.3 and 6.5.5.3, respectively. Anti-idling provisions are addressed in Section 6.5.8.

BOS 41 The ENF states that the size of the boilers, generators and other combustion units in the proposed CUP have not been determined, and will not be determined until final design. The DEIR should include a worst-case upper bound estimate of the proposed Project's onsite combustion equipment, along with estimates of both air pollutant and greenhouse gas emissions from this equipment.

The methodology and results of an air quality analysis of stationary sources are presented in Sections 6.5.4.3 and 6.5.5.3, respectively. A GHG emissions analysis is provided in Section 7.0.

BOS 42 MassDEP and MEPA encourage all major construction projects to meet requirements for diesel construction equipment in the MassDEP State Revolving Fund requirements... These require that all non-road diesel equipment rated 50 horsepower or greater that will be used on a project site meet EPA's Tier 4 emission limits or be retrofitted with appropriate emission reduction equipment. Emission reduction equipment includes EPA-verified, CARB verified, or DEP-approved diesel oxidation catalysts or diesel particulate filters. This should be addressed in the DEIR.

Construction air quality mitigation measures are presented in the Draft CMP in Attachment L.

BOS 43 The DEIR should include a discussion of regional air quality and public health. The Project study area includes a concentration of major transportation sources – highways, Logan Airport, and port and rail activities. Since the proposed Project could add to regional air pollutant emissions through increased traffic and induced growth, possible resulting effects on regional air quality and public health should be considered in the DEIR. This should include references to ongoing MA Department of Public Health and Massport studies of air quality and public health in East Boston neighborhoods.

Regional air quality is discussed in Section 6.5.3.

BOS 44 Organic deposits that provide a potential source for methane generation are presumably below the groundwater table. Although the groundwater table depth does affect the potential for methane generation and migration, it does not eliminate the potential for methane migration; therefore this potential issue should be addressed in the DEIR. Sampling and analysis of driven vapor points to measure soil gas is an appropriate investigation measure.

Potential vapor intrusion is discussed in Section 6.11.4.

BOS 45 The DEIR should discuss why transportation improvements are starting four months after Project construction begins.

The Proponent intends to start construction of transportation improvements simultaneously with, or very close to, commencement of Project construction.

BOS 46 Substantial site grading and soil movement will likely be necessary at the site to achieve adequate flood protection, stormwater retention and landscaping. We suggest that the DEIR include a soils balance, quantifying how much material will

be moved, imported, and exported from the site. The geotechnical section of the ENF states that the Proponent intends to keep soils on-site to the extent possible, and that currently the Project includes just one level of below-grade parking. We support this approach.

Site grading will consist of cutting and filling, as described in Section 2.3.5. The Proponent intends to limit the amount of soil brought onto the site or removed from the site to the maximum extent practicable.

BOS 47 The DEIR should specify whether construction materials will be conveyed to the site via water transportation.

There are currently no plans to convey construction materials to the site via water transportation.

BOS 48 Each of the following aspects of Suffolk Downs ongoing operation should be addressed in the CMP, which should be included in the DEIR:

- Racetrack operations
- Safety – pedestrian and vehicular movement
- Access – which areas will be closed off due to construction activities
- Staging areas
- Worker parking
- Noise
- Dust

The Draft CMP in Attachment L addresses each of these items.

BOS 49 Demolition/construction-period noise is subject to the Regulations for the Control of Noise in the City of Boston… implemented by the Boston Air Pollution Control Commission (APCC), a division of the Boston Environment Department. Please see Regulation 3, Restrictions – Construction Sites.

Construction noise impacts from the Project have been evaluated against Regulation 3 noise limits, and results of the analysis are discussed in Section 6.6.4.3.

BOS 50 Best Available Control Technologies (BACT) and other BMPs should be employed at the Project site to minimize noise impacts. Measures should include:

- Securing any decking on roadways so there is no rattling when traffic passes over;
- Using vehicles and equipment with either ambient-sensitive or manually adjustable back-up alarms;

- Proper sizing of impact equipment such as hoe rams, pile drivers and jackhammers and powering only to the degree needed to perform the work;
- Installation of noise suppression enclosures on hoe rams;
- Placement of stationary noise producing equipment such as pumps and generators as far away as possible from residential and sensitive receptor locations; and
- Keeping engine housing panels on all equipment closed, and when not in use, shutting off equipment.

Construction-period noise mitigation is discussed in the Draft CMP in Attachment L.

BOS 51 All pre-2007 diesel construction vehicles working on the Project should be retrofitted using retrofit technologies approved by the EPA and that ultra-low-sulfur diesel (ULSD) fuel (15 ppm) be used for all off-road diesel equipment.

Construction air quality, including diesel emissions, is addressed in the Draft CMP in Attachment L.

BOS 52 A plan should be put in place to ensure compliance with the Commonwealth of Massachusetts Department of Public Health, Division of Environmental Health, Bureau of Air Quality Control Regulations for the Control of Air Pollution Regulation 11 – Transportation Media (MGL 90 s16A, 310 CMR 7.11).

Anti-idling provisions are described in Section 6.5.8.

BOS 53 An enforceable anti-idling plan should be developed for the Project site, the Project area, and for any vehicle layover/marshaling area. The plan should be included in the DEIR.

Construction-period air quality, including idling, is addressed in the Draft CMP in Attachment L.

BOS 54 To minimize the spread of dust and debris, it is suggested to lay one to two inches of gravel no less than ten (10) feet in length at truck entrances and egresses in addition to a wheel wash, with proper provisions for runoff. The use of the wheel wash is needed.

Construction-period air quality mitigation, including dust control measures, is identified in the Draft CMP in Attachment L.

BOS 55 Regular vacuum cleaning of streets and sidewalks in the Project area should be employed to ensure that they remain free of dust and debris. The use of a vacuum sweeper is an important measure for preventing construction-related dust and debris from being transported by air or deposited in storm drains.

Construction-period air quality mitigation, including dust control measures, is identified in the Draft CMP in Attachment L.

BOS 56 **To the greatest extent possible, aggregate piles and excavated materials should not be allowed to remain on the site overnight and on weekends or holidays. Means to ensure that materials will not blow off site should be identified.**

Construction-period air quality mitigation, including dust control measures and materials management, is identified in the Draft CMP in Attachment L.

BOS 57 **If work at the site will include interior or exterior abrasive blasting or chemical cleaning, a permit must first be obtained from the APCC.**

The Proponent acknowledges this requirement and will comply.

BOS 58 **The Environmental Site Assessment (ESA) referenced in the ENF notes that the Method 3 Risk Characterization supporting the site Response Action Outcome excluded contaminants associated with background conditions and that a Health and Safety Plan for protection of construction workers and a Soil Management Plan for management and disposal of site soils would be prudent for any future site development. These should be provided in the DEIR.**

Project health and safety plans to protect worker safety will be created prior to construction and will be included as part of the Contract Documents. Health and safety plans will be detailed documents tailored to meet the specific needs of the Project site and will include practices intended to protect workers consistent with appropriate Occupational Safety and Health Administration (OSHA) and regulatory requirements. It is not standard practice, nor is it feasible, to prepare health and safety plans relating to workplace safety at this stage of Project planning. The Proponent intends to reuse all excavated soils on-site. If excess soils are generated, they will be sampled and tested consistent with standard practice to allow for disposition at appropriate licensed facilities and will be managed in accordance with applicable MassDEP regulations. Contract documents for the Project will include items related to soil management.

BOS 59 **The DEIR should consider the regulatory requirements included in the MassDEP policy regarding Construction of Buildings in Contaminated Areas.**

Section 6.11.1 contains a discussion of the regulatory status of the site and regulatory requirements for working in the area.

BOS 60 The ENF text on Non-Structural Controls mentions that onsite storage of hazardous materials or toxic chemicals during construction will be limited to what is absolutely necessary. Additional details regarding the nature of these materials should be provided in the DEIR, as well as spill prevention and control procedures, especially for construction equipment and vehicles.

A draft spill response plan, predominantly governing refueling activities, is provided in the Draft CMP in Attachment L. It is not anticipated that any significant volumes of hazardous materials or toxic chemicals will be stored on-site during construction; however, if small quantities of such materials storage becomes necessary, the contractor will obtain all required approvals.

BOS 61 The ENF text on dewatering notes that dewatering discharges will be infiltrated into the ground where possible. This may be difficult due to the shallow groundwater table at the site as well as the potential for contamination as noted in the ESA. The DEIR should include:

- Locations where significant dewatering efforts are anticipated such as the parking garage
- BMPs/groundwater treatment options and disposal locations
- Applicable regulatory requirements

With the exception of limited excavation for on-site utilities, the only areas where dewatering is expected to be needed will be the basement levels of the new casino and parking garage. Excavations are anticipated to go as deep as El. 12 (for pile caps, which is approximately zero to one foot below recently-measured groundwater levels. Attachment F contains a stormwater report with an Operations and Maintenance Plan as well as an Erosion and Sedimentation Control Plan that outlines construction operations including potential stockpiling and dewatering locations. Section 9.3 describes stormwater management.

BOS 62 Contaminated material management issues that are likely to be encountered during Project construction and should be addressed in the DEIR include:

- Above ground storage tanks
- Underground storage tanks
- Existing hazardous materials in the maintenance garage
- PCBs – management and disposal of PCB-contaminated materials including building envelopes (e.g. window caulking) and electrical transformers

Underground storage tanks are discussed in Section 6.11.5 and construction-period materials management and handling procedures, including construction and demolition debris, are described in the Draft CMP in Attachment L.

BOS 63 The ENF states that based on a review of hourly traffic data over a 24-hour period, the Proponent will conduct noise impact analysis for two scenarios, a daytime off-peak hour and a nighttime hour. In the DEIR, 24-hour casino equipment and operational noise, and not just traffic noise, should be used in selecting these scenarios. At a minimum, the two scenarios should be: (1) hour of greatest increase over existing background monitored noise level; and (2) hour of highest combined total noise impact. If neither of these occurs during a nighttime hour, a nighttime hour should be added to assess sleep disturbance impact. A better and more informative analysis would also include a complete hour-by-hour 24-hour noise profile of the facility at build-out.

Details of the mobile source noise analysis are discussed in Section 6.6.4.2.

BOS 64 The ENF states that a baseline sound level monitoring program will be conducted in and around residential neighborhoods to the north, east, and south of the Project site. The DEIR should include the results of 24-hour monitoring for a representative weekday and weekend day at potentially affected sensitive receptor locations in these neighborhoods. Potentially affected sensitive receptors could be those near the Project site, near traffic noise sources, and those farther away but with direct line of sight to the proposed facility.

The baseline sound level monitoring program is discussed in Section 6.6.3.

BOS 65 The proposed Boardman Street flyover and increase bus activity in the Suffolk Downs parking areas should be included as possible new noise sources in the DEIR noise assessment.

The mobile source noise analysis is discussed in Section 6.6.4.2.

BOS 66 The DEIR should include construction noise impact modeling and not be limited to a generic discussion of mitigation measures. Since the construction period will be 30 months or more adjacent to residential areas, the modeling could inform specific mitigation measures related to activity siting, enclosures, and specifications for equipment muffling.

A screening-level quantitative analysis of potential noise impacts during construction is discussed in Section 6.6.4.3.

BOS 67 The ENF states that noise impact will be evaluated based on City of Boston noise regulations and FHWA Noise Abatement Criteria. The DEIR should also compare Project equipment noise levels to MassDEP sound level criteria, and compare total modeled combined noise impacts (equipment, idling buses, other site activity, and increase traffic) at nearby residential sensitive receptors to EPA and HUD day-night residential noise impact criteria.

Predicted sound levels from the Project are evaluated against City of Boston, FHWA, MassDEP, EPA, and HUD noise impact criteria in Section 6.6.4.

BOS 68 **The ENF does not mention any additional protection to prevent exposure to adjacent tank farms or the onsite landfill in a flooding event. A review of the adequacy of existing protection should be included in the DEIR.**

The Project does not include additional protection measures from the neighboring tank farm; the tank farm has containment berms around each of the tanks in accordance with best practices and federal regulation, and these berms have been constructed to the property line. In some cases, a small amount of the berm is actually on Suffolk Downs' property. Wetlands exist on the Suffolk Downs side of the berms. Increasing the height of these berms would include construction on the tank farm property as well as impact existing wetlands. Therefore, increasing the height of these berms would be impractical. The on-site landfill is completely underground; therefore, any flooding that occurs on the site will not adversely impact the landfill or have negative impacts on the Project.

BOS 69 **The DEIR should describe how and where potentially hazardous materials will be stored on site.**

A draft spill response plan, predominantly governing refueling activities, is provided in the Draft CMP in Attachment L. It is not anticipated that any significant volumes of hazardous materials or toxic chemicals will be stored on-site during construction; however, if small quantities of such materials storage becomes necessary, the contractor will obtain all required approvals.

BOS 70 **The DEIR should include a detailed discussion of post-construction solid waste management and recycling, as well as abatement of asbestos-containing materials and lead-based paint. The ENF states that the Proponent is committed to studying anaerobic digestion for both solid organic waste diversion and for on-site energy production. We support this approach, and encourage the Proponent to commit to implementation as well.**

Materials handling, including asbestos-containing materials and lead-based paint, is addressed in the Draft CMP in Attachment L. Due to space requirements for setting up an on-site digester with pre- and post-digester material processing and dewatering equipment combined with the highly variable production of manure from the barns, the Proponent determined that off-site digestion of organic waste is much more practicable. While the volume of organic waste produced on site will be sizable, the combination of seasonal variation and the total amount of material produced is much smaller than would be required to justify an on-site digester. Even if a digester operation were scaled down to a size needed for the volume of

material produced on site, additional material would need to be trucked onto the site seasonally, which would require the facility to be permitted for and become a waste receiver for at approximately six months a year.

BOS 71 **The City is interested in reviewing socioeconomic studies related to induced growth and community impacts, including those referenced in MEPA regulations.**

The Proponent has provided these studies, which are not typically part of a MEPA review, directly to the City.

BOS 72 **Pursuant to the Environmental Justice Policy of the Executive Office of Environmental Affairs, this Project is within an environmental justice population (see paragraphs 14 and 15 of the Policy). The scope of the DEIR should include provisions to comply with this policy.**

Section 1.10 discusses socioeconomics and EJ.

BOS 73 **The DEIR should include discussion of current land use and character of adjacent areas (within a defined study area) to assess compatibility and visual character.**

Section 4.0 describes the building design, which addresses the Project context as well.

BOS 74 **The DEIR should describe in greater detail how the massing and building heights within the Project will compare to surrounding neighborhood.**

Section 4.3.2 describes massing, form, and response to the Project site context.

BOS 75 **The ENF presents very general information about wetland impacts and mitigation, although we are encouraged by the new landscaping information provided at the March 6 MEPA consultation session, which indicates that portions of the site will be returned to their natural state as wetland. We look forward to reviewing more detailed information in the DEIR.**

Section 4.4 describes landscape restoration.

BOS 76 **The ENF indicates that there will be approximately 480,000 square feet of filling within BLSF and that compensatory storage will be provided. The DEIR should provide the locations and plans for providing required flood storage.**

The Project includes work within the 100-year floodplain, with grading consisting of cutting and filling. A floodplain compensation area will be provided in the vicinity of the Resort entrance. Section 2.3.5 contains a summary of floodplain cuts and fills; the Project will not result in any net filling of the 100-year floodplain.

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Stantec

March 22, 2013

Ms. Elizabeth Dello Russo
City of Boston Law Department
City of Boston
City Hall, Room 615
Boston, MA 02201

Reference: The Resort at Suffolk Downs

Dear Ms. Dello Russo:

Per your request we are reissuing our "gap analysis" letter of December 17, 2012 for use as an attachment to the City's comment letter on the Environmental Notification Form filed with the state regarding the above project. On January 7, 2013 VHB issued a response to the December 17, 2012 letter on behalf of the project proponent. In its letter VHB noted that many of the issues raised in the gap analysis would be more fully addressed in the Draft Environmental Impact Report (DEIR) to be filed with the state. The issues for which the City should expect to see more information in the DEIR are listed below. The listed items are generally the same as included in the December 17, 2012 letter except that some comments have been consolidated and all have been grouped by subject matter.

Study Scope

The traffic study area should be expanded to include the following locations: **STAN 01**

1. The full Bennington Street/Route 1A interchange area to also include the closely-spaced Saratoga Street, Bremen Street and Chelsea Street intersections with Neptune Road. The Bennington Street/Neptune Road intersection is presently part of the study area.

2. Additional intersections along Bennington Street between Neptune Road and Saratoga Street as necessary to fully understand the potential impact of a proposed bike lane on Bennington Street and to understand opportunities to enhance traffic signal coordination and control along this corridor.

3. The Route 1A southbound intersections with the southbound on ramp from Route 145 and with Curtis Street. These "K-type" intersections are subject to some unique and potentially unsafe queuing and merge conditions that warrant a safety analysis.

The traffic study scope should also be expanded into the following areas:

4. FHWA Permits: Identify any applicable Federal permit or review requirements associated with proposed off-site transportation system improvements. Explain how these requirements will be met. **STAN 02**

5. Construction Management: Provide a construction management plan for the proposed development as well as proposed off-site transportation system improvements. Provide a traffic management plan to address traffic impacts associated with construction of off-site transportation system improvements. **STAN 03**

Study Assumptions

Certain assumptions used in the traffic analysis should be verified or revised as noted below.

1. Provide the source data used as the basis of the trip generation estimates for the project. It is understood that only one active urban casino resort was counted in developing trip generation rates for the project. Data should be provided for additional locations. **STAN 04**

2. Source data used to develop the mode split for project related trips should be provided. Obtain and present relevant data for the existing race track to help define existing trip distribution and mode choice patterns for patrons and guests. **STAN 05**

3. Historic traffic volume data for study area roadways, particularly Route 1A, should be provided. Data for pre-recession (2007 and earlier) traffic conditions is specifically requested. Many areas have seen traffic declines since the economic recession began in 2008. It may make sense to use pre-recession traffic volume levels for existing or baseline conditions. **STAN 06**

4. Determine the level of racetrack activity occurring during the traffic count program that was done for the project. Adjust baseline traffic volumes as appropriate to reflect typical racetrack activity under existing conditions. **STAN 07**

5. A detailed explanation of temporal traffic impacts and derivation of critical analysis period should be provided. Emphasis should be on Route 1A operations looking at hourly background volumes, hourly casino traffic volumes and hourly racetrack volumes in combination. No data has been provided to understand daily and hourly variations in racetrack volumes and how these volumes may change over time with a casino resort constructed on site. **STAN 08**

6. Update assumptions related to background development and its anticipated traffic impacts. New projects have been identified by the City since the traffic count program was conducted. Assumptions regarding the inclusion/exclusion of the BJ's Wholesale and Seaport Square projects should be clarified. The applicant should obtain a current list of active projects from both Revere and Boston. **STAN 09**

Study Methods/Analysis

Certain study methods should be explained or reconsidered as described below. Additional analyses should also be provided as listed.

1. Provide a systems analysis for the proposed Route 1A improvements to consider coordinated signal operations, traffic progression and vehicle stacking between closely spaced intersections. Presently, the Route 1A intersections have been analyzed as if each were operating in isolation. Explain how **STAN 10**

clearance times have been considered in the analysis of the proposed mitigation plans. Some very wide intersections are proposed requiring long clearance times and long pedestrian signal phases.

2. Provide a detailed parking evaluation. This evaluation should look at temporal parking demands for the racetrack, casino, hotels and special events. Comparisons should be made to the proposed future parking supply. The proposed parking management plan should be described indicating how and if off-site parking might be used to serve special event parking demands. The study should also explain how the parking management plan will balance the competing goals of minimizing vehicle trip generation for the facility while precluding casino related parking in adjacent neighborhoods. (If limiting the number of parking spaces on the site is used as a strategy to reduce vehicular traffic demands might this result in increased parking demands on neighborhood streets and at nearby MBTA lots?) **STAN 11**

3. Describe transit and pedestrian access in terms of trip distance to/from the front and back doors of the casino. The site is quite large hence; walking distances should be measured to the casino front door for patrons and from the back door for employees not just "to the site". Actual walking distances should be considered in the mode choice and trip distribution evaluations as well as in the mitigation plans. Provide a map or plan depicting the location, width and condition of all pedestrian facilities located within walking distance of the site. **STAN 12**

4. Provide a comprehensive transit system impact analysis including a discussion of Existing, No Build and Build condition load factors on routes serving the site. Assess the impact of the project on nearby Blue Line parking facilities recognizing that employees will be encouraged to access the site via public transportation. **STAN 13**

5. Develop and analyze post-Build traffic conditions on key study area roadways that consider the potential impact of induced development and redevelopment that may occur if and when approval of the casino project is certain. **STAN 14**

6. Describe and compare past redevelopment plans for the subject site to the proposed casino plan. Consider trip generation impacts and traffic mitigation plans. **STAN 15**

7. Describe how hotel traffic has been included in the traffic analysis. The one site referenced in developing trip generation rates for the study does not include a hotel. **STAN 16**

8. Explain and describe alternative mitigation plans for the Route 1A/Boardman Street intersection. Discuss the positive and negative elements of full grade-separation and other strategies in terms of operations, land impacts, construction timetable and cost. **STAN 17**

9. Recalibrate the existing conditions intersection analyses particularly for Bennington Street where some intersections/turning movements are reportedly operating with volume-to-capacity ratios in excess of 5.0. **STAN 18**

10. Explain the appropriateness of analyzing traffic circles in the project area as roundabouts. Verify that the analysis model applied reflects field-observed operating protocol. Yield upon entry is assumed for roundabout operations. Drivers in Massachusetts do not always follow this protocol at traffic circles. **STAN 19**

Mitigation

The traffic study should better define transportation mitigation plans and/or offer additional mitigation as described below.

1. Provide traffic mitigation plans for Bennington and Saratoga Street to address reported poor intersection levels of service. Describe possible strategies to upgrade signal systems and connect them to the City's traffic control center. **STAN 20**

2. Provide 20-scale or 40-scale conceptual plans for the Route 1A improvements with proposed limits of work and rights-of-way shown. The plans should describe proposed improvements to pedestrian areas, treatment of medians and below-roadway areas. **STAN 21**

3. Provide documentation regarding the timing of mitigation/transportation improvements proposed along roadways in Revere. It is suggested that some of these improvements will be "built by others" and may not be in place prior to project opening. **STAN 22**

4. Provide a detailed description of proposed enhancements to existing pedestrian, bicycle and transit access to and within the site. Identify site access locations for pedestrians and bicyclists. Identify new pedestrian and bike facilities to serve the site including the proposed DCR bike path extension and spur to Bennington Street. Clarify funding and timing for these improvements along with any project contribution to these plans. **STAN 23**

5. Develop, describe and commit to strategies to transport transit-dependent employees who may commute during non-operating hours for the MBTA. **STAN 24**

6. Consider the need to modify time limits and/or introduce other parking management strategies to ensure that adequate on-street parking remains available to local residents on city streets. Provide "duration of stay" information for site visitors and compare the typical durations to time limits for on-street parking in the site environs. **STAN 25**

7. Provide a detailed way finding plan that will aid visitors accessing the site along major routes. Explain strategies that will be used to deter employees, taxicabs, delivery vehicles and other regular site visitors from using "short cuts" through residential areas. **STAN 26**

8. Explain in greater detail proposed Travel Demand Management strategies, goals and objectives to minimize site traffic generation. Explain how participation by the casino in the local Transportation Management Association might help reduce the number of vehicle trips generated by other TMA members. **STAN 27**

9. Describe any traffic monitoring plans that may be put in place after project opening to: confirm the traffic forecasts offered during the permitting process; determine if the goals of the TDM plan are met; and, inform decision making relative to the implementation of additional post-build mitigation measures. Describe financial resources that would be committed to post-build traffic mitigation to address unforeseen circumstances. **STAN 28**

10. Water Transportation: Describe any water transportation plans that may be in place and how the project may be able to make use of water access given East Boston's geographic location. **STAN 29**

11. Public Safety: Describe and commitment to any special elements of the site access management plan to facilitate access by emergency vehicles. **STAN 30**

12. Discuss possible or proposed MBTA bus route modifications that could provide more convenient site access. Describe possible changes to the MBTA Blueline Suffolk Downs and Beachmont stations to better handle the ridership increases and shuttle bus traffic anticipated at these stations. Similarly, describe and commit to streetscape improvements along Winthrop Avenue as necessary to support increased pedestrian activity between the site and the Beachmont station. **STAN 31**

13. Describe existing and proposed accommodations for pedestrians to cross Route 1A in the site vicinity and any pedestrian improvements/ amenities proposed along the Route 1A corridor. **STAN 32**

14. Explain how bus staging will be managed on site. Describe measures that will be taken to minimize noise and air impacts to adjacent residential areas. **STAN 33**

The above list is not meant to be all inclusive as additional issues will likely be identified as the project moves forward. Please do not hesitate to contact us if you have any questions regarding the above.

Regards,

STANTEC CONSULTING SERVICES INC.



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STAN 01 The traffic study area should be expanded to include the following locations:

- The full Bennington Street/Route 1A interchange area to also include the closely-spaced Saratoga Street, Bremen Street and Chelsea Street intersections with Neptune Road. The Bennington Street/Neptune Road intersection is presently part of the study area.
- Additional intersections along Bennington Street between Neptune Road and Saratoga Street as necessary to fully understand the potential impact of a proposed bike lane on Bennington Street and to understand opportunities to enhance traffic signal coordination and control along this corridor.
- The Route 1A southbound intersections with the southbound on ramp from Route 145 and with Curtis Street. These "K-type" intersections are subject to some unique and potentially unsafe queuing and merge conditions that warrant a safety analysis.

All of the requested locations are included in the transportation analysis study area (see Section 5.0).

STAN 02 Identify any applicable Federal permit or review requirements associated with proposed off-site transportation system improvements. Explain how these requirements will be met.

No Federal permit or review is required for the proposed off-site transportation improvements.

STAN 03 Provide a construction management plan for the proposed development as well as proposed off-site transportation system improvements. Provide a traffic management plan to address traffic impacts associated with construction of off-site transportation system improvements.

The Draft CMP in Attachment L discusses construction management, including traffic management.

STAN 04 Provide the source data used as the basis of the trip generation estimates for the Project. It is understood that only one active urban casino resort was counted in developing trip generation rates for the Project. Data should be provided for additional locations.

Detailed research of trip generation, including counts performed at comparable locations, is presented in Sections 5.4.1 through 5.4.4.

STAN 05 **Source data used to develop the mode split for the Project-related trips should be provided. Obtain and present relevant data for the existing racetrack to help define existing trip generation and mode choice patterns for patrons and guests.**

Analysis of mode share for patrons, guests, and employees is presented in Section 5.4.5.

STAN 06 **Historic traffic volume data for study area roadways, particularly Route 1A, should be provided. Data for pre-recession (2007 and earlier) traffic conditions is specifically requested.**

An analysis of historic pre-recession traffic volume data is included in Attachment A.

STAN 07 **Determine the level of racetrack activity occurring during the traffic count program that was done for the Project. Adjust baseline traffic volumes as appropriate to reflect typical racetrack activity under existing conditions.**

Baseline traffic counts were performed during the active racing season, and it has been determined that no adjustment is necessary.

STAN 08 **A detailed explanation of temporal traffic impacts and derivation of critical analysis period should be provided. Emphasis should be on Route 1A operations looking at hourly background volumes, hourly casino traffic volumes and hourly racetrack volumes in combination. No data has been provided to understand daily and hourly variations in racetrack volumes and how these volumes may change over time with a casino resort constructed on site.**

Analyses of temporal background volumes and Project traffic are included in Sections 5.2.8, 5.2.9, 5.4.2, and 5.4.6.

STAN 09 **Update assumptions related to background development and its anticipated traffic impacts. New projects have been identified by the City since the traffic count program was conducted. Assumptions regarding the inclusion/exclusion of the BJ's Wholesale and Seaport Square projects should be clarified. The applicant should obtain a current list of active projects from both Revere and Boston.**

Assumptions regarding background development, in response to City of Revere and City of Boston requirements, are presented in Section 5.3.2.

STAN 10 **Provide a systems analysis for the proposed Route 1A improvements to consider coordinated signal operations, traffic progression and vehicle stacking between closely spaced intersections. Presently, the Route 1A intersections have been analyzed as if each were operating in isolation. Explain how clearance times have**

been considered in the analysis of the proposed mitigation plans. Some very wide intersections are proposed, requiring long clearance times and long pedestrian signal phases.

An alternatives analysis for the proposed Route 1A infrastructure improvements is presented in Section 5.5.

STAN 11 Provide a detailed parking evaluation. This evaluation should look at temporal parking demands for the racetrack, casino, hotels and special events. Comparisons should be made to the proposed future parking supply. The proposed parking management plan should be described indicating how and if off-site parking might be used to serve special event parking demands. The study should also explain how the parking management plan will balance the competing goals of minimizing vehicle trip generation for the facility while precluding casino related parking in adjacent neighborhoods. (If limiting the number of parking spaces on the site is used as a strategy to reduce vehicular traffic demands, might this result in increased parking demands on neighborhood streets and at nearby MBTA lots?)

The parking analysis is presented in Section 5.10.

STAN 12 Describe transit and pedestrian access in terms of trip distance to/from the front and back doors of the casino. The site is quite large; hence, walking distances should be measured to the casino front door for patrons and from the back door for employees not just "to the site." Actual walking distances should be considered in the mode choice and trip distribution evaluations as well as in the mitigation plans. Provide a map or plan depicting the location, width and condition of all pedestrian facilities located within walking distance of the site.

On-site pedestrian accommodations are described in detail in Sections 1.0 and 4.0. Walking distance is included in the determination of mode share for patrons and employees in Section 5.4. Off-site pedestrian facilities are shown in the corresponding figures of improvements to be provided in the HCAs with Revere and Boston.

STAN 13 Provide a comprehensive transit system impact analysis including a discussion of Existing, No Build and Build condition load factors on routes serving the site. Assess the impact of the Project on nearby Blue Line parking facilities recognizing that employees will be encouraged to access the site via public transportation.

Comprehensive analyses of transit impacts for existing and future conditions are presented in Sections 5.2.1 and 5.8.1, respectively. It is not anticipated that significant numbers of employees will park-and-ride at Blue Line stations, as parking is available only at Blue Line stations relatively close to the site. The parking plan for employees is presented in Section 5.10.3.

STAN 14 **Develop and analyze post-Build traffic conditions on key study area roadways that consider the potential impact of induced development and redevelopment that may occur if and when approval of the casino project is certain.**

The DEIR/EPNF analysis includes year 2022 No Build and Build analyses which include regional background growth as determined by MassDOT and including all background projects required by the cities of Revere and Boston.

STAN 15 **Describe and compare past redevelopment plans for the subject site to the proposed casino plan. Consider trip generation impacts and traffic mitigation plans.**

An analysis of alternative site development scenarios is presented in Section 1.9.

STAN 16 **Describe how hotel traffic has been included in the traffic analysis. The one site referenced in developing trip generation rates for the study does not include a hotel.**

Hotel traffic is included in the overall Project trip generation, as the comparable locations at which counts were performed include hotels.

STAN 17 **Explain and describe alternative mitigation plans for the Route 1A/Boardman Street intersection. Discuss the positive and negative elements of full grade-separation and other strategies in terms of operations, land impacts, construction timetable and cost.**

An alternatives analysis for the Route 1A infrastructure improvements is presented in Section 5.5.

STAN 18 **Recalibrate the existing conditions intersection analyses particularly for Bennington Street where some intersections/turning movements are reportedly operating with volume-to-capacity ratios in excess of 5.0.**

Given the regulatory environment through which DEIR/EPNF findings are reported, and the general desire to not modify factors within the base Synchro program, the Proponent considers that the models should be used for comparative purposes between various conditions. This is especially true where Project-related impacts are of such a scale that they could be assumed to be within the average daily traffic variation of an intersection during one of the analyzed peak hours.

STAN 19 **Explain the appropriateness of analyzing traffic circles in the project area as roundabouts. Verify that the analysis model applied reflects field-observed operating protocol. Yield upon entry is assumed for roundabout operations.**

The study area intersections of Butler Circle, Brown Circle, and Eliot Circle are defined as roundabouts in Chapter 21 of the Highway Capacity Manual (HCM 2010). By definition, vehicles entering the roundabout must yield to circulating

traffic, which is true for all three locations. In addition, state law in the Commonwealth of Massachusetts requires all entering vehicles to yield to traffic within the circle. As such, Bell Circle (a.k.a. Mahoney Circle) and Copeland Circle are not defined as roundabouts and were analyzed as discussed in Section 5.0.

STAN 20 **Provide traffic mitigation plans for Bennington and Saratoga Street to address reported poor intersection LOS. Describe possible strategies to upgrade signal systems and connect them to the City's traffic control center.**

Plans for improvements at Bennington and Saratoga Street are described in Section 5.6.3.

STAN 21 **Provide 20-scale or 40-scale conceptual plans for the Route 1A improvements with proposed limits of work and rights-of-way shown. The plans should describe proposed improvements to pedestrian areas, treatment of medians and below-roadway areas.**

Concept plans for all options developed for the Route 1A infrastructure improvements are presented in Section 5.5.

STAN 22 **Provide documentation regarding the timing of mitigation/transportation improvements proposed along roadways in Revere. It is suggested that some of these improvements will be "built by others" and may not be in place prior to Project opening.**

Commitments regarding timing of improvements along roadways in Revere are included in the City of Revere HCA, which is provided in Attachment B.

STAN 23 **Provide a detailed description of proposed enhancements to existing pedestrian, bicycle and transit access to and within the site. Identify site access locations for pedestrians and bicyclists. Identify new pedestrian and bike facilities to serve the site including the proposed DCR bike path extension and spur to Bennington Street. Clarify funding and timing for these improvements along with any Project contribution to these plans.**

On-site pedestrian and bicycle accommodations are described in detail in Section 1.4. Off-site improvements to be funded by the Proponent are described in Sections 5.8.2 and 5.8.3, and in the HCA commitments described in Section 5.6.

STAN 24 **Develop, describe and commit to strategies to transport transit-dependent employees who may commute during non-operating hours for the MBTA.**

The shuttle plan described in Section 5.8.3.2 will be the primary approach to addressing the gap in overnight transit service. As part of that plan, the Proponent is committed to collaborating with other transportation providers including Massport,

the MBTA, and private entities in the region. As described in the TDM plan in Section 5.9, the Proponent will adjust employee shift times to the extent possible to reflect transit availability although, as noted, there will be multiple shift times during the 24-hour day.

STAN 25 **Consider the need to modify time limits and/or introduce other parking management strategies to ensure that adequate on-street parking remains available to local residents on city streets. Provide "duration of stay" information for site visitors and compare the typical durations to time limits for on-street parking in the site environs.**

A parking analysis for the Project is presented in Section 5.10. The Proponent has committed to supporting City of Boston (and City of Revere) initiatives to protect neighborhood streets by expanding parking restrictions and the resident parking permit program.

STAN 26 **Provide a detailed way-finding plan that will aid visitors accessing the site along major routes. Explain strategies that will be used to deter employees, taxicabs, delivery vehicles and other regular site visitors from using "short cuts" through residential areas.**

The Proponent will work with MassDOT, DCR, and the cities of Revere and Boston to develop appropriate directional signage to the Resort.

STAN 27 **Explain in greater detail proposed TDM strategies, goals and objectives to minimize site traffic generation. Explain how participation by the casino in the local Transportation Management Association might help reduce the number of vehicle trips generated by other TMA members.**

A robust TDM plan for the Project is described in Section 5.9.

STAN 28 **Describe any traffic monitoring plans that may be put in place after Project opening to: confirm the traffic forecasts offered during the permitting process; determine if the goals of the TDM plan are met; and inform decision making relative to the implementation of additional post-build mitigation measures. Describe financial resources that would be committed to post-build traffic mitigation to address unforeseen circumstances.**

Commitments to monitoring, which are to be coordinated with MassDOT and BTD, are identified in Section 5.9.5.

STAN 29 **Water Transportation: Describe any water transportation plans that may be in place and how the Project may be able to make use of water access given East Boston's geographic location.**

The Proponent supports Mayor Menino's vision to enhance water transportation options to East Boston by instituting regular water shuttle service between the South Boston and East Boston waterfronts. As such, the Boston HCA includes a contribution that will assist the City in establishing this service.

STAN 30 **Public Safety: Describe and commit to any special elements of the site access management plan to facilitate access by emergency vehicles.**

The Project will maintain three access points to the site: (1) Tomasello Drive entry from Route 1A; (2) Tomasello Drive entry from Winthrop Avenue; and (3) emergency vehicle restricted access from Walley Street.

STAN 31 **Discuss possible or proposed MBTA bus route modifications that could provide more convenient site access. Describe possible changes to the MBTA Blue Line Suffolk Downs and Beachmont stations to better handle the ridership increases and shuttle bus traffic anticipated at these stations. Similarly, describe and commit to streetscape improvements along Winthrop Avenue as necessary to support increased pedestrian activity between the site and the Beachmont station.**

The Proponent has committed to providing an MBTA bus stop on-site should the MBTA wish to route bus service through the Project site. While it is the least-used station on the blue Line, the Proponent has had preliminary discussions with MBTA staff, and will continue to explore the need for improvements at Suffolk Downs Station to handle increased demand. Proposed streetscape and pedestrian improvements in Donnelly Square adjacent to Beachmont Station and along Winthrop Avenue between the station and the Project site access at Tomasello Drive are described in Section 5.6.

STAN 32 **Describe existing and proposed accommodations for pedestrians to cross Route 1A in the site vicinity and any pedestrian improvements/amenities proposed along the Route 1A corridor.**

Pedestrian accommodations on Route 1A differ in the various alternatives presented in Section 5.5. Pedestrian accommodations and safety will continue to be key priorities in advancing concept design in coordination with MassDOT and BTD.

STAN 33 **Explain how bus staging will be managed on site. Describe measures that will be taken to minimize noise and air impacts to adjacent residential areas.**

Project modeling has accounted for traffic, including buses, along Blue Line Drive. Anticipated impacts are within applicable FHWA noise limits. The noise and air analyses are included in Section 6.0.

BOSTON
TRANSPORTATION
DEPARTMENT

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March 26, 2013

Via U.S. and Electronic Mail
Secretary Richard K. Sullivan
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02214

Reference: EOEEA# 15006
Caesars Resort at Suffolk Downs
Transportation

Dear Secretary Sullivan:

The City of Boston is pleased to have the opportunity to comment on the Environmental Notification Form (ENF) submitted by Sterling Suffolk Racecourse, LLC ("Suffolk") for the above referenced project. The City, and specifically the Boston Transportation Department (BTD), is committed to protecting the transportation interests of the City of Boston relative to the resort proposal. The City and the community agree that traffic and transportation are a priority. With that in mind, the City is applying the highest standards to the developer's transportation plans, and asks that the state do the same. Many community members have concerns about transportation impacts from the proposed development. We understand that these concerns include but are not limited to assurances that:

- Mobility will not be degraded on roadways in the site environs;
- Sufficient capacity and improvements will be available on the MBTA Blue Line and area bus routes to meet resident and resort needs;
- Resort patrons and employees will not be parking on City streets in the East Boston neighborhood;
- Proposed transportation analysis and planning addresses all modes – automobile, transit, pedestrian, bicycle and water; and,

- Adequate measures will be employed to mitigate construction impacts.

Accordingly, we view the MEPA (Massachusetts Environmental Policy Act) review process as a valuable complement to the City of Boston's own project review process and an important means to address the concerns of the community.

While the scope of this letter is limited to transportation, the City's interests and review extend well beyond transportation issues. As such, a second letter is also being submitted to your office by the City commenting on non-transportation elements of the project's anticipated environmental impacts. *See Attachment A, March 26, 2013 City of Boston Environment and Energy Service Cabinet Letter.* Likewise, this letter does not encompass all of the City's transportation review of this project, much of which is happening at a local level. In an effort to share with your office the scope of the City's transportation review, attached please find a separate gap analysis letter that the City has sent to the proponent. *See Attachment B, March 22, 2013 Stantec Consulting Letter.*[1] The supplemental information filed with the ENF is informative in describing the project and its potential environmental impacts. Receipt of these materials has enabled the City to informally initiate its own project review process. Under the City's own review process the City will fully consider site plan and roadway impacts within our jurisdiction. However, through the MEPA process we seek to understand potential project impacts, and perhaps influence decisions, regarding transportation facilities and services in the City that are under state jurisdiction.

A. Importance of Route 1A and the MBTA

The City has specific transportation concerns that relate to State Route 1A and Massachusetts Bay Transportation Authority (MBTA) operations and facilities. Suffolk's preliminary transportation analysis notes the importance of Route 1A and the MBTA in providing safe and efficient access to the subject site. The analysis estimates that ten percent (10%) of the patron trips and thirty-five percent (35%) of the employee trips will be made by public transportation. Of the estimated 24,600 daily vehicle trips generated to/from the site, eighty-two percent (82%) are expected to use Route 1A, with approximately seventy percent (70%) oriented to the south of downtown Boston. The City is seeking assurances through the MEPA process that Route 1A and the MBTA have adequate capacity to handle these increased travel demands, and to prevent any excess demand spill-over onto City streets. Several City roadway intersections, as indicated in Suffolk's preliminary traffic investigations, are already operating at or near capacity and cannot readily accommodate increased traffic volumes. Therefore, the City asks that the state request from the proponent a detailed impact assessment and recommendations to protect the community from any potential impact, particularly related to Route 1A and the MBTA. **BTD 01**

B. Route 1A

[1] The City of Boston has hired Stantec Consulting to assist with its review of the proposed resort development.

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We look forward to the submission of a Draft Environmental Impact Report (DEIR) by Suffolk that includes a transportation study prepared in full conformance with the *EOEEA/MassDOT Guidelines for EIR/EIS Traffic Impact Assessment* (the *Guidelines)*. We ask that the study include all of the intersections listed in Attachment A/Section 3.2.6 (Proposed Study Area) of the ENF plus the following intersections: **BTD 02**

- Route 1A/Curtis Street
- Saratoga Street/Neptune Road
- Bremen Street/Neptune Road

The other study area intersections in the City of Boston, per ENF Attachment A/Section 3.2.6, we understand to include:

- Route 1A at Jughandle/Tank Farm Access
- Route 1A at Tomasello Drive (Suffolk Downs)
- Route 1A Northbound at Waldemar Avenue
- Route 1A at Boardman Street
- Bennington Street at Saratoga Street
- Bennington Street at Neptune Road
- Neptune Road at Route 1A Northbound Off-ramp
- Boardman Street at Saratoga Street

Additional intersections are to be considered in the City of Revere.

Consistent with the *Guidelines,* we would expect the DEIR to describe existing and anticipated future transportation conditions to at least the level of detail provided in the preliminary study with more specific and more firm commitments to transportation mitigation. Likewise, we expect Suffolk to address in the DEIR, and/or at the City level as appropriate, the issues raised in the attached "gap analysis" letter (Attachment B) prepared by the City's transportation consultant for this project. **BTD 03** **BTD 04**

Due to certain unique elements of the project we ask that the EOEEA require Suffolk to include analyses which may not be specifically identified in the *Guidelines*. First, we ask that a "post-build" analysis be completed for at least Route 1A in the site vicinity. We understand that inclusion of a post-build analysis is typical of traffic studies conducted for gaming resorts that are subject to federal review. Federal reviewers recognize that the introduction of gaming to an **BTD 05**

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area tends to attract additional "induced" development that will further increase travel demands after the gaming resort is built. In this case individual "induced development" projects may not be subject to MEPA review due to their size and/or location yet the cumulative impact of this type of development could have significant impacts on Route 1A traffic operations. Given the scope, cost and construction duration of improvements suggested by Suffolk for Route 1A, the northbound flyover at Boardman Street, decision-making regarding the Route 1A plan should look beyond the typical five-year time horizon considered in the *Guidelines*. It is standard practice for MassDOT to require preparation of a Functional Design Report (FDR) for a roadway project of this scale. Perhaps the FDR traffic analysis could be included in the DEIR as the "post-build" analysis. Second, we ask that the DEIR include an alternatives analysis for the suggested Route 1A improvements. Again, given the scale and cost of the suggested improvements, whatever is built for the proposed resort is likely to remain in place for many years. We ask that alternative Route 1A treatments be presented in the DEIR and evaluated in a matrix format describing as appropriate: **BTD 06**

- AM and PM peak hour traffic operations (level of service and volume-to-capacity ratio) for Route 1A intersections with Boardman Street, Tomasello Drive, Waldemar Avenue and the U-Turn/Tank Farm Access;
- Construction costs;
- Construction time period;
- Land acquisition requirements (number of parcels, number of property owners, total acreage, estimated land value); and,
- Pedestrian and bike accommodations and "pedestrian friendliness," (wider roads will make crossing Route 1A more difficult and/or dictate the need for grade separated crossings).

Supporting traffic flow networks, traffic operations analysis worksheets, cost estimate worksheets, construction phasing plans and preliminary taking plans may also be provided in the DEIR appendix to support the evaluation matrix.

C. MBTA

The City asks that a detailed impact analysis is done regarding the MBTA subway and bus line sites and services. The City would like the DEIR to consider project impacts on MBTA line capacities, including availability of service and station improvements. Many East Boston residents, businesses, patrons and visitors depend on these services. A detailed impact assessment is needed to protect and enhance the community from any potential impact. The City recommends that an MBTA analysis include review of shift times for employees at the resort, as well as capacity during rush hours, weekends and nighttime service. **BTD 07**

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We also ask that in addition to considering project impacts on MBTA line capacities, that the DEIR also analyze the capacity of MBTA parking facilities serving the Blue Line. Presumably, the DEIR will look at peak load factors for Blue Line trains and MBTA buses serving the project site to determine if adequate capacity is available to carry resort-generated riders. Ideally, most of the new riders to the resort will access the MBTA system as pedestrians entering the system by way of downtown subway stations or boarding MBTA buses near their homes. However, employees approaching from communities located north of the project site may choose to park at Wonderland or Beachmont stations, particularly if employee parking on site is limited as part of the project's Travel Demand Management plan. The ability of these stations to handle increased parking demands should be considered. **BTD 08**

D. Parking

Also, and related to the above comment, is a request that Suffolk provide a comprehensive parking analysis and parking management plan in the DEIR for both the construction period as well as after opening. On-street parking along City streets proximate to Suffolk Downs in the Orient Heights neighborhood should be available to East Boston residents and their guests under both construction conditions and future conditions with the resort built. However, competition for these spaces will occur if adequate parking is not provided by the resort to meet typical and peak resort parking needs. The DEIR should analyze typical weekend and special event parking demands. Gaming activity and related parking demand are expected to peak on weekend evenings. Special events, such as live performances, conferences, and high-stakes horse racing, may add to weekend peaks and/or create peaks at others times. A plan should be provided to ensure that resort-related parking demands will be met in resort-controlled parking facilities at all times and not on neighborhood streets. **BTD 09**

E. Water

The ENF does discuss the possibility of using water transportation to alleviate roadway congestion, which the City of Boston is assessing and encourages. The City is requesting the proponent look at how the project can tie in to the water transportation network to downtown Boston and the Boston Harbor Islands national park. In addition to considering water transport during casino operations, the City has asked the proponent to evaluate the possibility of using water transport during project construction for construction materials and construction workers. **BTD 10** **BTD 11**

F. Construction Management Plan

Finally, as the project advances, the proponent will be required to develop and submit a detailed Construction Management Plan (CMP) to the Boston Transportation Department (BTD) for review and approval. The CMP will address Traffic Demand Management measures for construction workers, proposed truck routes and hours, street occupancies, equipment staging, sidewalk relocations and hours of construction work. **BTD 12**

Once again we thank you for providing us with the opportunity to comment on the Caesar's Resort at Suffolk Downs ENF. We look forward to reviewing the anticipated DEIR.

Regards,

Thomas J. Tinlin
Commissioner
Boston Transportation Department

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BTD 01 The City is seeking assurances through the MEPA process that Route 1A and the MBTA have adequate capacity to handle these increased travel demands, and to prevent any excess demand spill-over onto City streets. Several City roadway intersections, as indicated in Suffolk's preliminary traffic investigations, are already operating at or near capacity and cannot readily accommodate increased traffic volumes.

Build condition traffic capacity analyses are presented in Sections 5.5 and 5.7. Build transit analysis is presented in Section 5.8.1.

BTD 02 We look forward to the submission of a DEIR by Suffolk that includes a transportation study prepared in full conformance with the EOEEA/MassDOT Guidelines for EIR/EIS Traffic Impact Assessment (the Guidelines). We ask that the study include all of the intersections listed in Attachment A/Section 3.2.6 (Proposed Study Area) of the ENF plus the following intersections:

- Route 1A/Curtis Street
- Saratoga Street/Neptune Road
- Bremen Street/Neptune Road

The DEIR/EPNF analysis is in conformance with the EEA/MassDOT Guidelines for Traffic Impact Assessment. The additional intersections requested have been included in the study area.

BTD 03 Consistent with the Guidelines, we would expect the DEIR to describe existing and anticipated future transportation conditions to at least the level of detail provided in the preliminary study with more specific and more firm commitments to transportation mitigation.

The DEIR/EPNF transportation analysis in Section 5.0 is substantially expanded and detailed in conformance with the Guidelines.

BTD 04 We expect Suffolk to address in the DEIR, and/or at the City level as appropriate, the issues raised in the attached "gap analysis" letter (Attachment B) prepared by the City's transportation consultant for this Project.

The Proponent has responded to all comments from the City's transportation consultant, Stantec, earlier in this section.

BTD 05 We ask that a "post-build" analysis be completed for at least Route 1A in the site vicinity. We understand that inclusion of a post-build analysis is typical of traffic studies conducted for gaming resorts that are subject to federal review. Federal reviewers recognize that the introduction of gaming to an area tends to attract

additional "induced" development that will further increase travel demands after the gaming resort is built. In this case individual "induced development" projects may not be subject to MEPA review due to their size and/or location yet the cumulative impact of this type of development could have significant impacts on Route 1A traffic operations. Given the scope, cost and construction duration of improvements suggested by Suffolk for Route 1A, the northbound flyover at Boardman Street, decision-making regarding the Route 1A plan should look beyond the typical five-year time horizon considered in the Guidelines. It is standard practice for MassDOT to require preparation of a Functional Design Report (FDR) for a roadway project of this scale. Perhaps the FDR traffic analysis could be included in the DEIR as the "post-build" analysis.

Federal review is not required for the proposed roadway improvements. The DEIR/EPNF traffic analysis horizon year is 2022. For Route 1A infrastructure improvement alternatives, a design year 2032 analysis is included.

BTD 06 We ask that the DEIR include an alternatives analysis for the suggested Route 1A improvements... We ask that alternative Route 1A treatments be presented in the DEIR and evaluated in a matrix format describing as appropriate:

- AM and PM peak hour traffic operations (LOS and volume-to-capacity ratio) for Route 1A intersections with Boardman Street, Tomasello Drive, Waldemar Avenue, and the U-Turn/Tank Farm Access;
- Construction costs;
- Construction time period;
- Land acquisition requirements (number of parcels, number of property owners, total acreage, estimated land value); and
- Pedestrian and bike accommodations and "pedestrian friendliness," (wide roads will make crossing Route 1A more difficult and/or dictate the need for grade-separated crossings).

Supporting traffic flow networks, traffic operations analysis worksheets, cost estimate worksheets, construction phasing plans and preliminary taking plans may also be provided in the DEIR appendix to support the evaluation matrix.

An alternatives analysis for Route 1A improvements is presented in Section 5.5.

BTD 07 The City asks that a detailed impact analysis is done regarding the MBTA subway and bus line sites and services. The City would like the DEIR to consider Project impacts on MBTA line capacities, including availability of service and station improvements... The City recommends that an MBTA analysis include review of shift times for employees at the resort, as well as capacity during rush hours, weekends and nighttime service.

A detailed transit impact analysis is presented in Section 5.8.1. Employee shift times are reflected in the analysis.

BTD 08 **We ask that... the DEIR also analyze the capacity of MBTA parking facilities serving the Blue Line... Employees approaching from communities located north of the Project site may choose to park at Wonderland or Beachmont stations, particularly if employee parking on site is limited as part of the Project's TDM plan.**

In an effort to limit trips to the site the Proponent is proposing to severely restrict employee parking, but it is not anticipated that significant numbers of employees will park at Wonderland or Beachmont stations. The employee parking plan is described in Section 5.10.3.

BTD 09 **[BTD requests] that Suffolk provide a comprehensive parking analysis and parking management plan in the DEIR for both the construction period as well as after opening. On-street parking along City streets proximate to Suffolk Downs in the Orient Heights neighborhood should be available to East Boston residents and their guests under both construction conditions and future conditions with the resort built... The DEIR should analyze typical weekend and special event parking demands.**

A parking analysis for the Project is presented in Section 5.10. The Proponent has committed to supporting City of Boston initiatives to protect neighborhood streets by expanding parking restrictions and the Resident Parking Permit program. During construction, personal vehicles will be allowed to park within designated areas at the Project construction site, and no construction vehicle parking will be allowed in adjacent neighborhoods. Terms and conditions to maximize protection of the neighborhoods related to workforce parking will be written into each subcontract and reviewed with each worker during a mandatory orientation. Terms and conditions encouraging public transportation use will be included in each subcontract. Overflow parking will be provided on the Project site to accommodate special events. These overflow parking spaces will consist of reinforced turf parking areas near the loading areas to the casino areas.

BTD 10 **The City is requesting the Proponent look at how the Project can tie into the water transportation network to downtown Boston and the Boston Harbor Islands national park.**

The Proponent supports Mayor Menino's vision to enhance water transportation options to East Boston by instituting regular water shuttle service between the South Boston and East Boston waterfronts. As such, the Boston HCA includes a contribution that will assist the City in establishing this service.

BTD 11 **In addition to considering water transport during casino operations, the City has asked the Proponent to evaluate the possibility of using water transport during Project construction for construction materials and construction workers.**

There are currently no plans to convey construction materials to the site via water transportation.

BTD 12 **As the Project advances, the Proponent will be required to develop and submit a detailed Construction Management Plan (CMP) to the BTD for review and approval. The CMP will address TDM measures for construction workers, proposed truck routes and hours, street occupancies, equipment staging, sidewalk relocations and hours of construction work.**

The Draft CMP in Attachment L addresses these items.

Boston Water and Sewer Commission

980 Harrison Avenue
Boston, MA 02119-2540
617-989-7000

February 20, 2013

Secretary Richard K. Sullivan, Jr.
Executive Office of Energy and Environmental Affairs (EEA)
Attn: MEPA Office
100 Cambridge Street, Suite 900
Boston MA 02114

Re: Caesars Resort at Suffolk Downs
Sterling Suffolk Racecourse, LLC
East Boston and Revere

Dear Mr. Sullivan:

The Boston Water and Sewer Commission (Commission) has reviewed the Environmental Notification Form (ENF) for the Caesars Resort at Suffolk Downs located at 525 McClellan Highway in East Boston. This letter provides the Commission's comments on the ENF.

The proposed project consists of renovations to the existing grandstand, clubhouse and links, and the construction of casino areas, hotels, parking garage and retail space. The existing office building and utility buildings will also be demolished. When construction is complete, the site will have two casino areas, two hotels and a parking garage in addition to the race track and stables.

Water to the site is provided by both the Commission and the City of Revere. The connection to the Commission water distribution system is an 8" water main in Waldemar Avenue in the Commission's northern high pressure zone. A separate 4" connection to the Commission's northern low pressure zone provides water to the CAFO. Wastewater for the site discharges to the Commission sewers at two locations, The grandstands and other utility buildings discharge to a 12" sewer in Waldemer Avenue thru an existing pump station. Sewage and street drainage from the stables area is pumped from a retention and enters the Commission wastewater system via a manhole at the end of Wally Street near the MBTA station. A separate storm drainage system collects water from roof located in the stable area.

The ENF states that the proposed project will increase water consumption from approximately 40,200 gallons per day (gpd) to 435, 810 gpd and wastewater generation will increase from approximately 166,020 gpd to 473,100 gpd.

The Commission has the following comments regarding the proposed project:

General

1. The Department of Environmental Protection, in cooperation with the Massachusetts Water Resources Authority and its member communities, are implementing a coordinated approach to flow control in the MWRA regional wastewater system, particularly the removal of extraneous clean water (e.g., infiltration/ inflow (I/I)) in the system. In this regard, DEP has been routinely requiring proponents proposing to add significant new wastewater flow to assist in the I/I reduction effort to ensure that the additional wastewater flows are offset by the removal of I/I. Currently, DEP is typically using a minimum 4:1 ratio for I/I removal to new wastewater flow added. The Commission supports the DEP/MWRA policy, and will require the proponent to develop a consistent inflow reduction plan. The 4:1 requirement should be addressed at least 90 days prior to activation of water service and will be based on the estimated sewage generation provided on the project site plan. **BWSC 01**

2. All new or relocated water mains, sewers and storm drains must be designed and constructed at Sterling Suffolk Racecourse, LLC expense. They must be designed and constructed in conformance with the Commission's design standards, Water Distribution System and Sewer Use Regulations, and Requirements for Site Plans. To assure compliance with the Commission's requirements, Sterling Suffolk Racecourse, LLC must submit a site plan and a General Service Application to the Commission's Engineering Customer Service Department for review and approval when the designs of the new water and wastewater systems and the proposed service connections to those systems are 50 percent complete. The site plan should include the locations of new, relocated and existing water mains, sewers and drains which serve the site, proposed service connections as well as water meter locations. **BWSC 02**

3. It is Sterling Suffolk Racecourse, LLC responsibility to evaluate the capacity of the water, sewer and storm drain systems serving the project site to determine if the systems are adequate to meet future project demands. With the site plan, Sterling Suffolk Racecourse, LLC must include a detailed capacity analysis for the water, sewer and storm drain systems serving the project site, as well as an analysis of the impacts the proposed project will have on the Commission's water, sewer and storm drainage systems. **BWSC 03**

4. The design of the project should comply with the City of Boston's Complete Streets Initiative, which requires incorporation of "green infrastructure" into street designs. Green infrastructure includes greenscapes, such as trees, shrubs, grasses and other landscape plantings, as well as rain gardens and vegetative swales, infiltration basins, and paving materials and permeable surfaces. The proponent must develop a maintenance **BWSC 04**

plan for the proposed green infrastructure. For more information on the Complete Streets Initiative see the City's website at http://bostoncompletestreets.org/

5. Sterling Suffolk Racecourse, LLC should be aware that the US Environmental Protection Agency issued a draft Remediation General Permit (RGP) for Groundwater Remediation, Contaminated Construction Dewatering, and Miscellaneous Surface Water Discharges. If groundwater contaminated with petroleum products, for example, is encountered, Sterling Suffolk Racecourse, LLC will be required to apply for a RGP to cover these discharges. **BWSC 05**

6. The existing water use and existing sewage generation estimates do not appear to be correct. The Commission requires that these values be recalculated and submitted with the Site Plan. Sterling Suffolk Racecourse, LLC should provide separate estimates of peak and continuous maximum water demand for residential, irrigation and air-conditioning make-up water for the project. Estimates should be based on full-site build-out of the proposed project. Sterling Suffolk Racecourse, LLC should also provide the methodology used to estimate water demand for the proposed project. **BWSC 06**

Water

1. Sterling Suffolk Racecourse, LLC must provide separate estimates of peak and continuous maximum water demand for residential, irrigation of landscaped areas, and air-conditioning make-up water for the project with the site plan. Estimates should be based on full-site build-out of the proposed project. Sterling Suffolk Racecourse, LLC should also provide the methodology used to estimate water demand for the proposed project.

2. Sterling Suffolk Racecourse, LLC should explore opportunities for implementing water conservation measures in addition to those required by the State Plumbing Code. In particular, Massachusetts Convention Center Authority should consider outdoor landscaping which requires minimal use of water to maintain. If Sterling Suffolk Racecourse, LLC plans to install in-ground sprinkler systems, the Commission recommends that timers, soil moisture indicators and rainfall sensors be installed. The use of sensor-operated faucets and toilets in common areas of buildings should be considered. **BWSC 07**

3. Sterling Suffolk Racecourse, LLC is required to obtain a Hydrant Permit for use of any hydrant during the construction phase of this project. The water used from the hydrant must be metered. Sterling Suffolk Racecourse, LLC Authority should contact the Commission's Operations Division for information on and to obtain a Hydrant Permit. **BWSC 08**

4. The Commission is utilizing a Fixed Radio Meter Reading System to obtain water meter readings. For new water meters, the Commission will provide a Meter Transmitter Unit

(MTU) and connect the device to the meter. For information regarding the installation of MTUs, Sterling Suffolk Racecourse, LLC should contact the Commission's Meter installation Department.

Sewage / Drainage

1. In conjunction with the Site Plan and the General Service Application Sterling Suffolk Racecourse, LLC will be required to submit a Stormwater Pollution Prevention Plan. The plan must: **BWSC 09**

   - Identifies best management practices for controlling erosion and for preventing the discharge of sediment and contaminated groundwater or stormwater runoff to the Commission's drainage system when the construction is underway.

   - Includes a site map which shows, at a minimum, existing drainage patterns and areas used for storage or treatment of contaminated soils, groundwater or stormwater, and the location of major control or treatment structures to be utilized during construction.

   - Provides a stormwater management plan in compliance with the DEP standards mentioned above. The plan should include a description of the measures to control pollutants after construction is completed.

2. Developers of projects involving disturbances of land of one acre or more will be required to obtain an NPDES General Permit for Construction from the Environmental Protection Agency and the Massachusetts Department of Environmental Protection. Sterling Suffolk Racecourse, LLC is responsible for determining if such a permit is required and for obtaining the permit. If such a permit is required, it is required that a copy of the permit and any pollution prevention plan prepared pursuant to the permit be provided to the Commission's Engineering Customer Services Department, prior to the commencement of construction. The pollution prevention plan submitted pursuant to a NPDES Permit may be submitted in place of the pollution prevention plan required by the Commission provided the Plan addresses the same components identified in item 1 above. **BWSC 10**

3. The Commission encourages Sterling Suffolk Racecourse, LLC to explore additional opportunities for protecting stormwater quality on site by minimizing sanding and the use of deicing chemicals, pesticides, and fertilizers. **BWSC 11**

4. The discharge of dewatering drainage to a sanitary sewer is prohibited by the Commission. Sterling Suffolk Racecourse, LLC is advised that the discharge of any **BWSC 12**

dewatering drainage to the storm drainage system requires a Drainage Discharge Permit from the Commission. If the dewatering drainage is contaminated with petroleum products, Sterling Suffolk Racecourse, LLC will be required to obtain a Remediation General Permit from the Environmental Protection Agency (EPA) for the discharge.

5. Sterling Suffolk Racecourse, LLC must fully investigate methods for retaining stormwater on-site before the Commission will consider a request to discharge stormwater to the Commission's system. The site plan should indicate how storm drainage from roof drains will be handled and the feasibility of retaining their stormwater discharge on-site. Under no circumstances will stormwater be allowed to discharge to a sanitary sewer. **BWSC 13**

6. Sanitary sewage must be kept separate from stormwater and separate sanitary sewer and storm drain service connections must be provided. **BWSC 14**

7. The Commission requests that Sterling Suffolk Racecourse, LLC install a permanent casting stating "Don't Dump: Drains to Boston Harbor" next to any catch basin created or modified as part of this project. Sterling Suffolk Racecourse, LLC should contact the Commission's Operations Division for information regarding the purchase of the castings. **BWSC 15**

8. If a cafeteria or food service facility is built as part of this project, grease traps will be required in accordance with the Commission's Sewer use Regulations. Sterling Suffolk Racecourse, LLC is advised to consult with the Commission's Operations Department with regards to grease traps. **BWSC 16**

9. The enclosed floors of a parking garage must drain through oil separators into the sewer system in accordance with the Commission's Sewer Use Regulations. The Commission's Requirements for Site Plans, available by contacting the Engineering Services Department, include requirements for separators. **BWSC 17**

10. The Commission requires installation of particle separators on all new parking lots greater than 7,500 square feet in size. If it is determined that it is not possible to infiltrate all of the runoff from the new parking lot, the Commission will require the installation of a particle separator or a standard Type 5 catch basin with an outlet tee for the parking lot. Specifications for particle separators are provided in the Commission's requirements for Site Plans. **BWSC 18**

11. The Commission requires that existing stormwater and sanitary sewer service connections, which are to be re-used by the proposed project, be dye tested to confirm they are connected to the appropriate system. **BWSC 19**

Thank you for the opportunity to comment on this project.

Yours truly,

John P. Sullivan, P.E.
Chief Engineer

JPS/ra

cc: Sterling Suffolk Racecourse, LLC
✓ Epsilon Associates, Inc.
K. Pedersen, BRA
M. Zlody, BED
P. Larocque, BWSC

BOSTON WATER AND SEWER COMMISSION (BWSC)

BWSC 01 **The Commission supports the MassDEP/MWRA policy [to require proponents to remove infiltration/inflow (I/I) from the wastewater system using a minimum 4:1 ratio], and will require the Proponent to develop a consistent inflow reduction plan. The 4:1 requirement should be addressed at least 90 days prior to activation of water service and will be based on the estimated sewage generation provided on the Project site plan.**

The Proponent continues to work with BWSC regarding the Project and to develop mitigation strategies related to reducing water and wastewater impacts. The Proponent is committed to providing appropriate mitigation for I/I, and will pay the appropriate fees or work with BWSC to identify an appropriate project utilizing the fees to offset the increase in flows through I/I reduction (see Section 9.1)).

BWSC 02 **All new or relocated water mains, sewers and storm drains must be designed and constructed at Sterling Suffolk Racecourse, LLC expense. They must be designed and constructed in conformance with the Commission's design standards, Water Distribution System and Sewer Use Regulations, and Requirements for Site Plans. To assure compliance with the Commission's requirements, Sterling Suffolk Racecourse, LLC must submit a site plan and a General Service Application to the Commission's Engineering Customer Service Department for review and approval when the designs of the new water and wastewater systems and the proposed service connections to those systems are 50 percent complete. The site plan should include the locations of new, relocated and existing water mains, sewers and drains which serve the site, proposed service connections as well as water meter locations.**

The Proponent will provide BWSC with the required plans regarding water, sewer, and site drainage when the plans are completed.

BWSC 03 **It is Sterling Suffolk Racecourse, LLC responsibility to evaluate the capacity of the water, sewer and storm drain systems serving the project site to determine if the systems are adequate to meet future project demands. With the site plan, Sterling Suffolk Racecourse, LLC must include a detailed capacity analysis for the water, sewer and storm drain systems serving the project site, as well as an analysis of the impacts the proposed project will have on the Commission's water, sewer and storm drainage systems.**

The Proponent continues to work with BWSC to identify and mitigate any Project impacts regarding water, sewer, and storm drain systems.

BWSC 04 **The design of the project should comply with the City of Boston's Complete Streets Initiative, which requires incorporation of "green infrastructure" into street designs. Green infrastructure includes greenscapes such as trees, shrubs, grasses and other landscape plantings, as well as rain gardens and vegetative swales, infiltration basins, and paving materials and permeable surfaces. The proponent must develop a maintenance plan for the proposed green infrastructure.**

Section 4.4 describes the streetscape design and compliance with the City of Boston's Complete Streets Initiative.

BWSC 05 **Sterling Suffolk Racecourse, LLC should be aware that the US EPA issued a draft Remediation General Permit (RGP) for Groundwater Remediation, Contaminated Construction Dewatering, and Miscellaneous Surface Water Discharges. If groundwater contaminated with petroleum products, for example, is encountered, Sterling Suffolk Racecourse, LLC will be required to apply for an RGP to cover these discharges.**

The Proponent intends to comply with all applicable requirements of the Clean Water Act.

BWSC 06 **The existing water use and existing sewage generation estimates do not appear to be correct. The Commission requires that these values be recalculated and submitted with the Site Plan. Sterling Suffolk Racecourse, LLC should provide separate estimates of peak and continuous maximum water demand for residential, irrigation and air-conditioning make-up water for the Project. Estimates should be based on full site build-out of the proposed Project. Sterling Suffolk Racecourse, LLC should also provide the methodology used to estimate water demand for the proposed Project.**

The existing water use and sewage generation estimates in the ENF were developed from three years of water use records from Suffolk Downs. Therefore, the Proponent believes the estimates are accurate. An analysis was performed estimating water use and sewer discharges on an hourly basis (see Section 9.1).

BWSC 07 **Sterling Suffolk Racecourse, LLC should explore opportunities for implementing water conservation measures in addition to those required by the State Plumbing Code. In particular, Sterling Suffolk Racecourse, LLC should consider outdoor landscaping which requires minimal use of water to maintain. If Sterling Suffolk Racecourse, LLC plans to install in-ground sprinkler systems, the Commission recommends that timers, soil moisture indicators and rainfall sensors be installed. The use of sensor-operated faucets and toilets in common areas of buildings should be considered.**

Water conservation measures in addition to those required by the State Plumbing Code are planned, including rainwater harvesting (using rainwater for irrigation and other needs) and plumbing fixtures that use less water than the Code mandates (including sensor faucets, waterless urinals, and low-flow plumbing fixtures). Sections 4.4 and 4.5 describe method to minimize site irrigation as well as stormwater reuse for irrigation.

BWSC 08 **Sterling Suffolk Racecourse, LLC is required to obtain a Hydrant Permit for use of any hydrant during the construction phase of this project. The water used from the hydrant must be metered. Sterling Suffolk Racecourse, LLC should contact the Commission's Operations Division for information on and to obtain a Hydrant Permit.**

The Proponent acknowledges these requirements and will follow the necessary procedures.

BWSC 09 **In conjunction with the Site Plan and the General Service Application, Sterling Suffolk Racecourse, LLC will be required to submit a Stormwater Pollution Prevention Plan. The plan must:**

- **Identify BMPs for controlling erosion and for preventing the discharge of sediment and contaminated groundwater or stormwater runoff to the Commission's drainage system when the construction is underway;**
- **Include a site map which shows, at a minimum, existing drainage patterns and areas used for storage or treatment of contaminated soils, groundwater or stormwater, and the location of major control or treatment structures to be utilized during construction; and**
- **Provide a stormwater management plan in compliance with MassDEP standards mentioned above. The plan should include a description of the measures to control pollutants after construction is completed.**

Attachment F contains a drainage report with a draft SWPPP consistent with EPA NPDES requirements. The drainage summary also includes the locations of BMPs used on the site, existing and proposed drainage patterns, and a construction management plan. All stormwater management designs will comply with MassDEP Stormwater Management Guidelines (see Section 9.3).

BWSC 10 **Developers of projects involving disturbances of land of one acre or more will be required to obtain a NPDES General Permit for Construction from the EPA and MassDEP. Sterling Suffolk Racecourse, LLC is responsible for determining if such a permit is required and for obtaining the permit.**

The list of anticipated permits, reviews, and approvals includes a NPDES General Permit for Construction (see Table 3-1).

BWSC 11 **The Commission encourages Sterling Suffolk Racecourse, LLC to explore additional opportunities for protecting stormwater quality on site by minimizing sanding and the use of deicing chemicals, pesticides, and fertilizers.**

Sections 4.4 and 4.5 address the Proponent's intent to minimize use of chemical fertilizers.

BWSC 12 **The discharge of dewatering drainage to a sanitary sewer is prohibited by the Commission. Sterling Suffolk Racecourse, LLC is advised that the discharge of any dewatering drainage to the storm drainage system requires a Drainage Discharge Permit from the Commission.**

The Proponent acknowledges this requirement.

BWSC 13 **Sterling Suffolk Racecourse, LLC must fully investigate methods for retaining stormwater on-site before the Commission will consider a request to discharge stormwater to the Commission's system. The site plan should indicate how storm drainage from roof drains will be handled and the feasibility of retaining their stormwater discharge on-site. Under no circumstances will stormwater be allowed to discharge to a sanitary sewer.**

The Project will not discharge any stormwater to sanitary sewer lines. All stormwater generated from the site will be collected, retained, infiltrated, and reused using a combination of LID and conventional drainage techniques (see Section 9.3).

BWSC 14 **Sanitary Sewage must be kept separate from stormwater and separate sanitary sewer and storm drain service connections must be provided.**

Separate sanitary and storm drain services will be provided to the Resort.

BWSC 15 **The Commission requests that Sterling Suffolk Racecourse, LLC install a permanent casting stating "Don't Dump: Drains to Boston Harbor" next to any catch basin created or modified as part of this Project.**

The Proponent will comply with this request.

BWSC 16 **If a cafeteria or food service facility is built as part of this Project, grease traps will be required in accordance with the Commission's Sewer Use Regulations. Sterling Suffolk Racecourse, LLC is advised to consult with the Commission's Operations Department with regards to grease traps.**

Grease traps will be provided, per the plumbing code. The design team will consult with the BWSC's operations department on additional requirements, if any.

BWSC 17 The enclosed floors of a parking garage must drain through oil separators into the sewer system in accordance with the Commission's Sewer Use Regulations. The Commission's Requirements for Site Plans, available by contacting the Engineering Services Department, include requirements for separators.

The Project will provide separators, as required.

BWSC 18 The Commission requires installation of particle separators on all new parking lots greater than 7,500 square feet in size. If it is determined that it is not possible to infiltrate all of the runoff from the new parking lot, the Commission will require the installation of a particle separator or a standard Type 5 catch basin with an outlet tee for the parking lot. Specifications for particle separators are provided in the Commission's requirements for Site Plans.

Stormwater in the parking areas will be treated with a combination of traditional catch basins, particle separators, and LID BMPs. All catch basins and particle separators will comply with BWSC standards (see Section 9.3).

BWSC 19 The Commission requires that existing stormwater and sanitary sewer service connections, which are to be reused by the proposed Project, be dye-tested to confirm they are connected to the appropriate system.

The Resort will not include reuse of any sanitary or stormwater drains on site. All sanitary and storm drain systems for the Resort will be new.

DANIEL RIZZO
Mayor

The City of REVERE, MASSACHUSETTS

DEPARTMENT OF PLANNING AND COMMUNITY DEVELOPMENT
FRANK STRINGI • DIRECTOR
281 BROADWAY, REVERE, MA 02151

781-286-8181 Fax 781-286-8180

March 19, 2013

Secretary Richard Sullivan
Executive Office of Energy & Environmental Affairs
ATTN: MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114

RE: Environmental Notification Form – Caesars Resort at Suffolk Downs

Dear Secretary Sullivan:

The City of Revere Department of Planning and Community Development in coordination with the Mayor's Office have reviewed the above referenced Environmental Notification Form for the proposed Caesars Resort at Suffolk Downs and offer the following comments:

TRAFFIC

1. The analysis as prepared for the ENF is based on a 5-year growth horizon, with 2012 as the existing baseline, anticipating 2017 as the year of opening. This provides a MEPA level analysis, but does not provide an appropriate design level analysis. It is the City of Revere's opinion that analysis of traffic impacts should be done for a **20-year** horizon of growth from the year of opening. Also, the City requests that residual growth and any other specific developments will be considered as the analysis continues. **REV 01**

2. It is the City's opinion that the proponent's traffic consultant should further substantiate the use of a single site for trip generation purposes by providing further detail comparing the development characteristics of the Sugarhouse site in Philadelphia with the proposed project site. Also, will the enhancement of the horse racing facility cause an increase in trips not already considered within the existing racetrack volumes and Sugarhouse trip generation rate? **REV 02**

3. The proponent should further explain the use of an 18% mode share on carpool (HOV) and a 35% mode share for public transit. What will be the proponent's commitment towards implementation of the Transportation Demand Management Plan and ensure that such mode share splits would be achieved on the employee trips? **REV 03**

4. Proponent should provide further review, based on expected trip traffic, of adequacy of proposed onsite parking capacity. The City of Revere wants to be assured that parking for employees, track users, and casino users has been adequately considered and provided on site. **REV 04**

5. The City has a strong interest in providing appropriate bicycle and pedestrian routes to the site and needs to see improved pedestrian connections to the site from adjacent neighborhoods beyond the boundaries of the site. **REV 05**

6. The proponent should work closely with the MBTA on improving transit access within the site as a number of bus routes bypass the site along Revere Beach Parkway. **REV 06**

7. It should be defined how the traffic improvements proposed for the project tie into the more regional transportation improvements being proposed by MassDOT such as the widening of Route 1 from Copeland Circle to Route 99 including the Copeland Circle/Route 60 connection and Route 1 and Route 16 direct ramp connections, as well as the timing of these improvements. It is noted that the proponent has committed to Route 1/Route16 connections both northbound and southbound with new signalization and ramp widening as an intermediate improvement, as well as participating in right-of-way acquisition and design of a full, direct-access interchange from Route 16 to Route 1 northbound. **REV 07**

8. The Route 1A at Boardman Street flyover is integral to the project and removes the volume of traffic from the Boardman Street intersection, improving overall conditions there. It is the City's opinion that the proponent should review all elements of the Route 1A improvements, specifically the flyover structure for adequate intersection and stopping sight distance. The proponent should provide additional information about other concepts considered for Route 1A improvements/grade separation. This information should include at least a preliminary cost-benefit analysis of those options. **REV 08**

9. The Route 1A at Waldemar Avenue intersection is being proposed for signalization. The proponent should provide physical separation to prevent drivers from leaving Waldemar Avenue and attempting to cross 3-4 lanes of traffic to attempt a u-turn directly onto Route 1A southbound as this would create interference with through traffic to Route 1A northbound. Further, in the event there is congestion at the site drive or beyond in the northbound direction, traffic on the approach from Boardman Street or Route 1A northbound may experience congestion as the capacity between Waldemar Avenue and the site drive at Tomasello Drive fills with vehicles from the other approach. **REV 09**

10. The Route 1A/Tomasello Drive intersection is proposed as the sites main entrance. The proponent should further review the triple left turn movement required of vehicles exiting the facility and entering onto Route 1A southbound. Turning movements should be confirmed adequate for combinations of larger vehicles such as coach buses, shuttles, etc. **REV 10**

11. The proponent is committed to making improvements at the Route 1/Route 16 interchange by constructing interim geometric improvements and new signalization as presented in the ENF, as well as participating in ROW acquisition and design of a full, direct-access interchange for the Route 1 northbound approach at Route 16. It is the City's opinion that the proposed mitigation plan provides an improvement in traffic conditions at the interchange, at the Route 16/Garfield Avenue/Webster Avenue intersection, and the Route 60 corridor per the traffic analysis presented in the ENF.

12. The following intersections must be further analyzed for impact from the proposed project and shall include the following mitigation improvements: **REV 11**

Route 16/Revere Beach Parkway/Harris Street Intersection

- Design and implementation of optimal traffic signal timing and phasing at the Route 16/Revere Beach parkway/Harris Street intersection including split phasing.
- Provision of two exclusive right turn lanes eastbound onto Revere Beach Parkway.
- Implementation of pedestrian safety improvements to allow for pedestrian safe routes from Winthrop Avenue to Revere Beach Parkway in both eastbound and westbound directions including associated sidewalk reconstruction, curb ramps, crosswalks and median improvements.
- Installation of an emergency vehicle pre-emption system.

Donnelly Square **REV 12**

- The proponent's traffic consultant has not provided a complete analysis of the Donnelly Square area. The traffic study presents an analysis of the State Road/Bennington Street/Winthrop Avenue intersection only. The Bennington Street/Crescent Avenue intersection was not included in the analysis.
- The proponent should provide a detailed traffic and pedestrian circulation study of the Donnelly Square area. The limit of work for the Donnelly Square improvements should encompass the intersection of Endicott Avenue/State Road to the north, Everard Avenue/Bennington Street to the south, Washburn Avenue/Winthrop Avenue to the

west, and should also include the intersection of Winthrop Avenue/Bennington Street and Crescent Avenue/Bennington Street.

- The City has identified the following improvements within Donnelly Square: Design and implementation of an optimal traffic signal timing and phasing plan including split phasing for this intersection for the weekday morning, weekday evening, and Saturday midday peak periods; re-design intersection to channelize traffic flow on the intersection approaches; construct permanent pedestrian crosswalks with new ADA ramps at all crosswalks within the Donnelly Square area; widening of Winthrop Avenue west of Washburn Avenue to provide for the relocation of the MBTA bus stops in the eastbound and westbound lanes to accommodate bus turn-in lanes and provide for two lanes on Winthrop Avenue eastbound; aesthetic improvements including new pavement markings; landscaping improvements within the Square and along Winthrop Avenue to the site drive at Revere Beach Parkway and Tomasello Drive; and installation of an emergency vehicle pre-emption system.

North Shore Road/Revere Beach Parkway/Tomasello Drive Intersection **REV 13**

- The traffic analysis indicates LOS E and LOS F on the left turn movement exiting Tomasello Drive during the Friday P.M. and Saturday P.M. peak hour conditions respectively under build and mitigation. The proponent should address this issue and mitigate the deterioration in level of service.

- The City has identified the following improvements: design and implementation of optimal traffic signal timing at the intersection of North Shore Road and Revere Beach Parkway including split phasing to accommodate increased traffic movements associated with the resort casino; evaluation of alternatives for the provision of an exclusive right hand turning lane into the Tomasello site drive; pedestrian safety measures at the intersection and along Revere Beach Parkway including traffic median improvements and potential realignment; and the installation of an emergency vehicle pre-emption system.

Mahoney Circle **REV 14**

- Design and implementation of a comprehensive upgrade of the signs within Mahoney Circle consistent with the MUTCD standards to improve pedestrian guidance and safety.

- Installation of ADA accessible ramps and associated sidewalk and median upgrade improvements within and around the circle.

- Implement channelization and signalization improvements in coordination with MassDOT.

- Design and implementation of a comprehensive upgrade of the signs and pavement markings approaching and within Mahoney Circle consistent with the MUTCD standards to improve motorist guidance and safety.

- Upgrade the traffic islands within the circle to include new curbing and landscaping.

- Installation of an emergency vehicle pre-emption system.

Brown Circle **REV 15**

- Design and implementation of a comprehensive upgrade of the signs within Brown Circle consistent with the MUTCD standards to improve pedestrian guidance and safety.

- Installation of ADA accessible ramps.

- Design and implementation of channelization and signalization improvements in coordination with MassDOT including new pavement and directional markings and channelization islands at the Route 107 northbound approach to the circle.

- Design and implementation of a comprehensive upgrade of the signs and pavement markings approaching and within Mahoney Circle consistent with the MUTCD standards to improve motorist guidance and safety.

- Geometric and channelization improvements by extending existing islands and installing new islands to facilitate traffic flow in a safe manner.

Route 60/Revere Street Intersection **REV 16**

- The Lower North Shore Transportation Improvement Study identifies a recommended improvement for the Route 60/Revere Street intersection. This improvement should be further discussed with MassDOT relative to a timeline for its implementation. The proponent should present additional analysis to determine if the recommended improvement plan would address operational issues with the project generated traffic in place.

- Design and implementation of an optimal signal timing and phasing plan.

- Implement pedestrian safety improvements including new crosswalks and ADA accessible ramps with associated sidewalk reconstruction.

- Installation of an emergency vehicle pre-emption system.

Copeland Circle/Route 1 Improvements **REV 17**

- The Lower North Shore Transportation Improvement Study identifies a recommended improvement for the Copeland Circle intersection. This improvement should be further discussed with MassDOT relative to a timeline for its implementation by MassDOT. The proponent should present additional analysis to determine if the recommended improvement plan would address operational issues with the project generated traffic.

13. In addition to the aforementioned traffic improvements recommended by the City, the City will rely upon MassDOT to identify appropriate scope and study elements on State-owned roadways through the MEPA process to include: appropriate study of potentially affected intersections, appropriate study of alternatives, 20-year growth horizon, reasonable mitigation efforts and follow up. **REV 18**

14. The City is requesting that the MEPA process clearly define scope and schedule of proposed traffic mitigation and improvements as well as who will be responsible for the funding and implementation. **REV 19**

ENVIRONMENT

1. The cumulative induced traffic impacts of the proposed project in an already congested ozone nonattainment area could be significant. Therefore, a detailed analysis of the associated effects on local air quality should be included in the DEIR. **REV 20**

2. A traffic management plan should be outlined in the DEIR regarding the management of existing pedestrian and traffic operations during construction activities both on site and off site. **REV 21**

3. The landscaping and streetscape improvements along the Revere Beach Parkway and Winthrop Avenue border of the site should be further defined in the DEIR along with a more detailed plan for streetscape improvements within the Donnelly Square area. **REV 22**

4. Sales Creek and Green Creek are major stormwater drainage collectors for the City of Revere and dissect the Suffolk Downs property with discharge into the Belle Isle Marsh ACEC. It is important that the DEIR outline a stormwater management plan and pollutant abatement measures to be undertaken within the Suffolk Downs property and proposed parking areas. It is also recommended that a maintenance plan be provided in the DEIR that ensures the design flow capacity of these creeks and downstream drainage system, including the prevention of silt and sand from entering these drainage channels from both the parking lot areas and track infield. **REV 23**

5. The DEIR should summarize the impacts on the City of Revere water, sewer and drainage system that may arise as a result of the full build out of the project including any planned improvements proposed for the parking lot and stable area located in Revere and the DEIR should describe how those impacts will be mitigated. **REV 24**

6. The DEIR should detail how post construction solid waste management and recycling will be handled as well as the abatement of asbestos and lead paint. **REV 25**

7. The ENF mentions that onsite storage of hazardous materials or toxic chemicals during construction will be limited to what is absolutely necessary. The proponent should discuss the nature of these materials in the DEIR and the manner in which they will be removed as well as spill prevention and control procedures, especially for construction equipment and vehicles. **REV 26**

8. The DEIR should address the appropriate removal of hazardous soils within the site and describe in detail an erosion control and sedimentation control plan for the proposed parking lot areas adjacent to Sales Creek and tributary drainage ditches during construction. **REV 27**

Respectfully,

Frank Stringi

Frank Stringi
DPCD Director

C: Mayor Dan Rizzo
Revere City Council
John Festa, Economic Development Director

CITY OF REVERE (REV)

REV 01 **The [transportation] analysis as prepared for the ENF is based on a 5-year growth horizon, with 2012 as the existing baseline, anticipating 2017 as the year of opening. This provides a MEPA-level analysis, but does not provide an appropriate design level analysis. It is the City of Revere's opinion that analysis of traffic impacts should be done for a 20-year horizon of growth from the year of opening. Also, the City requests that residential growth and any other specific developments will be considered as the analysis continues.**

The DEIR/EPNF traffic analysis horizon year is 2022. For Route 1A infrastructure improvement alternatives, a design year 2032 analysis is included. Both of these dates have been requested by MassDOT. In addition to regional growth, specific developments as requested by the cities of Revere and Boston have been considered in the future year projections.

REV 02 **It is the City's opinion that the Proponent's traffic consultant should further substantiate the use of a single site for trip generation purposes by providing further detail comparing the development characteristics of the Sugarhouse site in Philadelphia with the proposed Project site. Also, will the enhancement of the horse racing facility cause an increase in trips not already considered within the existing racetrack volumes and Sugarhouse trip generation rate?**

The trip generation analysis in Section 5.4 is based on extensive research of proprietary data, other studies, and actual counts performed by the Proponent at comparable locations, two of which include racetracks.

REV 03 **The Proponent should further explain the use of an 18% mode share on carpool (HOV) and a 35% mode share for public transit. What will be the Proponent's commitment towards implementation of the TDM plan to ensure that such mode share splits would be achieved on the employee trips?**

The derivation of mode shares is described in detail in Section 5.4.5. The Proponent is committed to a comprehensive TDM plan, presented in Section 5.9, which includes monitoring elements.

REV 04 **The Proponent should provide further review, based on expected trip traffic, of adequacy of proposed onsite parking capacity. The City of Revere wants to be assured that parking for employees, track users, and casino users has been adequately considered and provided on site.**

The parking analysis is presented in Section 5.10.

REV 05 **The City has a strong interest in providing appropriate bicycle and pedestrian routes to the site and needs to see improved pedestrian connections to the site from adjacent neighborhoods beyond the boundaries of the site.**

The Proponent has committed to roadway and safety improvements in the City of Revere HCA, many of which include bicycle and pedestrian enhancements both remote from and close to the Project site.

REV 06 **The Proponent should work closely with the MBTA on improving transit access within the site as a number of bus routes bypass the site along Revere Beach Parkway.**

The Proponent has committed to provide an MBTA bus stop on the Project site, should the MBTA wish to route bus service through the site.

REV 07 **It should be defined how the traffic improvements proposed for the Project tie into the more regional transportation improvements being proposed by MassDOT such as the widening of Route 1 from Copeland Circle to Route 99 including the Copeland Circle/Route 60 connection and Route 1 and Route 16 direct ramp connections, as well as the timing of these improvements.**

The roadway and traffic improvements committed to in the City of Revere HCA are consistent with regional improvements planned or being considered by MassDOT.

REV 08 **The Route 1A at Boardman Street flyover is integral to the Project and removes the volume of traffic from the Boardman Street intersection, improving overall conditions there. It is the City's opinion that the Proponent should review all elements of the Route 1A improvements, specifically the flyover structure, for adequate intersection and stopping sight distance. The Proponent should provide additional information about other concepts considered for Route 1A improvements/grade separation. This information should include at least a preliminary cost-benefit analysis of those options.**

An alternatives analysis of options for the Route 1A improvements is presented in Section 5.5. Design development of any concept will comply with all appropriate MassDOT design standards.

REV 09 **The Route 1A at Waldemar Avenue intersection is being proposed for signalization. The Proponent should provide physical separation to prevent drivers from leaving Waldemar Avenue and attempting to cross 3-4 lanes of traffic to attempt a U-turn directly onto Route 1A southbound, as this would create interference with through-traffic to Route 1A northbound. Further, in the event there is congestion at the site drive or beyond in the northbound direction, traffic on the approach from**

Boardman Street or Route 1A northbound may experience congestion as the capacity between Waldemar Avenue and the site drive at Tomasello Drive fills with vehicles from the other approach.

The physical prevention of U turns on Route 1A from Waldemar Avenue can be accommodated in the design. The analysis presented in Section 5.5 indicates that the section between Boardman Street, Waldemar Avenue, and Tomasello Drive will have adequate capacity.

REV 10 The Route 1A/Tomasello Drive intersection is proposed as the site's main entrance. The Proponent should further review the triple left-turn movement required of vehicles exiting the facility and entering onto Route 1A southbound. Turning movements should be confirmed adequate for combinations of larger vehicles such as coach buses, shuttles, etc.

This issue will be addressed in the design development of the concept plan in coordination with MassDOT. The Project driveway will be designed to accommodate large vehicles.

REV 11 [Route 16/Revere Beach Parkway/Harris Street intersection] must be further analyzed for impact from the proposed Project and shall include the following mitigation improvements:

- Design and implementation of optimal traffic signal timing and phasing... including split phasing.
- Provision of two exclusive right turn lanes eastbound onto Revere Beach Parkway.
- Implementation of pedestrian safety improvements to allow for pedestrian safe routes from Winthrop Avenue to Revere Beach Parkway in both eastbound and westbound directions including associated sidewalk reconstruction, curb ramps, crosswalks and median improvements.
- Installation of an emergency vehicle pre-emption system.

Improvements at this location are included in the City of Revere HCA (see Section 5.6).

REV 12 [Donnelly Square] must be further analyzed for impact from the proposed Project and shall include the following mitigation improvements:

- The Proponent's traffic consultant has not provided a complete analysis of the Donnelly Square area. The traffic study presents an analysis of the State Road/Bennington Street/Winthrop Avenue intersection only. The Bennington Street/Crescent Avenue intersection was not included in the analysis.

- The Proponent should provide a detailed traffic and pedestrian circulation study of the Donnelly Square area. The limit of work for the Donnelly Square improvements should encompass the intersection of Endicott Avenue/State Road to the north, Everard Avenue/Bennington Street to the south, Washburn Avenue/Winthrop Avenue to the west, and should also include the intersection of Winthrop Avenue/Bennington Street and Crescent Avenue/Bennington Street.
- The City has identified the following improvements within Donnelly Square: Design and implementation of an optimal traffic signal timing and phasing plan, including split phasing for this intersection for the weekday morning, weekday evening, and Saturday midday peak periods; re-design intersection to channelize traffic flow on the intersection approaches; construct permanent pedestrian crosswalks with new ADA ramps at all crosswalks within the Donnelly Square area; widening of Winthrop Avenue west of Washburn Avenue to provide for the relocation of the MBTA bus stops in the eastbound and westbound lanes to accommodate bus turn-in lanes and provide for two lanes on Winthrop Avenue eastbound; aesthetic improvements including new pavement markings; landscaping improvements within the Square and along Winthrop Avenue to the site drive at Revere Beach Parkway and Tomasello Drive; and installation of an emergency vehicle pre-emption system.

The Crescent Avenue intersection has been included in the traffic analysis presented in Section 5.7. Improvements at Donnelly Square and on Winthrop Avenue are included in the City of Revere HCA (see Section 5.6).

REV 13 [North Shore Road/Revere Beach Parkway/Tomasello Drive intersection] must be further analyzed for impact from the proposed Project and shall include the following mitigation improvements:

- The traffic analysis indicates LOS E and LOS F on the left turn movement exiting Tomasello Drive during the Friday PM and Saturday PM peak hour conditions, respectively, under build and mitigation. The Proponent should address this issue and mitigate the deterioration in level of service.
- The City has identified the following improvements: design and implementation of optimal traffic signal timing at the intersection of North Shore Road and Revere Beach Parkway including split phasing to accommodate increased traffic movements associated with the resort casino; evaluation of alternatives for the provision of an exclusive right hand turning lane into the Tomasello site drive; pedestrian safety measures at the intersection and along Revere Beach Parkway, including traffic median improvements and potential realignment; and the installation of an emergency vehicle pre-emption system.

Improvements at Tomasello Drive and North Shore Road are included in the City of Revere HCA (see Section 5.6).

REV 14 [Mahoney Circle] must be further analyzed for impact from the proposed Project and shall include the following mitigation improvements:

- Design and implementation of a comprehensive upgrade of the signs within Mahoney Circle consistent with the MUTCD standards to improve pedestrian guidance and safety.
- Installation of ADA accessible ramps and associated sidewalk and median upgrade improvements within and around the circle.
- Implement channelization and signalization improvements in coordination with MassDOT.
- Design and implementation of a comprehensive upgrade of the signs and pavement markings approaching and within Mahoney Circle consistent with the MUTCD standards to improve motorist guidance and safety.
- Upgrade the traffic islands within the circle to include new curbing and landscaping.
- Installation of an emergency vehicle pre-emption system.

Improvements at Mahoney Circle are included in the City of Revere HCA (see Section 5.6).

REV 15 [Brown Circle] must be further analyzed for impact from the proposed Project and shall include the following mitigation improvements:

- Design and implementation of a comprehensive upgrade of the signs within Brown Circle consistent with the MUTCD standards to improve pedestrian guidance and safety.
- Installation of ADA accessible ramps.
- Design and implementation of channelization and signalization improvements in coordination with MassDOT including new pavement and directional markings and channelization islands at the Route 107 northbound approach to the circle.
- Design and implementation of a comprehensive upgrade of the signs and pavement markings approaching and within Mahoney Circle consistent with the MUTCD standards to improve motorist guidance and safety.
- Geometric and channelization improvements by extending existing islands and installing new islands to facilitate traffic flow in a safe manner.

Improvements at Brown Circle are included in the City of Revere HCA (see Section 5.6).

REV 16 [Route 60/Revere Street Intersection] must be further analyzed for impact from the proposed Project and shall include the following mitigation improvements:

- The Lower North Shore Transportation Improvement Study identifies a recommended improvement for the Route 60/Revere Street intersection. This improvement should be further discussed with MassDOT relative to a timeline for its implementation. The Proponent should present additional analysis to determine if the recommended improvement plan would address operational issues with the Project-generated traffic in place.
- Design and implementation of an optimal signal timing and phasing plan.
- Implement pedestrian safety improvements including new crosswalks and ADA accessible ramps with associated sidewalk reconstruction.
- Installation of an emergency vehicle pre-emption system.

Improvements at the Revere Street/Route 60 intersection are included in the City of Revere HCA (see Section 5.6).

REV 17 [Copeland Circle/Route 1 improvements] must be further analyzed for impact from the proposed Project and shall include the following mitigation improvements:

- The Lower North Shore Transportation Improvement Study identifies a recommended improvement for the Copeland Circle intersection. This improvement should be further discussed with MassDOT relative to a timeline for its implementation by MassDOT. The Proponent should present additional analysis to determine if the recommended improvement plan would address operational issues with the Project-generated traffic.

An analysis of Project impacts at Copeland Circle is presented in Section 5.7.

REV 18 In addition to the aforementioned traffic improvements recommended by the City, the City will rely upon MassDOT to identify appropriate scope and study elements on State-owned roadways through the MEPA process to include: appropriate study of potentially affected intersections, appropriate study of alternatives, 20-year growth horizon, reasonable mitigation efforts and follow up.

The DEIR/EPNF analysis is responsive to MassDOT's comments on the ENF, and the study area includes all additional locations requested by MassDOT, MBTA, and the cities of Revere and Boston.

REV 19 **The City is requesting that the MEPA process clearly define scope and schedule of proposed traffic mitigation and improvements as well as who will be responsible for the funding and implementation.**

Section 10.0 includes proposed Section 61 Findings intended to define the scope, schedule, and responsibilities for the proposed traffic and roadway improvements based on the HCA.

REV 20 **The cumulative induced traffic impacts of the proposed Project in an already-congested ozone non-attainment area could be significant. Therefore, a detailed analysis of the associated effects on local air quality should be included in the DEIR.**

The methodology and results of the mesoscale analysis are presented in Sections 6.5.4.1 and 6.5.5.1, respectively. The methodology and results of the microscale analysis are presented in Sections 6.5.4.2 and 6.5.5.2, respectively.

REV 21 **A traffic management plan should be outlined in the DEIR regarding the management of existing pedestrian and traffic operations during construction activities both on site and off site.**

The Draft CMP in Attachment L describes construction-period management, including traffic management and pedestrian access.

REV 22 **The landscaping and streetscape improvements along the Revere Beach Parkway and Winthrop Avenue border of the site should be further defined in the DEIR along with a more detailed plan for streetscape improvements within the Donnelly Square area.**

Section 4.3.6 describes the Winthrop Avenue streetscape design. Improvements at Donnelly Square are included in the City of Revere HCA (see Section 5.6).

REV 23 **Sales Creek and Green Creek are major stormwater drainage collectors for the City of Revere and dissect the Suffolk Downs property with discharge into the Belle Isle Marsh ACEC. It is important that the DEIR outline a stormwater management plan and pollutant abatement measures to be undertaken within the Suffolk Downs property and proposed parking areas. It is also recommended that a maintenance plan be provided in the DEIR that ensures the design flow capacity of these creeks and downstream drainage system, including the prevention of silt and sand from entering these drainage channels from both the parking lot areas and track infield.**

The Project will significantly improve stormwater management relative to the existing system, and stormwater in the parking areas will be treated with a combination of traditional catch basins, particle separators, and LID BMPs consistent with BWSC standards and the State Stormwater Guidelines (see Section 9.3).

REV 24 **The DEIR should summarize the impacts on the City of Revere water, sewer, and drainage system that may arise as a result of the full build out of the Project including any planned improvements proposed for the parking lot and stable area located in Revere and the DEIR should describe how those impacts will be mitigated.**

The Project will have minimal impacts to Revere's water, sewer, and drain systems, as Resort buildings will be serviced by the City of Boston. All stormwater will be collected, treated, and discharged to Sales Creek or to wetland systems draining to Sales Creek, improving the performance of that drainage feature, which services various Revere neighborhoods. Section 9.0 contains discussions of the Resort's wastewater, water supply, and stormwater management systems.

REV 25 **The DEIR should detail how post construction solid waste management and recycling will be handled as well as the abatement of asbestos and lead paint.**

Materials handling, including asbestos-containing materials and lead-based paint, is addressed in the Draft CMP in Attachment L.

REV 26 **The ENF mentions that onsite storage of hazardous materials or toxic chemicals during construction will be limited to what is absolutely necessary. The Proponent should discuss the nature of these materials in the DEIR and the manner in which they will be removed as well as spill prevention and control procedures, especially for construction equipment and vehicles.**

A draft spill response plan, predominantly governing refueling activities, is provided in the Draft CMP in Attachment L. It is not anticipated that any significant volumes of hazardous materials or toxic chemicals will be stored on-site during construction; however, if small quantities of such materials storage becomes necessary, the contractor will obtain all required approvals.

REV 27 **The DEIR should address the appropriate removal of hazardous soils within the site and describe in detail an erosion control and sedimentation control plan for the proposed parking lot areas adjacent to Sales Creek and tributary drainage ditches during construction.**

It is the Proponent's intent to keep and re-use excavated materials on-site. Excavated soils will be stockpiled and managed in accordance with typical practice (i.e., segregation, stockpiling) as well as applicable regulations and legal requirements. If hazardous soil materials are encountered on site that cannot be reused, they will be handled, transported and disposed of in accordance with all state and federal requirements. A draft SWPPP has been included along with a

drainage report (see Attachment F). The draft SWPPP was prepared in compliance with the U.S. EPA NPDES program and, along with the Erosion and Sedimentation Control Plans, describe erosion and sedimentation protection for the Project. The SWPPP will be further refined as design progresses.

COMMONWEALTH OF MASSACHUSETTS
THE GENERAL COURT
STATE HOUSE, BOSTON 02133-1053

March 20, 2013

Executive Office of Energy and Environmental Affairs
MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114

To Whom It May Concern:

The proposed resort casino at Suffolk Downs is the most important land use decision for East Boston and Revere since the expansion of Logan Airport in the 1960's and 1970's. Residents of these host communities will be voting as to whether or not they support the Caesars Resort at Suffolk Downs in the near future. As such, it is imperative to provide a great amount of detail and clarity in every aspect of the proposal. To do so ensures that the citizens of East Boston and Revere make a well-informed decision when they vote in the referendum. It is in this spirit that we ask for a number of items included in the Early Notification Form ("ENF") to be expanded upon in the Draft Environmental Impact Report ("DEIR").

Suffolk Downs has proposed a series of transportation infrastructure improvements, most notably the "Boardman Street Flyover" and a connection onto Route 1 North via Route 16 West. While these are improvements that we strongly support, questions still remain as to what the proposals will mean for host communities. For example, how will the weekday morning and evening commutes change? Will the proposed "Boardman Street Flyover" make the morning drive to the Harbor Tunnels less time-consuming for East Boston and Winthrop residents? How will the proposed Route 1 North Connection on Route 16 impact the northbound commute through Revere? Will the proposed widening of Route 1A South improve the southbound morning commute on Route 1A for Revere residents? **PBL 01**

These are just a few questions that the current ENF leaves unanswered. To help residents more fully understand and appreciate the new roads, greater specificity regarding the traffic count analysis, as well as a three-dimensional or digital model depicting the proposed improvements, are necessary in the DEIR. **PBL 02**

Additionally, the proposed development will have buildings as high as 165 feet. With residential properties nearby, the DEIR must include a detailed shadow analysis for the surrounding neighborhoods. PBL 03

Finally, the applicant concludes on page seven of the ENF that "environmental impacts from the Project will be less than the impacts of any reasonably-sized development alternative at the site." While we believe that to be the case, it is incumbent upon the applicant to convince residents that a resort casino is the better alternative to the other potential developments; namely by explaining in greater detail how that conclusion was reached. The DEIR should also include examples beyond the mixed-use development currently referenced in a one page summary in the ENF. PBL 04

We have expressed conditioned support for the project in the past, pending both a more fulsome analysis of the public benefits in the ENF, as well as the benefits that will be part of the proponent's Host and Surrounding Community Agreements.

Thank you for your consideration and if you should have questions, please do not hesitate to contact us.

Sincerely,

ANTHONY PETRUCCELLI
State Senator

CARLO BASILE
State Representative

SALVATORE LaMATTINA
Boston City Councilor

STATE SENATOR PETRUCCELLI; STATE REPRESENTATIVE BASILE; BOSTON CITY COUNCILOR LAMATTINA

PBL 01 **Suffolk Downs has proposed a series of transportation infrastructure improvements, most notably the "Boardman Street Flyover" and a connection onto Route 1 North via Route 16 West. While these are improvements that we strongly support, questions still remain as to what the proposals will mean for host communities. For example, how will the weekday morning and evening commutes change? Will the proposed "Boardman Street Flyover" make the morning drive to the Harbor Tunnels less time-consuming for East Boston and Winthrop residents? How will the proposed Route 1 North connection on Route 16 impact the northbound commute through Revere? Will the proposed widening of Route 1A South improve the southbound morning commute on Route 1A for Revere residents?**

A detailed traffic operations analysis is presented in Section 5.5 for the proposed Route 1A infrastructure improvement alternatives and in Section 5.7 for all other study area locations.

PBL 02 **To help residents more fully understand and appreciate the new roads, greater specificity regarding the traffic count analysis, as well as a three-dimensional or digital model depicting the proposed improvements, are necessary in the DEIR.**

A detailed traffic operations analysis is presented in Section 5.5 for the Route 1A infrastructure improvement alternatives. A three-dimensional model of the flyover solution (Option 4) advocated by the Proponent for the community was displayed at a series of community open houses hosted by the Proponent at Suffolk Downs and other locations in East Boston and Revere during the spring 2013.

PBL 03 **With residential properties nearby, the DEIR must include a detailed shadow analysis for the surrounding neighborhoods.**

A comprehensive shadow analysis is provided in Section 6.2.

PBL 04 **The applicant concludes on page seven of the ENF that "environmental impacts from the Project will be less than the impacts of any reasonably-sized development alternative at the site." While we believe that to be the case, it is incumbent upon the applicant to convince residents that a resort casino is the better alternative to the other potential developments, namely by explaining in greater detail how that conclusion was reached. The DEIR should also include examples beyond the mixed-use development currently referenced in a one page summary in the ENF.**

Section 1.9 evaluates alternative development options for the Project site. These options include two mixed use alternatives that would contain a mix of retail, office, and residential uses.

City of Malden
Massachusetts

Gary Christenson, Mayor
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March 25, 2013

Secretary Richard K. Sullivan
Executive Office of Energy & Environmental Affairs
Attn: MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114

RE: Environmental Notification Form—Caesars Resort at Suffolk Downs

Dear Secretary Sullivan:

On behalf of the City of Malden, I appreciate this opportunity to make public comment on the Environmental Notification Form (ENF) filed by Caesars Resort at Suffolk Downs.

Of particular concern to Malden, at this point in the process, is the ultimate traffic mitigation plan that will be developed in conjunction with this major redevelopment proposal. While the proponent acknowledges in the ENF that it will need to undertake a full-blown analysis of traffic issues both in the area proximate to the redevelopment site as well as in the region, I would strongly suggest that any traffic plan that is developed should take into account and incorporate the long-needed improvements to both the Route One Corridor and to Wellington Circle. **MLD 01**

The Route One Transportation Improvement Project (Malden, Revere and Saugus) as well as the need to make significant improvements to Wellington Circle to unlock the redevelopment potential in this area have been high priority projects on the Commonwealth of Massachusetts Transportation Improvement Plan (TIP) for many years. As a surrounding community, Malden supports prudent redevelopment, but believes that these two high priority highway projects cannot be overlooked by the developer or the Commonwealth when the time comes to undertake the more extensive traffic mitigation study. Not only would these highway improvement projects improve the flow of traffic in these areas, but they would also eliminate a lot of traffic congestion that occurs even today in Malden's residential neighborhoods that abut portions of these highway corridors. **MLD 02**

If you would like to address Malden's concerns in greater detail, I can be reached at 781-397-7000, ext. 2000 or by email at mayor@cityofmalden.org.

Sincerely,

GARY CHRISTENSON
Mayor

MAYOR CHRISTENSON, MALDEN

MLD 01 **I would strongly suggest that any traffic plan that is developed should take into account and incorporate the long-needed improvements to both the Route 1 Corridor and to Wellington Circle.**

The traffic analysis performed for the DEIR/EPNF and presented in Section 5.7 does not identify significant Project impacts in the Route 1 Corridor or at Wellington Circle. However, the Proponent has proposed improvements at the Route 1/Route 16 interchange to assist in regional traffic movements and is supportive any improvements planned or under consideration for Route 1 and for Wellington Circle by the Commonwealth. The proposed improvements for Route 1 and Route 16 are consistent with future plans in the Copeland Circle area.

MLD 02 **Malden supports prudent redevelopment, but believes that [the Route One Transportation Improvement Project (Malden, Revere and Saugus) as well as the need to make significant improvements to Wellington Circle] cannot be overlooked by the developer or the Commonwealth when the time comes to undertake the more extensive traffic mitigation study.**

Please see the response to MLD 01.

HOST COMMUNITY ADVISORY COMMITTEE

City Hall, Room 615 Boston MA 02201

HCAC

Brian Leary, *Chairman*
Sarah Barnat
Lisa Calise
David Fubini
Ronald L. Walker II

March 20, 2013

Dear East Boston Community:

The Host Community Advisory Committee would like to share with you some of the City's assessments and recommendations of the environmental review of the proposed development at Suffolk Downs. In January Suffolk Downs submitted an Environmental Notification Form to the state. This is an important step in the process of reviewing the development, and ensuring that the development works for the community. The City has assembled a specialized team of City officials, independent consultants and subject matter experts to review this filing and the overall development. Included below are a series of requests and recommendations related to the environmental filing that the City is analyzing. We encourage the state to also consider them in its environmental review process.

The City and the community agree that traffic and transportation are a priority. With that in mind, the City is applying the highest standards to the developer's transportation plans, and asks that state do the same. The City has requested, and we recommend that the state also request from the developer:

- A detailed impact assessment and recommendations to protect the community from any potential impact; **HCAC 01**
- A detailed analysis of vehicular, pedestrian, bicycle and boat access connections to the site; **HCAC 02**
- An analysis on the MBTA, including availability of service and station improvements; **HCAC 03**
- An overall comprehensive parking study; and **HCAC 04**
- A detailed construction management and demand management plan. **HCAC 05**

As a leader in environmental sustainability and energy efficiency, the City is encouraged by Suffolk Downs' pledge for a particularly green development, including new plans to reduced pavement by 30% and transform current asphalt in to natural landscape. At the same time, the City has very high environmental standards. Therefore, the City asks that the state also request from the developer environmental material and studies in many areas, including the following:

- Detailed consideration of energy and water conservation and alternative energy measures; **HCAC 06**
- Use of sustainable building materials; **HCAC 07**
- Detailed evaluation of local and regional air quality impacts, and information on soil and hazardous materials; **HCAC 08**
- Information on stormwater management, sea level rise, and storm surge preparedness. **HCAC 09**
- In all of these areas, the City suggests that the developer consider impacts for the construction period as well as future effects.

Finally, we want to reiterate that the City's critique of the Environmental Notification Form is one of many reviews of the overall development, all of which are improved by community engagement and feedback. We look forward to continuing to work with the community and the state throughout this process.

Sincerely,

Elizabeth Dello Russo, Esquire
Executive Director, Host Community Advisory Committee

HOST COMMUNITY ADVISORY COMMITTEE

HCAC 01 **[We recommend that the state also request] a detailed impact assessment and recommendations to protect the community from any potential impact.**

This document is a comprehensive analysis of potential Project impacts and mitigation measures proposed to avoid and minimize those impacts.

HCAC 02 **[We recommend that the state also request] a detailed analysis of vehicular, pedestrian, bicycle and boat access connections to the site;**

Section 5.0 includes detailed analysis of vehicular, pedestrian and bicycle access to the Project site. Attachment C contains a water transportation analysis.

HCAC 03 **[We recommend that the state also request] an analysis on the MBTA, including availability of service and station improvements.**

Sections 5.2.1 and 5.8.1 include analyses of MBTA service and operations for existing and Build conditions, respectively.

HCAC 04 **[We recommend that the state also request] an overall comprehensive parking study.**

A parking study for the Project is presented in Section 5.10.

HCAC 05 **[We recommend that the state also request] a detailed construction management and demand management plan.**

The Draft CMP in Attachment L addresses construction-period activities.

HCAC 06 **[The City asks that the state also request, for construction period and future effects,] detailed consideration of energy and water conservation and alternative energy measures.**

Water conservation measures incorporated into the Project design are identified in Section 9.2.3, and alternative energy measures are described in Section 9.5.

HCAC 07 **[The City asks that the state also request] use of sustainable building materials.**

Section 2.0 describes the Project's sustainable design.

HCAC 08 **[The City asks that the state also request, for construction period and future effects,] detailed evaluation of local and regional air quality impacts, and information on soil and hazardous materials.**

Construction-period air quality considerations and handling of soils and materials are described in the Draft CMP in Attachment L. An air quality analysis based on Project design is provided in Section 6.5.

HCAC 09 **[The City asks that the state also request, for construction period and future effects,] information on stormwater management, sea level rise, and storm surge preparedness.**

Section 2.3 contains a discussion of climate change and adaptation; Section 9.3 describes proposed stormwater management.

Sent: Thursday, March 21, 2013 9:36 AM
To: Buckley, Deirdre (EEA)
Subject: EEA No.15006.

Dear Ms. Buckley,

I am writing to express my concerns regarding the environmental impact of the proposed casino at Suffolk Downs. I have been a resident of the Eagle Hill neighborhood of East Boston for over ten years, and despite its flaws, like persistent litter and the lack of real political leadership to address what matters most to residents, I really love this neighborhood and am committed to protecting the values that set us apart and make East Boston such a great place to live.

I strongly believe that locating a predatory gambling establishment in a residential, densely populated working class neighborhood is a very bad idea.

Some of my major concerns include:

- Increased traffic and related pollution **ANT 01**
- Increased crime
- Increased drug use and alcoholism
- Increased foreclosures due to problem gamblers
- Lower property values
- Higher insurance rates
- Fewer local businesses that do not support the casino interests

Repeated studies have demonstrated all of these negative effects on neighborhoods that house casinos and I don't think any amount of mitigation can justify bringing this into our community. East Boston already has to deal with a large airport and two tunnels. It is a bad idea that should be stopped.

I can understand why casino owners want to develop Suffolk Downs into a casino – they stand to make a killing off the backs of the working poor. But I think it's really irresponsible that the elected officials in the Commonwealth support this idea on the basis on the creation of low wage jobs, with full knowledge of all the negative effects expanded gambling will bring.

Thank you for your time.

Sincerely,
John Antonellis, Lead Instructor
Harvard Bridge Program, Center for Workplace Development
124 Mount Auburn Street, 3rd Floor
Cambridge, MA 02138
john_antonellis@harvard.edu
617-384-7627 Phone

ANTONELLIS, JOHN

ANT 01 Some of my concerns include:

- Increased traffic and related pollution;
- Increased crime;
- Increased drug use and alcoholism;
- Increased foreclosures due to problem gamblers;
- Lower property values;
- Higher insurance rates; and
- Fewer local businesses that do not support the casino interests.

The Expanded Gaming Act requires applicants for a gaming license to prepare and submit studies regarding the impacts of casino development. As part of the Host Community Agreement negotiations for the Project, the City of Boston asked the Proponent to advance the timeline for these required studies and, in July and August of 2012, the Proponent provided the City with several studies responsive to these requests. These independent, third-party studies prepared at the Proponent's expense address the impacts of a potential casino development on insurance and property values, as well as the social impacts such as crime, addiction, and problem gaming.

DB

LOIS A. BAXTER
17 CIRCUIT ROAD
WINTHROP, MA 02152
LAB2403@VERIZON.NET

RECEIVED
MAR 18 2013
MEPA

March 7, 2013

Richard Sullivan, Secretary
Executive Office of Energy and Environmental Affairs
Attention: Deirdre Buckley, MEPA Unit
100 Cambridge Street
Boston, MA 02114

Re: EEA # 15006
Caesars Resort at Suffolk Downs Project
Environmental Notification Form (ENF)

Dear Ms. Buckley:

I am writing as a life-long resident of Winthrop, MA. As I am not opposed to a Casino at Suffolk Downs as it will help our economy and bring jobs hopefully to the surrounding communities; however, I have serious reservations about the traffic problem at the intersection of Route 1A/Boardman Street.

As I write this comment letter today (during the snow storm), traffic leaving Winthrop today was horrendous. Winthrop has two ways out of town, through East Boston or Revere. The Revere exit was closed due to the major flooding on the Winthrop/Revere Parkway. It took the residents of Winthrop over one hour to get as far as Orient Heights in East Boston (which on a good day is probably a five-minute commute) because no one thought to have a police detail at the intersection of Pleasant and Main Street in Winthrop or a Boston Police Officer or State Police Officer at Orient Heights to help with the traffic nightmare during the morning rush hour.

However, the real traffic problem for Winthrop and East Boston residents is the Route 1A/Boardman Street intersection where traffic can back up. Winthrop residents have been complaining for years about this traffic problem but no one does anything or seems to care. MassPort pays for a State Police Detail at this intersection but he causes ***MAJOR TRAFFIC*** problems because he just sits in his car and lets all the traffic run on Route 1A and forgets about the Boardman Street traffic. (I recently sat in traffic on Boardman Street for over 10 minutes before he changed the light for Boardman Street.) BAX 01

Therefore, if the Casino were to be built and Winthrop residents have only one way to exit the town through East Boston when the Revere exit is closed because of flooding, it will be a traffic nightmare if nothing is done to alleviate this traffic problem at this intersection. Traffic backs up on Boardman Street even on a good day! Extensive traffic planning and studying need to be completed to alleviate this traffic congestion/back up at this intersection for the residents of Winthrop and East Boston. **I strongly suggest (urge) that the people making these decisions witness firsthand the traffic problems at the Route 1A/Boardman Street intersections during both AM and PM rush hours to better understand the problem before allowing this Casino to be built and commit to fix this traffic problem before this Casino is allowed to go forward.**

As I understand it, they plan to do a "flyover" on Route 1A for traffic flow into the Suffolk Downs casino, but this will not help the real traffic problem at the intersection of Route 1A and Boardman Street.

When MEPA writes the scope for the EIR for this project, I request that MEPA makes sure that the following are specifically in the EIR:

1. That the intersection of Route 1A and Boardman Street be included in all traffic analysis and that a Level of Service Analysis is done for the intersection in all of the alternatives analysis. BAX 02

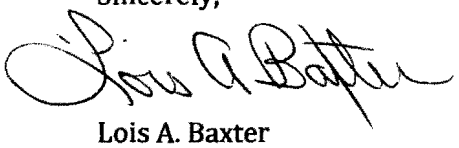
2. That the analysis on this intersection be performed based on actual traffic counts. I believe a full week of counts, while schools are open, is needed. BAX 03

3. That the traffic study in the EIR identify ways to improve traffic flow through this intersection by considering things such as improvements to the signal, changing the signal timing, adding exclusive turn lanes, or any other traffic mitigation measures (as opposed to relying on a traffic control officer). BAX 04

4. If improvements to the signal timing or a new signal would make even small improvements, that the developer works with the City of Boston Transportation Department to implement these improvements right away so that the congestion is reduced as soon as possible even before the Casino is opened, understanding that additional traffic mitigation may be coming later when the project goes to construction. BAX 05

Thank you for your consideration of my comments and look forward to seeing some drastic measures taken to reduce the traffic congestion in this area.

Sincerely,



Lois A. Baxter

BAXTER, LOIS

BAX 01 **The real traffic problem for Winthrop and East Boston residents is the Route 1A/Boardman Street intersection where traffic can back up... Traffic backs up on Boardman Street even on a good day! Extensive traffic planning and studying need to be completed to alleviate this traffic congestion at this intersection... I strongly suggest that the people making these decisions witness firsthand the traffic problems at the Route 1A/Boardman Street intersections during both AM and PM rush hours to better understand the problem before allowing this casino to be built and commit to fix this traffic problem before this casino is allowed to go forward.**

The traffic analysis presented in Section 5.0 is founded on actual traffic data collection and observation of conditions in the field.

BAX 02 **I request that MEPA makes sure... that the intersection of Route 1A and Boardman Street be included in all traffic analyses and that a LOS Analysis is done for the intersection in all of the alternatives analyses.**

An LOS analysis of the Route 1A and Boardman Street intersection is included in all traffic analyses for all alternative concepts presented in Section 5.0.

BAX 03 **I request that MEPA makes sure... that the analysis on this intersection be performed based on actual traffic counts. I believe a full week of counts, while schools are open, is needed.**

The analysis in Section 5.0 is based on actual counts performed while schools were in session. These included full-week counts at key locations as described in Section 5.2.7.

BAX 04 **I request that MEPA makes sure... that the traffic study in the EIR identify ways to improve traffic flow through this intersection by considering things such as improvements to the signal, changing the signal timing, adding exclusive turn lanes, or any other traffic mitigation measures (as opposed to relying on a traffic control officer).**

The Proponent has advocated for a flyover solution at this location. As requested by MassDOT, an alternatives analysis of other options is presented in Section 5.5.

BAX 05 I request that MEPA makes sure… if improvements to the signal timing or a new signal would make even small improvements, that the developer works with the City of Boston Transportation Department to implement these improvements right away so that the congestion is reduced as soon as possible even before the casino is opened, understanding that additional traffic mitigation may be coming later when the Project goes to construction.

The Proponent will work with BTD and MassDOT to strive for early implementation of traffic improvements where possible.

Bike to the Sea, Inc.
83 Jacob Street
Malden MA 02148
781-397-6893

Riding for Bike Safety and Safe Places to Ride
Leading Supporter of the Northern Strand
Community Trail

March 21, 2013

Diedre Buckley
MA Environmental Protection Act Section
100 Cambridge Street
Boston MA 02108

Re: Suffolk Downs Casino
MEPA 15006

Bike to the Sea, Inc hereby submits the following comments on the Scope of Work for the Draft ENF for the Suffolk Downs Casino.

Our organization has been working for 20 years to promote bicycling and bicycling safety along the Northern Strand communities including Revere, Saugus, Everett, Lynn and Malden. Heavy congestion and the lack of bicycle accommodations create significant obstacles to safe bicycling in our area. A major contributor is the traffic along Routes 1, 1A, 60 and 16 especially on beach days. Pedestrians face similar barriers.

Given that this is a regional facility, the EIR should consider regional impacts. Pedestrian and bicycling crossings at major rotaries and intersections are particular problems. Bicyclists are banned (probably illegally) from Copeland Circle where Route 60 and Route 1 intersect. Brown Circle – where Route 60 and Route 107 come together has no safe pedestrian crossings. Bell Circle is one of the most dangerous and confusing places to walk, drive and bicycle. **BS 01**

Casinos generate large volumes of traffic particularly on weekends. The draft EIR should be sure to take into account traffic volumes on summer "beach" weekends when traffic is heaviest. **BS 02**

Consideration should be given to ensuring regional bicycle trail and route connections to the area including creating a connection from the Northern Strand in North Revere along Route 1 towards Squire Road and Charger Street. Pedestrian and bicycle connections from Park Street **BS 03** **BS 04**

/Winthrop Street along the Belle Isle Inlet and Bennington Street / East Boston Greenway in East Boston should be reviewed as an alternative to the walkway shown from Route 1A.

Sincerely yours,

Stephen P. Winslow
Secretary

BIKE TO THE SEA, INC.

BS 01 **Given that this is a regional facility, the EIR should consider regional impacts. Pedestrian and bicycling crossings at major rotaries and intersections are particular problems. Bicyclists are banned (probably illegally) from Copeland Circle where Route 60 and Route 1 intersect. Brown Circle – where Route 60 and Route 107 come together has no safe pedestrian crossings. Bell Circle is one of the most dangerous and confusing places to walk, drive and bicycle.**

The roadway improvements committed to by the Proponent in the HCAs with Revere and Boston include many pedestrian and bicycle safety improvements and physical accommodations on and off site (see Section 5.6).

BS 02 **The Draft EIR should be sure to take into account traffic volumes on summer "beach" weekends when traffic is heaviest.**

The DEIR/EPNF traffic analysis in Section 5.0 addresses peak Friday afternoon commuter peak hour and Saturday afternoon peak hour conditions.

BS 03 **Consideration should be given to ensuring regional bicycle trail and route connections to the area including creating a connection from the Northern Strand in North Revere along Route 1 towards Squire Road and Charger Street.**

The HCA commitments include on-street bicycle accommodations in the Bennington Street corridor connecting Constitution Beach, Belle Isle Marsh, and Revere Beach.

BS 04 **Pedestrian and bicycle connections from Park Street/Winthrop Street along Belle Isle Inlet and Bennington Street/East Boston Greenway in East Boston should be reviewed as an alternative to the walkway shown from Route 1A.**

Pedestrian and bicycle connections are described in Section 1.4.

Comments for MEPA Review of Caesar's Resort at Suffolk Downs
3/7/13

Daniel Blustein
Revere, MA

I hope that creative ideas fueled by new technologies are explored for this large-scale project. The proponents have released vague plans regarding the incorporation of renewable energy sources and natural stormwater retention systems (landscaping). These are key areas in which environmental considerations should drive forward thinking and not just the path of least resistance. A few questions that should be considered:

-*Can the project incorporate the use of pervious/permeable pavements to improve groundwater retention?* This may require filling in roadway areas to increase elevation above the ground water line which, when done effectively, could limit the potential for flood damage. **BLU 01**

-*Can Sales Creek be modified to return it to some of its environmental importance?* Currently Sales Creek mostly serves as a storm water drainage system for Suffolk Downs. Historically, this waterway connected Belle Isle Marsh with the Chelsea River. If reconnected and rehabilitated, Sales Creek could become an important ecosystem for anadromous fish, juvenile crustaceans, endangered shore birds, and many other resources. **BLU 02**

-*How are the proponents planning to mitigate the continued, and likely increased, pressure that horse waste has on local ecosystems?* While positive work has been completed in response to the proponent's Clean Water Act Settlement, there has been little talk about how the proposed development will increase the generation of animal waste and its subsequent handling. **BLU 03**

-*What are the most effective sources of renewable energy for the site?* Many different types of renewable energy sources have been mentioned by the proponent but it would be helpful to see an alternatives analysis to explore the benefit of renewables and to help identify the most effective options. **BLU 04**

BLUSTEIN, DANIEL

BLU 01 **Can the Project incorporate the use of pervious/permeable pavements to improve groundwater retention?**

The Project will utilize pervious pavement in pedestrian and plaza areas when appropriate (see Section 4.4).

BLU 02 **Can Sales Creek be modified to return it to some of its environmental importance? Currently Sales Creek mostly serves as a storm water drainage system for Suffolk Downs. Historically, this waterway connected Belle Isle Marsh with the Chelsea River. If reconnected and rehabilitated, Sales Creek could become an important ecosystem for anadromous fish, juvenile crustaceans, endangered shore birds, and many other resources.**

The proposed upgrades to the existing stormwater management system, coupled with a reduction of approximately 12 acres in impervious surfaces on the Project site, will significantly improve water quality discharging towards Sales Creek relative to existing conditions.

BLU 03 **How are the proponents planning to mitigate the continued, and likely increased, pressure that horse waste has on local ecosystems? ... There has been little talk about how the proposed development will increase the generation of animal waste and its subsequent handling.**

The generation of animal waste is not anticipated to increase as a result of the proposed Project. In addition, the Project will have no effect on the BMPs for handling horse waste, bedding, and feed that are dictated by the U.S. EPA and are currently practiced at the racetrack. Indeed, the surface area of the CAFO, where all such waste, bedding, and feed currently are contained, is expected to decrease when a portion of the existing barn area is converted to parking. That conversion will actually enhance the ability of the CAFO's new process-water control systems (which already handle more process water than EPA requires) to manage process water.

BLU 04 **What are the most effective sources of renewable energy for the site?**

Renewable energy sources are evaluated in Sections 7.2 and 7.4.

BOSTON HARBOR ISLAND ALLIANCE
Bringing the Islands to Life

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March 26, 2013

Secretary Richard K. Sullivan
Attn: Deirdre Buckley, MEPA Office
Energy and Environmental Affairs
100 Cambridge Street, 9th Floor
Boston MA 02114

Re: EEA No. 15006 (Caesars Resort at Suffolk Downs)

Dear Secretary Sullivan:

On behalf of Boston Harbor Island Alliance (BHIA), I write to provide comments on the pending Environmental Notification Form for the Caesars Resort at Suffolk Downs project. These comments are focused on the Public Benefits portion of the ENF (section 1.5).

BHIA is a nonprofit organization whose sole purpose is to promote the public use and awareness of the Boston Harbor Islands National Park Area, created by Congress in 1996. As you know, we work closely with your agencies, particularly the Department of Conservation and Recreation, along with the National Park Service and the City of Boston to promote access and use of the Harbor Islands.

BHIA supports this project. We are impressed with the Proponent's efforts to make it a "green" project, and particularly with their commitment to LEED certification. We are also pleased with the effort the Proponents have put into public outreach and their willingness to engage with all parties.

BHIA generally agrees with the description of Public Benefits set out in the ENF. We believe, however, that the ENF defines the parameters of the project and its potential benefits too narrowly, and would urge that Boston Harbor and the Boston Harbor Islands be included in the analysis during the MEPA process. **BHIA 01**

The Proponent has clearly spent considerable time and effort in designing a complex project which will "promote connectivity to adjacent land uses" (section 1.5, page 1-5, Open Spaces) and "link neighborhoods and ecosystems" (section 2.2.4, page 2-8). In addition, the Proponent, as required by a consent decree with the US EPA, will "improve public access…and protect natural resources" of the Belle Isle Marsh (section 1.5, page 1-6). And, as noted in the ENF (also page 1-6), the Proponent is "contemplating a potential connection to water shuttle service."

408 Atlantic Avenue, Suite 228 Boston, MA 02110-3350 ph: 617-223-8672 info@islandalliance.org

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The Proponent demonstrates significant analysis of Boston Inner Harbor water transportation opportunities which could bring guests to the resort (section 2.2.5.2, pages 2-11 and 2-12). However, water transportation is not discussed as part of section 3.6 Alternative Modes of Transportation (pages 3-19 to 3-21).

Based on the Proponent's clear objectives of providing a direct and easy connection to local natural resources, to improve access to those resources and the exploration of connecting the project to future water transportation routes, BHIA strongly urges that the Proponent be directed to expand the scope to include access to the Boston Harbor Islands National Park Area, a natural resource within sight and a short boat ride from the project location. By connecting the resort development to the Boston Harbor Islands, the Proponent will not only provide an alternative mode of transportation and a better visitors experience for guests and patrons of the resort, but it will also fulfill some key objectives that the Legislature laid out in Chapter 194 of the Acts of 2011 - the Gaming statute. The gaming statute calls on proponents to provide measurable economic benefit to not only the impacted communities but to the region and state as a whole. The Harbor Islands are truly a regional and statewide treasure that is used and valued by residents of Boston, Winthrop, Revere and all of the state's cities and towns. **BHIA 02**

The statute also implores proponents to mitigate impacts on existing cultural institutions and work with them and other entertainment venues via cross marketing and coordination to ensure "…patrons experience the diversified regional tourism industry."

The Boston Harbor Islands are a cornerstone of the local tourism experience.

We stand ready, willing and able to work with Caesars and Suffolk Downs to ensure a partnership is created that bolsters the experience of visitors to their resort casino and strengthens the broader tourism experience for both visitors and citizens alike in the communities surrounding Boston and Boston Harbor. BHIA would like the Proponent to explore supporting the Park and water transportation in the following ways: **BHIA 03**

- Provide information to the public in general and to resort guests on the opportunities presented by the Park.
- Underwrite public water transportation to the Park and within Boston Harbor.
- Include an analysis of direct water transportation opportunities from the resort to the Park and within Boston Harbor and the surrounding water transportation nodes in the region.

408 Atlantic Avenue, Suite 228 Boston, MA 02110-3350 ph: 617-223-8672 info@islandalliance.org

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The Boston Harbor National Park Area is a tremendous resource for residents and visitors. It seems fitting that the Proponent would include information about and access to the Park and the Harbor in its overall planning. Doing so will enhance the Caesars guest experience, while supporting a potent economic driver for local tourism, more than 130,000 visitors took public ferries to the Park in 2012, with overall visitorship estimated at 500,000 last year.

Thank you for the opportunity to comment. We very much look forward to hearing more about the project and are available to provide additional information as the MEPA process continues.

Very truly yours,

Tom Powers

Tom Powers
President

cc: Chip Tuttle
Boston Harbor Islands Partnership Members

408 Atlantic Avenue, Suite 228 Boston, MA 02110-3350 ph: 617-223-8672 info@islandalliance.org

BOSTON HARBOR ISLAND ALLIANCE

BHIA 01 **BHIA generally agrees with the description of Public Benefits set out in the ENF. We believe, however, that the ENF defines the parameters of the Project and its potential benefits too narrowly, and would urge that Boston Harbor and the Boston Harbor Islands be included in the analysis during the MEPA process.**

The Proponent is committed to working with the City of Boston on improving water transportation in the City and is providing funding for a South Boston to East Boston ferry service to increase the use of water transportation within the City generally.

BHIA 02 **Based on the Proponent's clear objectives of providing a direct and easy connection to local natural resources, to improve access to those resources and the exploration of connecting the Project to future water transportation routes, BHIA strongly urges that the Proponent be directed to expand the scope to include access to the Boston Harbor Islands National Park Area, a natural resource within sight and a short boat ride from the Project location.**

The Proponent supports Mayor Menino's vision to enhance water transportation options to East Boston by instituting regular water shuttle service between the South Boston and East Boston waterfronts. As such, the Boston HCA includes funding that will assist the City in establishing this service.

BHIA 03 **BHIA would like the Proponent to explore supporting the Park and water transportation in the following ways:**

- **Provide information to the public in general and to resort guests on the opportunities presented by the Park;**
- **Underwrite public water transportation to the Park and within Boston Harbor; and**
- **Include an analysis of direct water transportation opportunities from the resort to the Park and within Boston Harbor and the surrounding water transportation nodes in the region.**

The Proponent intends to post a Boston Gateway display focusing on various area attractions in the public atrium between Casino Areas I and II. The Proponent also intends to underwrite shuttle service to existing water transportation, and the Boston HCA includes funding that will assist the City in establishing water transportation services between the South Boston and East Boston waterfronts. Direct water transportation to the site is not feasible.

From: Jason Burrell [mailto:r.jason.burrell@gmail.com]
Sent: Wednesday, March 20, 2013 9:31 PM
To: Buckley, Deirdre (EEA)
Subject: EEA #15006: Environmental Concerns About East Boston Casino Proposal

Hi Deirdre,

I'm writing to you to express my concerns about the environmental impacts of the proposed casino by Caesar's in Suffolk Downs. As you are aware, East Boston is in close proximity to the airport and at least two major highways which have already elevated the pollution levels way above normal for an urban area. I have been living in East Boston for about six years and would like to make this a long term home. I fear that if the casino is built and the anticipated additional traffic of 10,000 vehicles on a weekday and up to 40,000 vehicles on Sat. and Sunday come to fruition, this will only add to the pollution concerns in the area. I'm especially disappointed at the developer's attempt to "white wash" this issue by stating that the casino being built will be the "greenest casino" ever. The reality is that building a 500,000 square foot structure on marsh land is NOT green and adding vehicle congestion to the area is NOT green, their attempt to mitigate this by claiming that the building will be LEED Certified is a poor effort to mask the real issue of the additional pollution and congestion that they will be creating. Please take this e-mail, along with the e-mails of my neighbors, in to consideration when reviewing the proposal of the Suffolk Downs Casino. Thank you. **BUR 01**

Sincerely,

Jason Burrell
(617) 501-7687

BURRELL, JASON

BUR 01 **I fear that if the casino is built and the anticipated additional traffic of 10,000 vehicles on a weekday and up to 40,000 vehicles on Saturday and Sunday come to fruition, this will only add to the pollution concerns in the area.**

A microscale analysis has been performed for the Project area, and the methodology and results are provided in Sections 6.5.4.2 and 6.5.5.2, respectively.

CLEAN WATER ACTION
MASSACHUSETTS

March 26, 2013

Secretary Richard K. Sullivan, Jr.
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office
Deirdre Buckley, **EEA no. 15006**
100 Cambridge Street, Suite 900
Boston, MA 02114

Subject: Public Comments for EEA no. 15006, Caesars Resort at Suffolk Downs

Dear Secretary Sullivan,

We are grateful for the opportunity to provide comments on the project proposed for the Suffolk Downs site. Clean Water Action is a 30,000+ member organization of diverse people and groups In Massachusetts joined together to protect our environment, health, economic well-being and community quality of life. Our goals include clean, safe and affordable water; prevention of health threatening pollution; creation of environmentally safe jobs and businesses; and empowerment of people to make democracy work. Clean Water Action organizes strong grassroots groups and coalitions and campaigns to elect environmental candidates and solve environmental and community problems.

We are pleased to understand that the design for Caesars Resort at Suffolk Downs proposes to reduce impervious surface cover by nine acres due to the reduced capacity of polluted stormwater runoff from the reduced acreage of impermeable surfaces.

CWA is pleased that the project proposes to use many energy-efficiency measures onsite such as heat recovery, high-efficiency lighting with energy-saving lighting controls, and water-conserving plumbing fixtures to reduce energy consumption, meet criteria of Massachusetts' Stretch Code and also LEED certification. Nonetheless, natural gas needs for the proposed facility will be provided by "new or existing service," according to the proposal. CWA has concerns about installation and use of a new underground pipeline inasmuch as any threats for leakage and explosion to the nearby areas of industrial, business, or residential uses. **CWA 01**

1010 Vermont Avenue NW, Suite 400 | Washington, DC 20005
Phone: 202.895.0420 | Fax: 202.895.0438
262 Washington Street #601 | Boston, MA 02108
Phone: 617.338.8131 | Fax: 617.338.6449
www.cleanwateraction.org/ma

For the work that is described as minor regarding in the 25-foot Riverfront Area of Sales Creek, CWA would like to request use of Best Available Technology during and after construction to prevent any further erosion, runoff, or other damage to the creek and downstream water and streambed. We request that the same care and use of BAC be undertaken on the portion of the property associated with the 100-foot buffer zone to Coastal Bank and Salt Marsh, as well as the 25-foot Riverfront Area (in Boston) and 200-foot Riverfront Area (in Revere) is associated with the Chelsea River which is associated with, though perhaps not directly within, the proposal site. **CWA 02**

As for new demand for water and wastewater treatment services, CWA asks the project developer to consider whether a system which treats wastewater onsite for reuse in toilet flushing and some landscaping, as exists at Gillette Stadium, might be considered. Measures such as these both reduce water use and costs and pressure on existing infrastructure, but demonstrate sustainable and innovative water practices for which MA strives to be known. **CWA 03**

Certainly we are pleased to read that new stormwater control measures will greatly improve stormwater discharged from the site that will lead to enhanced water quality reaching Sales Creek, the Belle Isle Inlet, and Rumney Marshes ACEC. For stormwater and erosion control measures, both during construction and afterwards during operation of the proposed facility, CWA requests consideration for maximum use of vegetation (versus pavement and other permanent structures) and Low Impact Development (LID) strategies, as have been mentioned elsewhere in the proposal. This is for a number of reasons, including the ability of native vegetation to perform natural services such as stormwater capture and treatment, atmospheric cooling and relief, especially, of urban heat-island effects of large developments, and also add naturally beautifying elements to a project located in and near our urban neighborhoods and business districts. **CWA 04**

CWA requests that sampling access and results before, during, and after construction be made available to the public or interested parties representing the public, such as our organization for educational purposes. If the proposed improvements to stormwater quality are proven out, the project could serve as a model and an educational tool for local community education programs, as well as a model for other developments across the Commonwealth as stormwater regulations become more and more rigorous and municipalities will be charged with meeting new federal standards. **CWA 05**

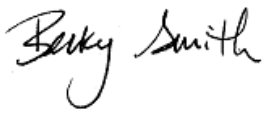
During construction, CWA will ask for diesel vehicle idling maximum time limits to be specified and enforced. In keeping with Caesars Palace's environmentally progressive facility design nationwide, we request that they consider hiring construction and demolition companies that have retrofitted their diesel on-road and non-road equipment with Diesel Particulate Filters (DPF's) which filter and avoid discharging much of the soot and particulate matter which **CWA 06**

contribute to respiratory, heart, and lung dysfunction, and which also contribute to climate change due to the dark particulate matter in the soot from the diesel vehicles.

Increased water needs are calculated to be from current use of 40,200 gallons per day to 435,810 gallons per day and do not require any new permitting, ostensibly being supplied by reservoirs under operation of the Massachusetts Water Resources Authority. Proposed wastewater treatment capacity increases from 166,020 gallons per day to 473,100, and does require new permitting. Again, CWA has concerns that while the MWRA is currently operating with bountiful water supplies, this may not remain the case during the lifetime of this built project, especially with increased extreme weather events caused by a changing climate. For this reason, and for reasons of decreasing pressure on both existing water and wastewater infrastructure, we ask that the developers consider an alternative such as the onsite wastewater treatment and reuse scheme similar to the one at Gillette Stadium. **CWA 07**

Thank you, again, for this opportunity to comment on the proposed development by Caesars Resort at Suffolk Downs.

Sincerely,



Becky Smith
Campaigns Director
Clean Water Action

CLEAN WATER ACTION

CWA 01 **Natural gas needs for the proposed facility will be provided by "new or existing service," according to the proposal. CWA has concerns about installation and use of a new underground pipeline inasmuch as any threats for leakage and explosion to the nearby areas of industrial, business, or residential units.**

Based on a meeting with the gas utility, it is expected that the natural gas needs for the Resort will be provided largely through existing piping infrastructure. Should any new piping be required, such work will receive the necessary approvals and will be performed in accordance with applicable requirements governing installation, service, and maintenance.

CWA 02 **For the work that is described as minor in the 25-foot Riverfront Area of Sales Creek, CWA would like to request use of Best Available Technology (BAT) during and after construction to prevent any further erosion, runoff, or other damage to the creek and downstream water and streambed. We request that the same care and use of BAT be undertaken on the portion of the property associated with the 100-foot buffer zone to Coastal Bank and Salt Marsh, as well as the 25-foot Riverfront Area (in Boston) and 200-foot Riverfront Area (in Revere) which is associated with the Chelsea River, though perhaps not directly within the proposal site.**

The minor on-site activities proposed in the Sales Creek RFA are limited to proposed stormwater management system improvements and upgrades and construction of a small floodplain compensatory storage area adjacent to Sales Creek. Proposed upgrades to the stormwater management system, including any new or modified discharges, will be set back from Sales Creek and will comply with MassDEP stormwater standards. No work is anticipated to occur on or below the Inland Bank of Sales Creek or its adjoining BVW. Erosion and sedimentation controls, as well as a clearly delineated limit of work setback, will protect these resource areas during construction. The proposed upgrades to the stormwater management system should substantially improve the quality of discharged water relative to existing conditions. As demonstrated in Section 6.9, these activities have been designed to fully comply with WPA performance standards.

CWA 03 **CWS asks the project developer to consider whether a system which treats wastewater onsite for reuse in toilet flushing and some landscaping, as exists at Gillette Stadium, might be considered.**

The Project does not include a system to reuse wastewater onsite. Rainwater will be collected from building roofs and reused for landscape irrigation, track watering, and cooling tower water demand (see Section 9.3).

CWA 04 For stormwater and erosion control measures, both during construction and afterwards during operation of the proposed facility, CWA requests consideration for maximum use of vegetation (versus pavement and other permanent structures) and Low Impact Development (LID) strategies... This is for a number of reasons, including the ability of native vegetation to perform natural services such as stormwater capture and treatment, atmospheric cooling and relief, especially of urban heat island effects of large developments, and also add naturally beautifying elements to a project located in and near our urban neighborhoods and business districts.

Sections 4.4 and 4.5 describe LID strategies to treat stormwater, reduce the urban heat island effect, and provide visual interest on the site.

CWA 05 CWA requests that sampling access and results before, during, and after construction be made available to the public or interested parties representing the public, such as our organization, for educational purposes. If the proposed improvements to stormwater quality are proven out, the Project could serve as a model and an educational tool for local community education programs, as well as a model for other developments across the Commonwealth as stormwater regulations become more and more rigorous and municipalities will be charged with meeting new federal standards.

The proposed stormwater management system will greatly improve existing conditions, and the Project will comply with all applicable stormwater regulations.

CWA 06 During construction, CWA will ask for diesel vehicle idling maximum time limits to be specified and enforced. In keeping with Caesars Palace's environmentally progressive facility design nationwide, we request that they consider hiring construction and demolition companies that have retrofitted their diesel on-road and non-road equipment with DPFs which filter and avoid discharging much of the soot and particulate matter which contribute to respiratory, heart, and lung dysfunction, and which also contribute to climate change due to the dark particulate matter in the soot from the diesel vehicles.

Construction-period air quality, including diesel emissions and vehicle idling, is discussed in the Draft CMP in Attachment L.

CWA 07 **CWA has concerns that while the MWRA is currently operating with bountiful water supplies, this may not remain the case during the lifetime of this built Project, especially with increased extreme weather events caused by a changing climate. For this reason, and for reasons of decreasing pressure on both existing water and wastewater infrastructure, we ask that the developers consider an alternative such as the onsite wastewater treatment and reuse scheme similar to the one at Gillette Stadium.**

The Project does not include a system to reuse wastewater onsite. Rainwater will be collected from building roofs and reused for landscape irrigation, track watering, and cooling tower water demand (see Section 9.3).

DB

FIRST BRISTOL CORPORATION

March 15, 2013

RECEIVED
MAR 18 2013
MEPA

Secretary Richard K. Sullivan, Jr.
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office
Deidre Buckley, EEA No. 15006
100 Cambridge Street, Suite 900
Boston, MA 02114

RE: Caesars Resort at Suffolk Downs (the "Project")
EEA No. 15006

Dear Secretary Sullivan:

MC-EB Realty LLC is the owner of 415 William McClellan Highway which is the site of a planned mixed-use development involving hotel, restaurant and retail development which has recently completed MEPA review. We are submitting this letter to provide comments on the above-referenced ENF within the comment period which ends March 26, 2013. We have reviewed the above-referenced ENF and note that it described certain roadway improvements which will be required to enable the Project to proceed, certain of which will be located in part on our property. **FBC 01**

We are supportive of the Suffolk Downs redevelopment, and have designed our development in a manner to assist with the implementation of the traffic and transportation improvements which are shown in conceptual fashion in the above-referenced ENF. We remain concerned however, that despite preliminary discussions with the Proponent to clarify the terms of the planned acquisition of that portion of MC-EB Realty's property needed to undertake these improvements, there is as yet no, even conceptual agreement, as to the extent, terms, size or timing of any such acquisition. We respectfully request that the Proponent clarify the extent, timing and terms of any planned acquisition so that we may analyze whether this is even feasible, considering the needs of our development with the proposed development of our property.

I respectfully request that the Proponent provide copies of all future MEPA filings to my office. We appreciate the opportunity to comment.

Very truly yours,

James Karam

cc: Chip Tuttle, Chief Operating Officer, Sterling Suffolk Racecourse LLC
Paul Cincotta, NED
Corinne Snowdon, Epsilon
Lianne Marshall
Jeffrey Dirk, VAI

FIRST BRISTOL CORPORATION

FBC 01 **... Certain roadway improvements which will be required to enable the Project to proceed... will be located in part on our property... We remain concerned that despite preliminary discussions with the Proponent to clarify the terms of the planned acquisition of that portion of MC-EB Realty's property needed to undertake these improvements, there is as yet no, even conceptual, agreement as to the extent, terms, size, or timing of any such acquisition.**

As noted in the analysis of transportation alternatives included in Section 5.0, there are some alternatives for the Route 1A improvements that require varying degrees of additional right-of-way beyond the current roadway limits. The Proponent expects that, at the completion of the permitting process, the roadway improvements will not require the use of any portions of MC-EB Realty's property other than those portions that the property owner has reserved for roadway improvements in connection with its Project Notification Form filed with the BRA on September 17, 2012. The Proponent will continue to work with the First Bristol Corporation on this issue as it proceeds with its development this Fall.

To whom it may concern:

I am an East Boston resident of just over a year. My wife and I are currently looking to buy a place in the Jeffries Point neighborhood. We have an offer in at the time and are excited about the prospect of our new condo on Chelsea st. The neighborhood has grown on us and we like the direction it is going in all ways but one.

The idea that a casino may go up at Suffolk Downs is very disconcerting. I did not understand, at first, the long-term effect that a casino has on a neighborhood. I started to hear grumblings amongst fellow eastie residents and did some of my own research. The change in home prices, crime and traffic are just a few of the seemingly inevitable negative effects a Casino will have. As I become more and more a part of this community I will become more and more vocal, like so many residents in East Boston. I think there is a surge of information getting out there informing residents of the negative long-term impact of a casino and I think we have the power to stop it. If not, we may end up regretting the decision to buy in Eastie. **FOR 01**

Ryan Forsyth

FORSYTH, RYAN

FOR 01 **The change in home prices, crime, and traffic are just a few of the seemingly inevitable negative effects a casino will have.**

Traffic impacts associated with the Project and corresponding proposed mitigation measures are addressed in detail in Section 5.0. Please see the response to ANT 01 regarding potential impacts on home prices and crime.

Friends of Belle Isle Marsh
P.O. Box 575
East Boston, MA 02128

March 25, 2013

Secretary Richard K. Sullivan, Jr.
Executive Office of Energy and Environmental Affairs (EEA)
Attn: MEPA Office
Deirdre Buckley, EEA No. 15006
100 Cambridge Street, Suite 900
Boston MA 02114

RE: EEA No. 15006 - Caesars Resort at Suffolk Downs ENF Comments

Dear Secretary Sullivan:

Thank you for the opportunity to comment on the Caesars Resort at Suffolk Downs Environmental Notification Form (ENF). I am submitting these comments on behalf of the Friends of Belle Isle Marsh. The Friends of Belle Isle Marsh has a number of concerns about the impacts this project may have on its immediate surrounding area, including the Belle Isle Marsh, the broader Critical Areas of Environmental Concern, as well as on the adjacent neighborhoods and region.

The Friends of Belle Isle Marsh, as residents of East Boston and Revere, treasure our home. However, the area isn't without its challenges. Throughout our community a significant number of less attractive commercial and industrial developments have been constructed. Many in East Boston believe from past experience that residents and workers in the area have not been adequately represented in decision-making processes. We would like to believe that a development the size and complexity of Caesars Resort at Suffolk Downs could become an attractive addition to our community. But this depends on transparency, good planning, and accountability. We urge MEPA to ensure that this project, should it come to fruition, be a positive for the community and for our natural environment.

Friends of Belle Isle Marsh, a non-profit 501(c)(3) grassroots environmental organization, was formed in the early 1980s to help preserve the Belle Isle Marsh and to publicize its importance as an urban natural resource. We believe that protection ultimately depends on public awareness of the value and beauty of this natural resource.

Among the largest surviving salt marshes in Boston Harbor, Belle Isle Marsh showcases plants and wildlife now rare to the Metropolitan area. The 241-acre marsh is a critical habitat for wildlife and vegetation. With its walking paths and beautiful coastal views, the Belle Isle Marsh also serves as a delightful respite for visitors. Within the Reservation, DCR manages 28 acres of landscaped park, including a circuit trail, benches, and an observation tower. Belle Isle Marsh is a natural treasure and important resource to East Boston and its surrounding communities.

The main entrance to the Belle Isle Marsh Reservation is off of Bennington Street, across from the Suffolk Downs MBTA Subway Station. The existing Suffolk Downs racetrack sits West of the main entrance, behind the Suffolk Down Station. As the crow flies, it is less than a tenth of a mile between the Marsh's perimeter and the Suffolk Downs racetrack. As such, a development the size and complexity of the Caesars Resort at Suffolk Downs is of considerable concern to the Friends of Belle Isle Marsh.

There is a history of environmental contamination at this site. Recently, the EPA and the Department of Justice found that Suffolk Downs had violated Section 301 of the Clean Water Act by discharging pollutants including manure, urine and bedding materials into Belle Isle Creek. The Belle Isle Creek runs through the Suffolk Downs racetrack and horse barn property and feeds the Marsh. In addition to paying a civil penalty of $1.25 million, Suffolk Downs will implement three Supplemental Environmental Projects (SEPs), at a total cost of approximately $742,000. Two of the SEPs are designed to monitor the water quality of the Mystic River and the Saugus River watersheds. The third SEP requires the installation of a boardwalk at Belle Isle Marsh. The boardwalk is designed to provide community access to the marsh without causing harm to sensitive wetland vegetation or destabilizing the marsh's riparian buffer.

The Friends of Belle Isle Marsh is exceedingly concerned with the impacts the Project may have on Belle Isle Creek and Marsh and the broader local floodplain and wetlands, especially given the recent Clean Water Act violation. We want assurance that these areas of Critical Environmental Concern are protected during both construction of the Resort, as well as during its ongoing operations. We understand that the Mystic River Watershed Association (MyRWA) is submitting comments to your office addressing potential water-related impacts on the watershed. Friends of Belle Isle Marsh fully supports MyRWA's ENF comments. **FBIM 01**

The following comments reflect principally our concerns about the transportation aspects of the Project and its associated environmental impacts, including air, noise and visual pollution on the Belle Isle Marsh and its surrounding area.

Comments on Transportation Matters

We have broken the following comments into several sections:

- Vehicular traffic, Transportation Demand Management, and Parking

- Public Transportation
- Pedestrian Access
- Bicycle Access
- Urban Design, Open Space, and Landscaping
- Overall Community Benefits

Vehicular Traffic, TDM, and Parking

We agree with the Proponents that the most significant environmental impact from this project is the generation of new traffic and its resultant air quality impacts (p. 7). Traffic congestion has been a chronic problem in Revere and East Boston. This congestion is bad for the community and bad for our environment. We also think that if not fully addressed, it will be bad for the proposed project itself.

The Proponent estimates that there will be an additional 24,600 vehicle trips per day generated from this project, in addition to the 15,900 trips already experienced at the site. This more than doubles site-related vehicle trips per day.

From the current traffic counts included in the ENF, and from empirical evidence, there is no argument that the roads in the Route 1 corridor are congested. We fear that additional trips from this project will amount to a tipping point, taking us from a bad situation to an unbearable one. The resultant air pollution from these additional vehicles sitting on clogged roads is of great concern to the Friends of Belle Isle Marsh. Given the density of the Orient Heights and other residential neighborhoods in the area, impacts on public health from air pollution, including asthma, allergies, respiratory illness are of real concern and need to be taken into account in any transportation analysis.

The Proponents have listed a number of areas within the Route 1A corridor that need improvement:

- Improvements at Route 1/Route 16 interchange
- Northbound flyover at Boardman Street
- Additional southbound lane on Route 1A
- Signalization at Waldemar Avenue
- Signalization at Tomasello Drive

We agree that these areas are in desperate need of attention. However, we believe that the Proponent is taking a piecemeal approach to roadway improvements. ***We urge MEPA to require the Proponents to conduct a Comprehensive Corridor Study of the Route 1A area, from the Sumner, Callahan and Ted Williams tunnels to Copeland Circle.*** **This corridor study should be done in conjunction with all applicable planning, design and regulatory bodies at the local, regional, and state levels.** **FBIM 02**

There have been a number of transportation analyses done of this area in the past. However, due to the size of this project and the forecasted increase in vehicular trips, an **FBIM 03**

up-to-date, holistic review of the corridor is necessary. We are not proposing this in order to delay the MEPA process. We are proposing this because there are significant, complex traffic problems all along the corridor. Residents and visitors alike are already faced with terribly challenging traffic conditions daily; the addition of 26,400 trips daily will make this situation worse.

In addition, there are number of other development proposals happening simultaneously to this project and more that are likely to occur because of the proposed project. Perhaps the most significant currently is the project proposal at 415 McClellan Highway at the corner of Route 1A and Boardman Street. This project's proposal calls for the construction of a new hotel containing 117,060 SF and 400 parking spaces. In addition, we understand that Global Petroleum intends to increase the volume of ethanol at its facility on Route 1A and increase the number of trucks entering and exiting the facility. Currently, a number of trucks serviced by this facility turn around at the "jug handle" near the entrance to Suffolk Downs. Truck traffic crossing from southbound to northbound using the "jug handle" requires a traffic signal, stopping the flow of traffic in both north and south directions. Additional truck traffic along the corridor will create additional north-south vehicular traffic delays at that traffic light and impede the flow of traffic into and out of Tomasello Drive, the main entrance to the Resort.

We ask the Proponent be required to include the 415 McClellan project, the truck traffic generated from Global Petroleum's current and future operations, as well as any other projects that may reasonably effect the corridor, in its DEIR transportation analysis. **FBIM 04**

In addition, *we ask that the Proponent be required to prove that additional vehicular traffic will not affect emergency services to the surrounding residential neighborhoods and local commercial, retail, and maritime areas. This analysis should include a scenario in which there is a serious accident at the Global Petroleum terminal.* **FBIM 05**

<u>Improvements at Route 1/Route 16 interchange:</u>

The Proponents have offered a preliminary concept plan for potential mid-term improvements at this interchange and state that the DEIR will include a study of such improvements using CTPS Modeling. They further state that any design of the improvements will be developed in coordination with MassDOT, DCR, and the cities of Revere and Chelsea.

This is a good start. However, we urge a more in-depth analysis of this area and of the relationship effects of any other design changes along other parts of the corridor. We are concerned particularly with how any changes to this area will affect Bell Circle (Route 1A and Route 60). **FBIM 06**

The difficulty faced by Route 1 Southbound travelers accessing Route 16 eastbound must be remedied. For decades, Route 60 has been the route used by southbound traffic accessing Logan Airport. To lessen the traffic load on Route 60, including traffic generated **FBIM 07**

by Logan Airport, the solution to the Route 1/Route 16 interchange has to be seen by the general populace as a significant improvement over current conditions or these travel patterns, ingrained over decades, will not change.

The Lower North Shore Transportation Improvement Study by CTPS in 2000 provides further insight into the difficulties at the Route 1/Route 16 interchange:

> "The present interchange lacks connections between Route 16 to the east and Route 1 to the north. All traffic to and from Route 1 north and destinations such as Revere Beach and Logan Airport must use Copeland Circle and Squire Road (Route 60). New connections at Route 1/Route 16 provide the first of two necessary connections between Route 1 and Route 1A to give motorists an alternative to using Route 60."
>
> "Once Route 1 and Route 16 are connected, Route 1A and Route 16 must also have seamless connections to complete the full Routes 1/16/1A connection. Recent developments along the Route 1A corridor between Mahoney Circle and Boardman Street, including proposals for two new hotels, a waste transfer facility, and the redevelopment of Suffolk Downs, *indicate the need for a more comprehensive plan for the corridor. It was expected that this study could be a step toward for a coordinated, region wide effort."* (Lower North Shore Transportation Improvement Study, 2000, emphasis added. Please note, Mahoney Circle is commonly referred to as Bell Circle.)

To our knowledge, a region wide, comprehensive plan for the corridor has not been completed. The Suffolk Downs development only heightens the need to perform this study. **FBIM 08**

Northbound flyover at Boardman Street & Additional southbound lane on Route 1A

Similar to what they have offered at the Route 1/Route 16 intersection, the Proponent has provided a concept design to ostensibly ameliorate traffic congestion at Boardman Street and Route 1A. *Although this plan may well be of some benefit if implemented, it is imperative that any plans for the Boardman Street intersection be looked at within the broader context of the Route 1A Corridor.* **FBIM 09**

Signalization at Waldemar Avenue& Tomasello Drive

As with the other potential Roadway Improvements listed in the ENF, we would like any long-term design changes at these intersections be implemented after a Comprehensive Corridor Study is completed. **FBIM 10**

Additional Concerns with Site Related Vehicular Traffic

Service Vehicles

The Proponent has stated that they will address service and other commercial traffic in the DEIR. *We ask that MEPA require the Proponent to show that service and commercial traffic will not have an auditory or visual impact on the Belle Isle Marsh, Belle Isle Creek or Sayles Creek.* **FBIM 11**

In addition, to ensure that service and other commercial vehicles employed by the Resort do not contribute to undue air pollution, *we propose that the Proponent include an analysis of operating only 'green' vehicles such as hybrid, electric, and compressed natural gas in its business operations*. **FBIM 12**

In addition, we ask that the *Proponent investigate requiring outside suppliers and transportation providers of the Resort to utilize green vehicles and report its findings in the DEIR.* At the very least, suppliers and transportation providers, including Taxi companies, should be required to retrofit their vehicles with state of the art pollution control equipment such as emission control equipment, idle reduction technologies and engine upgrades or replacements. Because this could be seen as a financial burden to some local suppliers, the Proponent should subsidize these efforts, making them affordable to local suppliers. This would not only mitigate air pollution from commercial vehicles servicing the Resort, but could also be a community relations benefit. **FBIM 13**

<u>Parking</u>

Although the number of parking spaces is being reduced in the latest plan set forth in the ENF, this decrease in total available parking is less significant to Air Quality than the Proponent implies. *We ask that MEPA require that further Air Quality Analysis should be based on the number of parking space currently being utilized at the existing Suffolk Downs site, not on the number of parking spaces currently available.* Average peak occupancy of current available parking spaces is far less than the number of parking spaces at the existing Suffolk Downs site. **FBIM 14**

<u>Crash Analysis</u>

We ask that MEPA also require that the DEIR crash analysis incorporate the impact of casino traffic on public safety, and commit to mitigate any issues that may arise from this analysis. We are concerned that due to the nature of the casino business, including late night activities and alcohol consumption, patrons leaving the Caesars Resort at Suffolk Down may contribute to safety problems in our community. Reports have shown that accident rates and drunk driving rates have increased in communities near casinos, resulting not only in additional crashes, but also the need for additional enforcement and emergency services. One solution to this issue is to encourage patrons to utilize public transportation. **FBIM 15**

Public Transportation

The Proponent states that the Project will enhance access to and from the MBTA Blue Line Suffolk Downs-Belle Isle Station, and will upgrade pedestrian and shuttle connections to the project site. The Proponent expects a significant number of visitors and a substantial

proportion of project employees will access the site via public transportation (2.2). This is encouraging to us. But it doesn't go far enough.

Coordinating with MBTA on Subway and Bus Service

We ask that the Proponent work with the MBTA to assess additional capacity needs on the Blue Line and the bus lines servicing the project site and include their findings in the DEIR. This evaluation should include late night service and the addition of express buses to and from the resort as needed. We encourage the Proponent to contribute financially to this increase in service if necessary. Due to the nature of the Casino's business, patrons will be arriving and leaving the resort during hours that the MBTA service is typically scaled back. An increase in subway and bus service will likely be necessary in order for public transportation to be a viable option for patrons and employees alike. Further, there are specific events, such as the Revere Beach Sandsculpting Festival, that already stress Blue-line capacity. The potential development of a soccer stadium at Wonderland would greatly add to this stress on game days. *We ask that MEPA require the Proponent to report on scheduling additional express bus service to Downtown Boston and Wonderland Station during these peak demand special events in the DEIR.* **FBIM 16**

Access Via Subway and Bus

The Proponent states that the project will improve the pedestrian/shuttle link between Suffolk Downs MBTA Station and the Project entrances to encourage travel by public transit (2.2.2). Indeed, the Suffolk Downs MBTA Station is ideally located to the site. However, the pedestrian connection to and from the Suffolk Downs Station and the project site can be vastly improved.

A large amount of detail and expense is planned for the vehicular entrance at Tomasello Drive. There are already landscaping and hardscaping plans for this area: "creating a unique arrival sequence and visitor experience" and "embracing the site's natural ecology and providing a dramatic arrival…." Understandably, the Proponent wants a certain grand 'feel' to the entrance appropriate to the quality of a Caesars Resort. The plans for the connection between the Suffolk Downs MBTA Station and the Resort are considerably less developed, and without any mention of the grandeur planned for the Tomasello vehicular entrance.

To encourage use of public transportation, we believe that it is important to treat the connection between the Suffolk Downs MBTA station and the resort in a similar fashion to the Tomasello entrance. A shuttle service to and from the MBTA station is a bare minimum. *We request that the Proponents consider additional improvements to this connection. These should include a seamless, sheltered pedestrian connection from the station and the resort reflecting the attention to detail and feel of the Tomasello Drive entrance and include these plans in the DEIR.* **FBIM 17**

Employer -Sponsored Transit Demand Management

We request that MEPA require the Proponent to provide an analysis in the DEIR of employer-sponsored transit demand management strategies. **FBIM 18**

A common benefit offered by employers is the provision of transit passes. We request that the Proponent provide free MBTA Charlie Cards to all employees who use transit to get to work. This program could be fashioned to incentivize the use of transit, perhaps requiring employees to commute to and from work via public transportation the majority of days in order to receive the card.

Another consideration should be to provide onsite childcare to employees. Having onsite childcare better enables employees with young children to utilize public transportation or shared rides because it simplifies their route to work.

Another consideration should be for the Proponent to offer prioritized vanpool and car pool parking spaces to employees who must drive to work.

We believe measures such as these will work to encourage the use of public transportation, leading to fewer vehicle trips and better air quality for the community and broader region.

Other Shuttle Services

The Proponent states that they will explore the feasibility of shuttle services between the Project and Logan Airport, water transportation terminals, local and downtown hotels, downtown Boston, the Boston Convention and Exhibition Center, the Black Falcon Cruise Terminal, and major tourist attractions. *Where public transportation to and from these destinations is not feasible we encourage the inclusion of these shuttle services in the DEIR's TDM Analysis. We request that the Proponent include in this analysis the use of 'green' shuttle services as described in our comments in the above Service Vehicles section*. **FBIM 19**

Bike and Pedestrian Circulation and Access

The Proponent states "To enhance local and regional connectivity, the Project will improve bike and pedestrian circulation and access." Friends of Belle Isle Marsh believe physical access and connection to the Community is essential to the success of the Project. We encourage the Proponent ensure that the physical design of the Casino is outward facing and welcoming to pedestrians, cyclists and the community as a whole. **FBIM 20**

The Proponent has indicated the design "will promote connectivity to adjacent land uses" and includes on-street bicycle accommodations to connect Constitution Beach to Revere Beach along the Bennington Street corridor, along the connections to the project site behind the Suffolk Downs MBTA Station and from Winthrop Avenue. We support the inclusion of on-street bicycle facilities, but emphasize that it is essential that the Proponent encourage cycling in the safest possible manner. *We ask that MEPA require the Proponent to* **FBIM 21**

investigate and implement wherever possible best practices in cycling infrastructure, such as cycle tracks, bicycle signals, bicycle boxes and other leading- edge design elements, as detailed in the NACTO Urban Bikeway Design Guide in the DEIR. The Proponent should also include bicycle wayfinding signs in accordance with the Manual on Uniform Traffic Control Devices.

In addition, it is essential that the bike facility locations are sited so as to not only improve access to the project site, but also to provide meaningful network linkages to the larger bicycle network. *To this end, we request that MEPA require the Proponent to report on how it is coordinating with all stakeholders, including the Metropolitan Area Planning Council, who is already coordinating efforts to create networks for safe non-vehicular traffic in Revere, Chelsea, Everett, Malden, Saugus and Lynn*. **FBIM 22**

We ask that MEPA strongly encourage the Proponent to explore sponsorship opportunities to bring the Hubway Bike Share system to East Boston and Revere on and around the project site. Hubway Bike Share would provide accessibility to cycling for visitors and employees as well as local residents. Cycling is ideal for short distances, displacing short vehicular trips. The Hubway system would allow local employees to commute via bicycle, provide a means for local residents to enjoy the open spaces of the project area, allow visitors to the casino to explore the neighborhoods of East Boston and Revere, and generally help integrate the Casino site with the community. **FBIM 23**

We ask MEPA to require the Proponent to include in its DEIR Pedestrian Access analysis how the Proponent may fund and facilitate the build-out of the East Boston Greenway to the Belle Isle Marsh and beyond, to Revere Beach. Building out the greenway will improve access to the Marsh, make important connections in the neighborhood and continue to improve the quality of life in East Boston and Revere for residents and visitors alike. The greenway build-out also advances the Casino project's stated pedestrian and bicycle circulation goals. **FBIM 24**

Safe sidewalks and crossings will become even more important as traffic volumes increase. In the ENF, the Proponent indicated "Sidewalks are provided on the majority of the study area roadways, but the physical condition of sidewalks and ADA compliance is deficient in several locations, and appropriate pedestrian crossing accommodations are absent at many locations." *We ask MEPA to require the Proponent to include in its DEIR analysis the undertaking and funding of a near-term project to repair and upgrade these identified sidewalk deficiencies.* **FBIM 25**

In order to reinforce the stated goals to enhance pedestrian connections and circulation, *we ask MEPA to encourage the Proponent to develop a robust pedestrian wayfinding system for the project area and the surrounding community.* A well-designed pedestrian wayfinding system encourages pedestrians by allowing them to easily navigate from place to place and understand their surroundings. This will benefit the Casino by helping guide pedestrian visitors to Casino facilities, and will allow visitors to enjoy the larger community with greater ease. **FBIM 26**

Urban Design, Open Space & Landscaping

We applaud Caesar's commitment to green building and their public pledge to build the greenest Casino in the Country at Suffolk Downs. However, to truly lead the industry with the Suffolk Downs project, the Proponent must pursue LEED Platinum status rather than LEED Gold. *We request that MEPA strongly encourage the Proponent to build Caesars Suffolk Downs as a LEED Platinum project and report the feasibility of this endeavor in the DEIR.* **FBIM 27**

While we applaud the stated decrease in impervious surfaces in the Project, *we ask MEPA to ensure the Proponents explore the use of permeable paving wherever possible on the site to further improve storm water management, particularly in the parking areas and pedestrian spaces*. There are several tested options for impervious parking lot applications, including pervious concrete, porous asphalt, and porous pavers. Use of permeable paving will also allow the Proponent the opportunity to reclaim and reuse the existing site asphalt. **FBIM 28**

Under the Expanded Gaming Law, applicants for gaming licenses are encouraged to procure or produce 10 percent of their annual electricity consumption from renewable sources. *We ask that MEPA require the Proponent to include in the DEIR an analysis of generating on-site enough renewable energy to meet, at a minimum, this 10 percent suggestion. In addition, we would like the Proponent to provide an analysis of how it may cover 50% and 100% of its annual electricity consumption with onsite and procured renewable energy.* A strong commitment to renewable energy is essential in the face of tremendous trip generation and the resultant air pollution expected from the Project. **FBIM 29**

Additional Studies

In addition to the environmental impacts that are already slated for study, we request that MEPA require the Proponent undertake several additional studies related to the impact of the development on the physical environment, including a light pollution study and a signage study.

The Proponent includes solar glare under the Development Review Components, however, *we encourage MEPA to require a comprehensive light pollution study to evaluate and recommend mitigations measures for all impacts of lighting planned for the project*, both interior and exterior, addressing issues of light trespass, over-illumination, and sky-glow. The investigation should look at the light impact on area wildlife, the project area generally and specifically on the residential neighborhood of Orient Heights directly abutting the project area. Recommendations for mitigation should include issues of shielding, color temperature, building materials, and other relevant issues. **FBIM 30**

We also urge MEPA to require investigation of visual blight from signage in the project area and surrounding communities. The current visual clutter of signage- from billboards to accessory signs in digital and traditional formats- lacks a cohesive scheme to unify and beautify the area. The study should include an inventory and analysis of the existing signage in the project area and surrounding environs, looking at zoning regulation and compliance. The study recommendations should include both the signage plan for the **FBIM 31**

Project, as well as recommendations for an area-wide scheme to improve signage aesthetics for the overall benefit of both the casino and the community. This project is a perfect opportunity to address this ongoing issue instead of compounding the problem.

Construction Considerations

As close neighbors to the project site, the Friends of Belle Isle Marsh are concerned about the conditions and impacts during the construction period, particularly potential negative impacts on Belle Isle Marsh and Creek. *We ask that MEPA require the Proponent include in the DEIR, in great detail, how construction of the Caesars Resort at Suffolk Downs will not negatively impact in any way the Belle Isle Creek, the Belle Isle Marsh or any of the Critical Environmental Area in and around the site.* The Proponent included numerous construction considerations, and we encourage them to pursue even more stringent policies and procedures to avoid negative construction impacts. We encourage the use of liquidated damages with contractors and sub-contractors to ensure that all stated precautions and mitigations are properly implemented. **FBIM 32**

Community Development

To further mitigate the environmental impact of the Casino in an ongoing manner*, we encourage MEPA to requirement consideration of long-term funding for "green jobs" and "green job training" in the mitigation plan.* Funding youth employment in conservation, such as Youth Conservation Corp (YCC) sponsored by Boston Natural Areas Network (BNAN) and creating training programs in the East Boston and Revere Communities, will both demonstrate the Proponents commitment to sustainability and nurture environmental stewards within the Community. **FBIM 33**

Comments on Process

In the past, with just a few exceptions, our community has been bruised by a lack of strong mitigation measures to avoid the worst of the resulting impacts and the lack of enforcement of mitigation agreements. As a result, we are exceedingly concerned with the impacts of the proposed Caesars Resort at Suffolk Downs and with the sequencing of the development and its related future developments in our area. To ensure that any proposed development truly has a positive impact on the neighborhood and on the related park lands, w*e would like to ask MEPA for assurance that any mitigation agreements made with the Proponent will be required and perhaps even provided as a requirement of any related state permits.* **FBIM 34**

Massachusetts Expanded Gaming Law Chapter 194, *An Act Establishing Expanded Gaming in the Commonwealth,* Section 10(c) states:

> "In awarding a category 1 license, the commission shall determine at what stage of construction a licensee shall be approved to open for business; provided, however, *that a licensee shall not be approved to open for business until the commission has*

> *determined…that total infrastructure improvements onsite and around the vicinity of the gaming establishment, including projects to account for traffic mitigation as determined by the commission, shall be completed before the gaming establishment shall be approved for opening by the commission*." (emphasis added)

Although this provides us with some hope that the Proponent will be required to fulfill the commitments they make, the fact that Phase 2 of the Gaming Regulations have not been completed gives us little guarantee as to what the Gaming Commission will require of the Proponent in terms of mitigation. It is understood that this issue is out of MEPA's jurisdiction. However, we believe that the current openness of the process on the Gaming Commission's end makes it all the more important that MEPA does everything it can to ensure that the Proponent meets all requirements under State jurisdiction. In addition, we would like to express our desire that the cities of Boston and Revere withhold occupancy permits until all mitigation has been completed. We encourage Revere and Boston officials to make this a requirement in their Host Community Agreements.

In Conclusion

In recent years, there has been some significant progress in making East Boston a greener, healthier neighborhood, and Friends of Belle Isle Marsh is happy to have played a significant role in these changes. We still face significant challenges from development around Belle Isle Creek and Belle Isle Marsh, many of which we have mentioned here. It is important that the positive trend continue, especially in the face of significant developments like the Caesars Resort at Suffolk Downs proposal.

First and foremost, we request that the Proponents be required to include in the DEIR a Comprehensive Corridor Study performed in conjunction with all applicable planning, design, and regulatory bodies at the local, state, and regional levels. For the reasons described above, this is the best way to ensure that roadway improvements done along the Corridor improve traffic conditions and air quality at the Belle Isle Marsh and in our local communities.

Although we believe that a Comprehensive Corridor Study is vitally important, the additional comments included in this letter are also of the utmost concern to the Friend of Belle Isle Marsh.

We ask that MEPA take seriously our concern for the health and vitality of the Belle Isle Marsh, and our community, and incorporate our requests into the upcoming DIER process. We urge MEPA to ensure that this Project, should it come to fruition, be a positive for the community and for our natural environment

Sincerely,

Daniela Foley

President
Friends of Belle Isle Marsh

FRIENDS OF BELLE ISLE MARSH

FBIM 01 **The Friends of Belle Isle Marsh is exceedingly concerned with the impacts the Project may have on Belle Isle Creek and Marsh and the broader local floodplain and wetlands... We want assurance that these Areas of Critical Environmental Concern are protected during both construction of the Resort as well as during its ongoing operations.**

Stormwater discharges during construction will be managed under a SWPPP prepared in accordance with the U.S. EPA NPDES Stormwater CGP and MassDEP stormwater regulations. Implementation of the SWPPP will include sedimentation and erosion control measures and other BMPs. The Project should not result in any impacts to Belle Isle Creek or adjacent Salt Marsh areas located north and east of the Project site.

FBIM 02 **We believe that the Proponent is taking a piecemeal approach to roadway improvements. We urge MEPA to require the Proponents to conduct a Comprehensive Corridor Study of the Route 1A area from the Sumner, Callahan, and Ted Williams tunnels to Copeland Circle. This corridor study should be done in conjunction with all applicable planning, design, and regulatory bodies at the local, regional, and state levels.**

Options for Route 1A infrastructure improvements are presented in Section 5.5. The Proponent has committed to a comprehensive package of roadway improvements in the HCAs with Revere and Boston HCAs (see Section 5.6). The City of Boston HCA includes a commitment to perform a Route 1A planning study.

FBIM 03 **There have been a number of transportation analyses done of this area in the past. However, due to the size of this Project and the forecasted increase in vehicular trips, an up-to-date, holistic review of the corridor is necessary.**

The City of Boston HCA includes a commitment to perform a Route 1A planning study.

FBIM 04 **We ask that the Proponent be required to include the 415 McClellan project, the truck traffic generated from Global Petroleum's current and future operations, as well as any other projects that may reasonably effect the corridor, in its Draft EIR transportation analysis.**

The DEIR/EPNF analysis includes regional background growth as determined by MassDOT and all background projects required by the cities of Revere and Boston, including 415 McClellan Highway. Global Petroleum's operations are captured in existing traffic counts.

FBIM 05 **We ask that the Proponent be required to prove that additional vehicular traffic will not affect emergency services to the surrounding residential neighborhoods and local commercial, retail, and maritime areas. This analysis should include a scenario in which there is a serious accident at the Global Petroleum terminal.**

The traffic analyses presented in Sections 5.5 and 5.7 projects overall improved traffic operations under Build compared to No Build conditions as a result of the extensive roadway improvements committed to in the HCAs. The overall improvement would be expected to improve conditions for emergency access.

FBIM 06 **We urge a more in-depth analysis of [the Route 1/Route 16 interchange] and of the relationship effects of any other design changes along other parts of the corridor. We are concerned particularly with how any changes to this area will affect Bell Circle (Route 1A and Route 60).**

Proposed improvements at the Route1/Route 16 interchange, the Route 16/Route 145 intersection, and at Bell Circle are described in Section 5.6, and operational analysis is presented in Section 5.7.

FBIM 07 **The difficulty faced by Route 1A Southbound travelers accessing Route 16 eastbound must be remedied. For decades, Route 60 has been the route used by southbound traffic accessing Logan Airport. To lessen the traffic load on Route 60, including traffic generated by Logan Airport, the solution to the Route 1/Route 16 interchange has to be seen by the general populace as a significant improvement over current conditions or these travel patterns, ingrained over decades, will not change.**

The Proponent shares this position, and at the request of the City of Revere has committed to provide improved connections at Route 1/Route 16 in coordination with MassDOT, DCR, and the cities of Revere and Chelsea.

FBIM 08 **To our knowledge, a region wide, comprehensive plan for the corridor has not been completed. The Suffolk Downs development only heightens the need to perform this study.**

The Boston MPO's Lower North Shore Transportation Improvement Study was prepared by the CTPS Staff for the Massachusetts Highway Department in October 2000.

FBIM 09 **Similar to what they have offered at the Route 1/Route 16 intersection, the Proponent has provided a concept design to ostensibly ameliorate traffic congestion at Boardman Street and Route 1A. Although this plan may well be of some benefit if implemented, it is imperative that any plans for the Boardman Street intersection be looked at within the broader context of the Route 1A corridor.**

As requested by MassDOT, an alternatives analysis for Route 1A improvements is presented in Section 5.5.

FBIM 10 **As with the other potential Roadway Improvements listed in the ENF, we would like any long-term design changes at [Waldemar and Tomasello Drive to] be implemented after a Comprehensive Corridor Study is completed.**

Changes to improve safety and traffic operations at the Waldemar Avenue and Tomasello Drive intersections on Route 1A are included in all Route 1A improvement options presented in Section 5.5.

FBIM 11 **We ask that MEPA require the Proponent to show that service and commercial traffic will not have an auditory or visual impact on the Belle Isle Marsh, Belle Isle Creek, or Sales Creek.**

Noise levels in the marsh or creeks were not evaluated since relevant noise criteria do not apply at these locations. However, noise impacts at the closest residences to the east of the Resort along Bennington Street are discussed in Section 6.6.4.2. Results of these analyses indicate that predicted sound levels due to stationary mechanical equipment, increased traffic volumes, and temporary construction activities are not anticipated to cause a significant noise impact on the surrounding community, and, with appropriate mitigation, are expected to meet relevant noise limits at all noise-sensitive locations.

FBIM 12 **To ensure that service and other commercial vehicles employed by the Resort do not contribute to undue air pollution, we propose that the Proponent include an analysis of operating only "green" vehicles such as hybrid, electric, and compressed natural gas in its business operations.**

Although the number of Resort operational vehicles is small, the Proponent is committed to using alternatively-fueled vehicles in its shuttle fleet and possibly other on-site equipment such as carts and maintenance equipment as feasible.

FBIM 13 **We ask that the Proponent investigate requiring outside suppliers and transportation providers of the Resort to utilize green vehicles and report its findings in the DEIR. At the very least, suppliers and transportation providers, including Taxi companies, should be required to retrofit their vehicles with state of the art pollution control equipment such as emission control equipment, idle reduction technologies, and engine upgrades or replacements. Because this could be seen as a financial burden to some local suppliers, the Proponent should subsidize these efforts, making them affordable…**

The Proponent will encourage the use of alternative-fueled vehicles with companies directly subcontracted to work at the facility; however, there are no plans to mandate the use of such vehicles or subsidize conversion of fleet vehicles. The ground shuttle fleet to be used by the Proponent's shuttle provider is expected to be exclusively or nearly exclusively made up of green vehicles.

FBIM 14 **We ask that MEPA require that further Air Quality Analysis should be based on the number of parking spaces currently utilized at the existing Suffolk Downs site, not on the number of parking spaces currently available. Average peak occupancy of current available parking spaces is far less than the number of parking spaces at the existing Suffolk Downs site.**

Air quality analysis is performed based on vehicle activity (existing and projected) rather than numbers of parking spaces. Therefore, as suggested in this comment, the air quality analysis reflects the occupancy/utilization of the parking spaces rather than the number of spaces available.

FBIM 15 **We ask that MEPA also require that the DEIR crash analysis incorporate the impact of casino traffic on public safety, and commit to mitigate any issues that may arise from this analysis.**

A crash analysis is presented in Section 5.2.11. While there will be an increase in traffic on the roadway network supporting the Project site, this does not suggest a corresponding increase in crashes. Significant roadway, traffic, and pedestrian safety improvements will be provided by the Project, some of which address pre-exiting safety issues.

FBIM 16 **We ask that the Proponent work with the MBTA to assess additional capacity needs on the Blue Line and the bus lines servicing the Project site and include their findings in the DEIR. This evaluation should include late night service and the addition of express buses to and from the resort as needed. We encourage the Proponent to contribute financially to this increase in service if necessary... We ask that MEPA require the Proponent to report on scheduling additional express bus service to Downtown Boston and Wonderland Station during these peak special events [e.g., Revere Beach Sandsculpting Festival] in the DEIR.**

A comprehensive transit analysis in presented in Sections 5.2.1 and 5.8.1 for existing and future Build conditions, respectively.

FBIM 17 **To encourage use of public transportation, we believe that it is important to treat the connection between the Suffolk Downs MBTA station and the resort in a similar fashion to the Tomasello entrance. A shuttle service to and from the MBTA station is a bare minimum. We request that the Proponents consider additional**

improvements to this connection. These should include a seamless, sheltered pedestrian connection from the station and the resort reflecting the attention to detail and feel of the Tomasello Drive entrance…

In addition to enhancements to this shuttle service itself, significant pedestrian, bicycle, and streetscape/landscape improvements are described in Sections 1.0 and 4.0.

FBIM 18 We request that MEPA require the Proponent to provide an analysis in the DEIR of employer-sponsored TDM strategies… We request that the Proponent provide free MBTA Charlie Cards to all employees who use transit to get to work… Another consideration should be to provide onsite childcare to employees… Another consideration should be for the Proponent to offer prioritized vanpool and carpool parking spaces to employees…

A robust TDM plan is presented in Section 5.9.

FBIM 19 The Proponent states that they will explore the feasibility of shuttle services between the Project and Logan Airport, water transportation terminals, local and downtown hotels, downtown Boston, the Boston Convention and Exhibition Center (BCEC), the Black Falcon Cruise Terminal, and major tourist attractions. Where public transportation to and from these destinations is not feasible we encourage the inclusion of these shuttle services in the DEIR's TDM Analysis. We request that the Proponent include in this analysis the use of "green" shuttle services…

Multiple potential destinations are identified in the shuttle plan presented in Section 5.8.3.2. Shuttle service is also described in Section 1.1.1.2.

FBIM 20 We encourage the Proponent to ensure that the physical design of the casino is outward facing and welcoming to pedestrians, cyclists, and the community as a whole.

Section 4.0 describes the Project's urban design concepts. Sections 1.4 and 4.4.7 describes how the pedestrian and bicycle connections designed in concern with the rest of the Project are intended to be inviting from surrounding communities.

FBIM 21 We ask that MEPA require the Proponent to investigate and implement wherever possible best practices in cycling infrastructure, such as cycle tracks, bicycle signals, bicycle boxes and other leading-edge design elements, as detailed in the NACTO Urban Bikeway Design Guide in the DEIR. The Proponent should also include bicycle wayfinding signs in accordance with the Manual on Uniform Traffic Control Devices.

The Proponent will work with the cities of Boston and Revere to incorporate best practices in proposed bicycle infrastructure to the extent possible.

FBIM 22 **It is essential that the bike facility locations are sited so as to not only improve access to the Project site, but also to provide meaningful network linkages to the larger bicycle network. To this end, we request that MEPA require the Proponent to report on how it is coordinating with all stakeholders, including the MAPC, who is already coordinating efforts to create networks for safe non-vehicular traffic in Revere, Chelsea, Everett, Malden, Saugus and Lynn.**

Improvements for bicycle access to the Project site, as described in Sections 1.4 and 5.8.3, have been identified with a view to creating missing linkages.

FBIM 23 **We ask that MEPA strongly encourage the Proponent to explore sponsorship opportunities to bring the Hubway Bike Share system to East Boston and Revere on and around the Project site.**

The Project includes two Hubway stations, the locations for which were determined in coordination with BTD and representatives from the City of Revere. Infrastructure will be installed to support the two stations, and they will be deployed at the Proponent's cost when the City deploys its East Boston Hubway system. The Proponent is committed to active participation with local municipalities to encourage regional deployment of the bike share system to help alleviate traffic congestion in the area.

FBIM 24 **We ask MEPA to require the Proponent to include in its DEIR Pedestrian Access analysis how the Proponent may fund and facilitate the build-out of the East Boston Greenway to the Belle Isle Marsh and beyond, to Revere Beach.**

Section 4.1 describes the Resort's proximity to East Boston's network of open spaces.

FBIM 25 **In the ENF, the Proponent indicated "sidewalks are provided on the majority of the study area roadways, but the physical condition of sidewalks and ADA compliance is deficient in several locations, and appropriate pedestrian crossing accommodations are absent at many locations." We ask MEPA to require the Proponent to include in its DEIR analysis the undertaking and funding of a near-term Project to repair and upgrade these identified sidewalk deficiencies.**

Off-site sidewalk disrepair, ADA deficiencies, and missing pedestrian accommodations will be addressed as part of the proposed improvements under the HCAs.

FBIM 26 **To reinforce the stated goals to enhance pedestrian connections and circulation, we ask MEPA to encourage the Proponent to develop a robust pedestrian wayfinding system for the Project area and the surrounding community.**

The Project will provide robust wayfinding for pedestrians and bicycles throughout the site.

FBIM 27 **To truly lead the industry with the Suffolk Downs project, the Proponent must pursue LEED Platinum status rather than LEED Gold. We request that MEPA strongly encourage the Proponent to build Caesars Suffolk Downs as a LEED Platinum project and report the feasibility of this endeavor in the DEIR.**

As the Project design progresses, the Proponent shall continue to review and research the feasibility of the LEED credit points not currently listed as attempted that may enable the Project to attempt a LEED Platinum Certification. Section 2.2 includes a summary LEED NC 2009 scorecard demonstrating how Proponent will achieve LEED Gold Certification and a detailed analysis of the LEED NC 2009 prerequisites and credits the Project is targeting for achievement.

FBIM 28 **We ask MEPA to ensure the Proponents explore the use of permeable paving wherever possible on the site to further improve stormwater management, particularly in the parking areas and pedestrian spaces.**

Pervious pavement will be utilized, when appropriate, in pedestrian and plaza areas of the project. Pervious pavements will not be used along the main roadways and driveways or the surface parking areas due to the intensity of use.

FBIM 29 **Under the Expanded Gaming Law, applicants for gaming licenses are encouraged to procure or produce 10 percent of their annual electricity consumption from renewable sources. We ask that MEPA require the Proponent to include in the DEIR an analysis of generating on-site enough renewable energy to meet, at a minimum, this 10 percent suggestion. In addition, we would like the Proponent to provide an analysis of how it may cover 50% and 100% of its annual electricity consumption with onsite and procured renewable energy.**

The Project design includes installation of an approximately 2.7-MW PV array that will provide approximately 10% of the Resort's estimated annual electricity use. The Project owner will also purchase renewable energy certificates to provide green power for a portion of the Resort's electricity needs that are not generated on site. In combination, these efforts will account for approximately 45-50% of the Resort's estimated electricity requirements. The Project design also includes the installation of two 100 kW CHP units. In addition, designated areas will be incorporated into the Project design to address collection and storage of bio-waste from food production, which will be transported to an organics recycling center where it will be processed through an Anaerobic Digester Plant to produce electricity. As the design progresses, the Proponent will continue to assess additional areas for the installation of additional PV panels.

FBIM 30 **We encourage MEPA to require a comprehensive light pollution study to evaluate and recommend mitigation measures for all impacts of lighting planned for the Project, both interior and exterior, addressing issues of light trespass, over-illumination, and sky-glow.**

The Proponent is committed to providing a site lighting design based on Dark Sky policies and strategies. Cutoff fixtures with energy efficient LED lighting will be considered along sensitive residential edges such as the Orient Heights neighborhood. Newly created open spaces between Tomasello Drive and Orient Heights will be landscaped to create a natural buffer zone to minimize light pollution. The Proponent will achieve a LEED Gold rating from the USGBC. One of the key strategies for reducing energy is a comprehensive lighting design strategy. Please refer to Section 2.0 for detailed building and site design strategies. In addition to the proposed strategies for light mitigation, as the site and building design further develops the Proponent will provide a detailed impact analysis and outline further strategies to minimize the lighting impacts from the development to the surrounding abutters.

FBIM 31 **We also urge MEPA to require investigation of visual blight from signage in the Project area and surrounding communities.**

The Proponent is sensitive to its relationship with host and surrounding communities, and will work to ensure exterior signage and lighting provides visual aesthetics for the Resort without negatively impacting surrounding communities.

FBIM 32 **We ask that MEPA require the Proponent to include in the DEIR, in great detail, how construction of the Caesars Resort at Suffolk Downs will not negatively impact in any way the Belle Isle Creek, the Belle Isle Marsh, or any of the ACEC around the site.**

The Project will meet and exceed MassDEP Stormwater Management Guidelines regarding water quality treatment in critical areas. The Project will utilize LID BMPs including bioretention basins, bioswales, water quality swales, pervious pavers, and rainwater reuse tanks to improve the water quality of stormwater discharges to the Belle Isle Inlet and Rumney Marshes ACEC relative to existing conditions (see Section 9.3).

The minor on-site activities proposed in the Sales Creek RFA include proposed stormwater management system improvements and upgrades and construction of a small floodplain compensatory storage area adjacent to Sales Creek. Proposed upgrades to the stormwater management system, including any new or modified discharges, will be set back from Sales Creek and will comply with MassDEP stormwater standards. No work is anticipated to occur on or below the Inland Bank of Sales Creek or its adjoining BVW. Sedimentation and erosion controls, and a

clearly delineated limit of work setback, will protect these resource areas during construction. The proposed upgrades to the stormwater management system should substantially improve the quality of discharged water relative to existing conditions. As demonstrated in Section 6.9, these activities have been designed to fully comply with WPA performance standards.

Stormwater discharges during construction will be managed under a SWPPP prepared in accordance with the U.S. EPA NPDES Stormwater CGP and MassDEP stormwater regulations. Implementation of the SWPPP will incorporate sedimentation and erosion control measures and other BMPs. The Project should not result in any impacts to Belle Isle Creek or adjacent Salt Marsh areas located north and east of the Project site.

FBIM 33 **We encourage MEPA to require consideration of long-term funding for "green jobs" and "green job training" in the mitigation plan. Funding youth employment in conservation, such as Youth Conservation Corp (YCC) sponsored by Boston Natural Areas Network (BNAN) and creating training programs in the East Boston and Revere Communities, will both demonstrate the Proponent's commitment to sustainability and nurture environmental stewards within the community.**

As demonstrated herein, Caesars and Suffolk Downs maintain a deep commitment to sustainability and associated job creation. However, the Proponent is still evaluating which local programs it is possible to support.

FBIM 34 **We would like to ask MEPA for assurance that any mitigation agreements made with the Proponent will be required and perhaps even provided as a requirement of any related state permits.**

Proposed Section 61 Findings for each of the state agencies from which the Project is seeking permits are provided in Section 10.0. These proposed Section 61 Findings include by reference the proposed mitigation measures.

From: smh00a@gmail.com [mailto:smh00a@gmail.com] **On Behalf Of** Steve Holt
Sent: Thursday, March 21, 2013 3:38 PM
To: Buckley, Deirdre (EEA)
Subject: EEA No.15006

My written concerns regarding the proposal for a resort casino at Suffolk Downs, East Boston:

- The ability of Caesars to financially sustain its environmental infrastructure in the future, given its debt of over $20 billion **HLT 01**
- Past environmental infractions by Suffolk Downs -- will those be taken into account in the final MEPA report? Last summer, of course, Suffolk Downs was fined $1.25 million after it was discovered that for almost a decade, the racetrack discharged horse manure and other waste into local tributaries and the Boston Harbor. It has been shown that if a business offends once, it will offend again, so this should be noted in your report.
- Suffolk Downs estimated last summer in its initial traffic plans that a casino would produce 10,000-15,000 new car trips every day. In its most recent report, that number is close to 25,000 new car trips. This is a huge discrepancy, resulting in far more emissions. Can Suffolk explain this discrepancy? **HLT 02**
- The wellbeing of the horses: When casinos are added to race tracks, the purses increase, putting more pressure on jockeys and owners to run tired, injured, or old horses. At Aquaduct Race Track in Queens, this led to a 100% increase in horse deaths last year after slots were introduced the year before. (NYT story) **HLT 03**

Thank you for considering these concerns! Let me know if you have any questions.

Best,

Steve Holt

Journalist • Writer • Editor
T: 617-447-6519

HOLT, STEVE

HLT 01 **[I am concerned about] the ability of Caesars to financially sustain its environmental infrastructure in the future, given its debt of over $20 billion.**

Caesars is more than capable of meeting and exceeding its financial and environmental commitments, and is looking forward to developing and operating a world-class resort in Boston with its partners. The company has more than $2 billion cash on its balance sheet and has successfully financed and developed two projects in Ohio in the last two years and financed its Baltimore project earlier this year.

HLT 02 **Suffolk Downs estimated last summer in its initial traffic plans that a casino would produce 10,000-15,000 new car trips every day. In its most recent report, that number is close to 25,000 new car trips… Can Suffolk explain this discrepancy?**

This apparent discrepancy reflects confusion between patron cars and patron car trips. Each patron car generates two car trips, comprising the arrival and departure of that car.

HLT 03 **[I am concerned about] the wellbeing of the horse. When casinos are added to racetracks, the purses increase, putting more pressure on jockeys and owners to run tired, injured, or old horses.**

Suffolk Downs has a proven track record of commitment to the health and safety of its equine athletes both during their racing careers and after they have retired from racing. In a 2012 New York Times study, Suffolk Downs had one of the lowest rates of injury and breakdown in the country, ranking sixth among the 62 racetracks included in the study. The track has received full accreditation from the National Thoroughbred Racing Association's Safety and Integrity Alliance following a complete review of operations at the facility, and it strongly advocated for the Massachusetts Gaming Commission's decision to improve safety and testing standards in the state. Suffolk Downs currently employs two veterinarians to examine every horse before and after every race. In 2008, Suffolk Downs became the first racetrack in the country to implement a strict anti-slaughter policy for owners and trainers with horses stabled on its grounds. Virtually every major racetrack in the country has adopted a similar policy.

From: Andrew Hunt [mailto:ahuntd@gmail.com]
Sent: Thursday, March 21, 2013 7:47 AM
To: Buckley, Deirdre (EEA)
Subject: EEA No.15006 Suffolk Downs Casino

I am opposed to the casino for the following reasons:

- Traffic is already a nightmare with cars sitting and polluting the air constantly **HNT 01**
- Traffic mitigation is handled by an $80,000/year trooper operating the signals at Boardman St manually
- More cars=more pollution
- More visitors=more trash **HNT 02**

Regards,

Andrew Hunt
202.352.4579 -- cell

HUNT, ANDREW

HNT 01 **Traffic is already a nightmare with cars sitting and polluting the air constantly... Traffic mitigation is handled by an $80,000/year trooper operating the signals at Boardman Street manually.**

The traffic analysis in Section 5.5 demonstrates that Route 1A improvements will address existing traffic congestion over and above the impact of Project vehicle trips. It is expected that trooper operation of the signals at Boardman Street will be eliminated as a result of the improvements to be constructed on Route 1A.

HNT 02 **More visitors [will mean] more trash.**

The Proponent is committed to responsibly and sustainably handling and processing Project waste, as demonstrated in this filing.

DB

Mass Audubon
Advocacy Department
Six Beacon Street, Suite 1025 ▲ Boston, Massachusetts 02108
tel 617.962.5187 ▲ fax 617.523.4183 ▲ email jclarke@massaudubon.org

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March 26, 2013

Secretary Richard K. Sullivan, Jr.
The Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office
Deirdre Buckley, **EEA #15006**
100 Cambridge Street, Suite 900
Boston, MA 02114

Via Email: Deirdre.Buckley@state.ma.us

Re: *Caesars Resort at Suffolk Downs, East Boston and Revere* (**EOEEA#15006**), and *Belle Isle Marsh Boardwalk* (**EOEEA#15015**)

Dear Secretary Sullivan:

On behalf of Mass Audubon, I submit the following comments on the Environmental Notification Form (ENF) for the proposed casino resort project at Suffolk Downs in Boston and Revere. The project requires preparation of a full Environmental Impact Report (EIR) as it triggers mandatory EIR thresholds for alteration of more than 50 acres of land and generation of more than 3,000 vehicle trips per day. It also triggers ENF thresholds for wastewater and work within an Area of Critical Environmental Concern (ACEC). The project is subject to review of energy consumption and associated emissions under the *Massachusetts Environmental Policy Act* (MEPA) *Greenhouse Gas* (GHG) *Emissions Policy and Protocol*. The EIR should be comprehensive and should include all existing and proposed development on the site and associated off-site projects including transportation improvements and any other projects such as the boardwalk at Belle Isle Marsh that was recently proposed under EEA #15015. Continued operation of the horse barns and associated management of horse waste on the site should be part of the EIR. There should be no segmentation of review of any aspect of the project.

Mass Audubon does not have a position on gambling, gaming, or casinos in general. We do, however, have serious concerns and a variety of suggestions regarding development of large scale destination-type resort casino complexes with a goal to avoid, minimize, and/or mitigate where possible the environmental impacts of such major development projects on the environment. The law that established gaming in Massachusetts (*Chapt. 194 of the Acts of 2011*) set mandatory and optional qualifying criteria for the Gaming Commission to consider when reviewing and deciding on gaming applications. Mass Audubon believes that, to the fullest extent possible, the highest standards of green development and sustainability should be required in all state and local licensing and permitting of gaming facilities.

The gaming law also requires the establishment of a Community Mitigation Fund. This fund should be equitably distributed to assist Boston, Revere and other appropriate surrounding communities in offsetting costs related to casino construction and operation. The EIR should fully document all impacts to surrounding communities and demonstrate the manner in which those impacts will be addressed.

Overview

The project site is comprised of 161 acres in the cities of Boston and Revere. The site is in a heavily urbanized environment with significant natural and built environmental constraints and sensitivities including Sales Creek and substantial areas of floodplain on the site; Belle Isle Marsh and the Rumney Marshes ACEC; already overburdened roadways; and adjacent industrial uses including tank farms. The site is served by the MBTA's Blue Line subway. The proposed project is a major gaming facility with associated amenities including two hotels with up to 450 guestrooms, 200,000 sf of gaming space, plus retail establishments, multi-purpose meeting and entertainment space, 16 restaurants, surface and structured parking, and support facilities including a central utility plant. There will be over 1.8 million sf of new development and the project will generate an estimated 24,600 vehicle trips per day.

The existing Suffolk Downs racecourse with associated horse stables and grandstand will remain and the existing clubhouse will be renovated. The ENF does not include the existing horse barns in the estimated amount of existing development. The EIR should be comprehensive and include analysis of all environmental impacts and mitigation including management of horse waste, which was the subject of a recent consent agreement between Sterling Suffolk Racecourse and the US Environmental Protection Agency (EPA.) **AUD 01**

Sustainable Design and Operation

The project proponent, Sterling Suffolk Racecourse, LLC is partnering with Caesars Entertainment in undertaking the project. Caesars has a corporate sustainability policy, *CodeGreen*, and the ENF indicates a commitment to build the project to a minimum of LEED Gold standard, including measures related to the guidelines for Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, and Indoor Environmental Quality. The ENF describes proposed improvements to existing conditions including reconfiguration of parking to reduce the number of surface spaces and incorporate vegetative filtering areas to manage stormwater runoff. The ENF also includes commitments to work with MassDOT on improvements to roadways in the project vicinity along with improvement to pedestrian and bicycle access and connections to nearby open spaces and greenways. The EIR should fully document all proposed environmental and sustainability commitments including the proposed timing of off-site transportation improvements in relation to the on-site development. **AUD 02**

See also comments below regarding energy and GHG, floodplains and wetlands, water, wastewater, stormwater, landscaping, transportation, and connections to open spaces and greenways.

Bird-Friendly Design: Mass Audubon requests that the project be designed to meet the new LEED Pilot Credit for Bird Collision Deterrence (PC55). Bird collisions with buildings are a significant factor in bird mortality. Design features such as alternatives to large expanses of reflective glass on facades and the placement of landscape materials in relation to buildings can greatly influence the degree to which a facility is or is not a hazard to birds. Given the site's proximity to the Belle Isle and Rumney **AUD 03**

Marshes ACEC frequented by many migratory and resident birds, we urge that the project be designed in a manner that will maximize its habitat value while minimizing bird collision hazards.

Wildlife and Habitat; ACEC: The Suffolk Downs development plans should demonstrate to state and city officials how their casino development will avoid, minimize, and mitigate impacts to the adjacent Department of Conservation and Recreation (DCR) owned Belle Isle Marsh Reservation. Belle Isle is significant as a component of the state-designated Rumney Marsh ACEC and there may be opportunities to contribute to the Marsh's ongoing restoration project. AUD 04

SEP and Environmental Projects in Surrounding Area

Sterling Suffolk Racetrack recently agreed to fund three Supplemental Environmental Projects (SEPs) as part of a consent decree with EPA in relation to water quality violations under the *US Clean Water Act* from the Confined Animal Feeding Operation (CAFO) at the horse barns. Improvements were also made to drainage in the area of the horse barns to direct runoff contaminates with horse waste in the sewer system. The SEPs included $495,000 to the Mystic River Watershed Association for water quality monitoring and public education; $90,000 to the Saugus River Watershed Council for water quality monitoring and public outreach; and construction of a boardwalk and interpretive signage at DCR's Belle Isle Marsh Reservation. An ENF for the Belle Isle Marsh boardwalk was recently reviewed under EEA #15015.

The EIR for the Suffolk Downs Resort Casino should include commitments to ongoing support for environmental protection, restoration, and education projects in Boston, Revere, and surrounding communities. The project will have substantial, ongoing effects to the environment in the vicinity and it should provide continuing support for beneficial projects and initiatives consistent with the project scale. For example, the boardwalk will require maintenance; there is a continuing need for public education and interpretation of the natural resources in the surrounding marshes and waterways; the marshes and waterways would benefit from additional stormwater remediation and other restoration efforts; and the commitment to improving pedestrian and bicycle connectivity to the site will require substantial ongoing state and local partnerships over a period of years to meet the full potential. AUD 05

Energy and Greenhouse Gases

The ENF indicates that the project will be energy efficient and that renewable energy such as solar photovoltaic arrays will be incorporated into the design. The ENF also indicates a possibility of the proponent developing an anaerobic digester for processing of organic food waste and horse waste. The project is subject to the *MEPA GHG Emissions Policy and Protocol*. The EIR should fully document energy use and emissions from on-site equipment, off-site production of electricity (including energy used in providing water and wastewater treatment to the project), and transportation-related emissions. The EIR should document how the project will be designed and operated to minimize GHG emissions to the maximum extent feasible. AUD 06

Massachusetts has committed via the *Global Warming Solutions Act of 2008* to address climate change through mandated GHG emission reductions. The Commonwealth's goals are to reduce emissions by 25% by 2020 and 80% by 2050. For the past two years, the American Council for an Energy-Efficient Economy recognized Massachusetts as the number-one state in the nation for its leadership in energy-efficiency policies and programs in the residential, commercial, industrial, and transportation sectors.

The EIR should demonstrate how it will work in concert with the Commonwealth's GHG reduction and efficiency goals.

In advancing its *Climate Action Plan*, Mayor Menino and the City of Boston have also has made significant commitments to reduce GHG emissions *...through more efficient buildings and vehicles, lower-carbon fuels, reduced driving, more recycling, and other changes in behavior....* To implement the *Plan*, the Boston City Council amended Article 37 of the municipal zoning code to require that all large-scale projects meet the U.S. Green Building Council's LEED certification standards. Boston is the nation's first city to require a green building standard through municipal zoning requirements. The ENF indicates the project will comply with the state's Stretch Code and LEED energy efficiency guidelines, and the EIR should provide detailed information on that. Mayor Menino has also proposed that buildings over 50,000 sf annually report their energy consumption. We urge that the Suffolk Downs casino cooperate with the Mayor by making a commitment to provide to the city and public annual energy audits, irrespective of a mandatory requirement. AUD 07 AUD 08

Water Resources

Wetlands and Floodplains: The EIR should include maps and narrative information delineating all coastal and inland wetland resources on the site or affected by the project including proposed off-site transportation improvements. The site contains historically filled, channeled, and culverted areas of wetlands associated with Sales Creek. Those areas should also be mapped. In addition, the EIR should demonstrate how any of those areas are subject to the standards of the *Massachusetts Public Waterfront Act* (MGL Chapt. 91.) The project design should show a restoration of the functionality and connectivity of area wetland resources, improved water quality over existing conditions to the maximum extent feasible, and provide for proper public access where safe and feasible. AUD 09 AUD 10 AUD 11

The project site contains extensive areas of floodplain. The ENF indicates that areas on the site within the 100-year floodplain may be classified as Bordering Land Subject to Flooding (BLSF) or Land Subject to Coastal Storm Flowage (LSCSF) depending on characteristics pursuant to the *Wetlands Protection Act* regulations. For purposes of the ENF, it is assumed that the floodplain on the site is classified as BLSF, consistent with two existing Orders of Conditions for the site. The performance standards for BLSF are more stringent than for LSCSF, and compensatory flood storage is required for BLSF. Compensatory storage is not required for filling of LSCSF, since it is assumed that fill affecting the ocean will have an imperceptible impact on flood levels. Fill in BLSF does require compensation to prevent increasing flooding effects on adjacent areas. Mass Audubon supports the Boston and Revere conservation commissions' determinations that floodplain areas on the site are classified as BLSF and that compensatory flood storage is required for any fill. The EIR should identify the locations and elevations of all areas of floodplain fill and associated compensatory storage areas. It should demonstrate that the compensatory areas will function to offset the proposed fill in each location based on localized flow patterns and elevations within and adjacent to the site. AUD 12

The ENF indicates that nearly 500,000 sf of floodplain will be altered for the project. A large amount of fill is proposed along the main access roadway to elevate it above storm surges based on predicted sea level rise. This will improve resilience of the site design in regard to climate change and storm surge events. Given the fact that the creeks and drainage ditches on and adjacent to the site flow through a developed and constricted landscape, it is important that any changes to the floodplain and flow patterns be carefully designed to avoid redirecting increased flood flows to adjoining properties. The EIR should AUD 13

include a detailed analysis of hydrology and flow patterns within and around the site pre- and post-construction.

Off-site transportation improvements to address traffic congestion associated with the project are proposed. The EIR should document wetlands impacts associated with those improvements, and should present an analysis of measures to avoid, minimize, and mitigate those impacts. AUD 14

Stormwater and Water Quality Improvement: Surface parking on the site will be reduced and reconfigured, and there will be a net decrease of nine acres of impervious surface. Stormwater from post-construction impervious areas will be filtered through extensive areas of vegetative filtration plantings. This should result in improved water quality. The EIR should also evaluate the potential for restoring more natural flow patterns and/or daylighting of creeks historically filled on or near the site.

The ENF indicates a commitment by the proponent to work with MassDOT and to assist with funding for several potential off-site transportation improvements. The evaluation of these improvements should include plans for achieving a significant net improvement in the water quality in stormwater runoff from those roadways. AUD 15

Water Conservation and Reuse: The ENF indicates that the project will increase water consumption at the site by an estimated 380,000 gallons per day over existing use. Landscape irrigation is projected to utilize 58,000 gallons per day. Water conservation will be achieved through installation of efficient plumbing fixtures and other typical conservation measures. The EIR should fully evaluate all potential measures to minimize water use and generation of wastewater including innovative methods such as maximizing use of stormwater for irrigation and reuse of grey water on-site. The goal for landscape use of potable water should be as close to zero as possible once plantings are established. AUD 16

Landscaping plants should be non-invasive yet resilient in order to minimize the need for irrigation, fertilizer, and energy use associated with landscape maintenance. Selection of species for planting should include consideration of salt tolerance, especially in areas likely to be subject to coastal storm surge events. AUD 17

Wastewater: The ENF indicates that the project will generate an estimated 307,000 gallons per day of wastewater above the existing 166,000 gallons per day (of which 150,000 gallons is from the CAFO.) Improvements are proposed to the local sewer system including a new pump station. The EIR should fully evaluate potential for reduction in generation of wastewater through water use efficiencies. AUD 18

Transportation

The project will generate over 24,000 new vehicle trips per day in a location where the local roadway network is already operating well above capacity. Addressing the transportation systems for the project is perhaps the most challenging topic to be addressed in the EIR. Route 1A is already one of the most congested highways in the Commonwealth as it is not only a busy urban throughway but is the most common route from north of Boston travelers heading to Logan International Airport. The EIR should fully document all transportation-related improvements and mitigation including Transportation Demand Management (TDM), enhanced access to subway and other transit options, and pedestrian and bicycle access within the site and connecting to off-site roads/sidewalks, open spaces and greenways. AUD 19

The proposed Suffolk Downs casino should coordinate with the MBTA to provide additional public transportation, Blue Line, bus, and regional ride-share opportunities. A cars-per-day quota should also be set to reduce traffic congestion and carbon emissions. AUD 20

Solid Waste

The EIR should document anticipated solid waste streams from the project and demonstrate a commitment to the highest possible standards for waste reduction, minimization, and recycling. The potential for the project to develop an anaerobic digestion facility to manage organic waste from the restaurants and horse manure should be evaluated. We encourage the proponent to work with government agencies and local businesses regarding the possibility of an anaerobic digester meeting shared needs and providing efficiencies of scale. This aspect of the project has the potential to convert waste to energy and to be a demonstration project for the application of such technologies in Massachusetts. AUD 21 AUD 22

Thank you for considering these comments when issuing the Scope for the EIR for this major resort casino project.

Sincerely,

John J. Clarke
Director of Public Policy and Government Relations

cc: Chip Tuttle, Sterling Suffolk Racecourse
Corinne Snowdon, Epsilon Associates
Brian Swett, Boston Chief of Environment and Energy
Boston City Council
Daniel Rizzo, Mayor of Revere
Revere City Council
Boston Conservation Commission
Revere Conservation Commission
Edward Lambert, Commissioner, DCR
Boston Harbor Associates
Friends of Belle Isle Marsh
Mystic River Watershed Association
Saugus River Watershed Association

Mass Audubon works to protect the nature of Massachusetts for people and wildlife. Together with more than 100,000 members, we care for 35,000 acres of conservation land, provide school, camp, and other educational programs for 225,000 children and adults annually, and advocate for sound environmental policies at local, state, and federal levels. Founded in 1896 by two inspirational women who were committed to the protection of birds, Mass Audubon has grown to become a powerful force for conservation in New England. Today we are respected for our science, successful advocacy, and innovative approaches to connecting people and nature. Each year, our statewide network of wildlife sanctuaries welcomes nearly half a million visitors of all ages, abilities, and backgrounds and serves as the base for our work. To support these important efforts, call 800-AUDUBON (283-8266) or visit www.massaudubon.org.

Protecting the Nature of Massachusetts

AUD 01 **The ENF does not include the existing horse barns in the estimated amount of existing development. The EIR should be comprehensive and include analysis of all environmental impacts and mitigation including management of horse waste…**

The horse barn area is included within the total acreage of the Project site and is included in environmental impacts and analysis.

AUD 02 **The EIR should fully document all proposed environmental and sustainability commitments including the proposed timing of off-site transportation improvements in relation to the on-site development.**

The narrative provided in this document identifies and describes the numerous sustainability design measures and mitigation measures included in the Project. The timing of off-site transportation improvements in relation to the on-site development is addressed in the HCAs.

AUD 03 **Mass Audubon requests that the Project be designed to meet the new LEED Pilot Credit for Bird Collision Deterrence (PC55)… Design features such as alternatives to large expanses of reflective glass on facades and the placement of landscape materials in relation to buildings can greatly influence the degree to which a facility is or is not a hazard to birds.**

As Project design progresses, the Proponent will continue to study the possibility and feasibility of incorporating design features into the Resort façade with the goal of minimizing the collision hazard to birds (see Sections 4.3.3.1 and 4.3.3.2).

AUD 04 **The Suffolk Downs development plans should demonstrate to state and city officials how their casino development will avoid, minimize, and mitigate impacts to the adjacent DCR-owned Belle Isle Marsh Reservation.**

The minor on-site activities proposed in the Sales Creek RFA include proposed stormwater management system improvements and upgrades and construction of a floodplain compensatory storage area adjacent to Sales Creek. Proposed upgrades to the stormwater management system, including any new or modified discharges, will be set back from Sales Creek and will comply with MassDEP stormwater standards. No work is anticipated to occur on or below the Inland Bank of Sales Creek or its adjoining BVW. Sedimentation and erosion controls, and a clearly delineated limit of work setback, will protect these resource areas during construction. The proposed upgrades to the stormwater management system should substantially improve the quality of discharged water relative to existing conditions. As demonstrated in Section 6.9, these activities have been designed to fully comply with the Wetlands Protection Act performance standards.

Stormwater discharges during construction will be managed under a SWPPP prepared in accordance with the U.S. EPA NPDES Stormwater CGP and MassDEP stormwater regulations. Implementation of the SWPPP will incorporate sedimentation and erosion control measures and other BMPs. The Project should not result in any impacts to Belle Isle Creek or adjacent Salt Marsh areas located north and east of the Project site.

AUD 05 **The EIR for the Suffolk Downs Resort Casino should include commitments to ongoing support for environmental protection, restoration, and education projects in Boston, Revere, and surrounding communities. The Project will have substantial, ongoing effects to the environment in the vicinity and it should provide continuing support for beneficial projects and initiatives consistent with the Project scale. For example, the boardwalk will require maintenance; there is a continuing need for public education and interpretation of the natural resources in the surrounding marshes and waterways; the marshes and waterways would benefit from additional stormwater remediation and other restoration efforts; and the commitment to improving pedestrian and bicycle connectivity to the site will require substantial ongoing state and local partnerships over a period of years to meet the full potential.**

Section 1.4 describes pedestrian and bicycle connectivity surrounding the Project. The proposed stormwater management system, as described in Section 9.3, will improve the water quality of stormwater discharges to Sales Creek, and ultimately to Belle Isle Inlet and the Rumney Marshes ACEC.

AUD 06 **The EIR should fully document energy use and emissions from on-site equipment, off-site production of electricity (including energy used in providing water and wastewater treatment to the Project), and transportation-related emissions. The EIR should document how the Project will be designed and operated to minimize GHG emissions to the maximum extent feasible... The EIR should demonstrate how it will work in concert with the Commonwealth's GHG reduction and efficiency goals.**

A comprehensive GHG emissions analysis is provided in Section 7.0.

AUD 07 **The ENF indicates the Project will comply with the state's Stretch Code and LEED energy efficiency guidelines, and the EIR should provide detailed information.**

Stretch Code compliance is addressed in the GHG emissions analysis provided in Section 7.0, and LEED credits and certification are discussed in Section 2.2.

AUD 08 **Mayor Menino has proposed that buildings over 50,000 square feet annually report their energy consumption. We urge that the Suffolk Downs casino cooperate with the Mayor by making a commitment to provide the city and public annual energy audits, irrespective of a mandatory requirement.**

Metering and reporting is already required as part of the LEED certification.

AUD 09 **The EIR should include maps and narrative information delineating all coastal and inland wetland resources on the site or affected by the Project including proposed off-site transportation improvements.**

Sections 6.9.1 and 6.9.2 describe on-site and off-site wetland resource areas, respectively.

AUD 10 **The site contains historically filled, channeled, and culverted areas of wetlands associated with Sales Creek. Those areas should also be mapped. In addition, the EIR should demonstrate how any of those areas are subject to the standards of the *Massachusetts Public Waterfront Act* (MGL Chapt. 91).**

As described in Section 5.2 of the ENF, in a determination dated June 23, 2000, MassDEP concluded that the filled portions of the Project site constitute landlocked tidelands, and therefore the site is not subject to Chapter 91 Licensing jurisdiction. Chapter 168 of the Acts of 2007 confirmed the validity of such previously-issued determinations from MassDEP, and MassDEP also reaffirmed the determination in its comment letter on the ENF. A request for a Public Benefit Determination is included in Section 6.7 of this DEIR/EPNF.

AUD 11 **The Project design should show a restoration of the functionality and connectivity of area wetland resources, improved water quality over existing conditions to the maximum extent feasible, and provide for proper public access where safe and feasible.**

The Project will meet and exceed MassDEP Stormwater Management Guidelines regarding water quality treatment in critical areas. The Project will utilize LID BMPs including bioretention basins, bioswales, water quality swales, pervious pavers, and rainwater reuse tanks to improve the water quality of stormwater discharges to the Belle Isle Inlet and Rumney Marshes ACEC see Section 9.3).

Information demonstrating compliance with WPA performance standards is provided in Section 6.9. Proposed upgrades to the existing stormwater management system, coupled with a reduction of approximately 12 acres in impervious surfaces on the Project site, will significantly improve water quality discharging towards Sales Creek relative to existing conditions. Public access and connectivity throughout the site is described in Section 1.4.

AUD 12 **The EIR should identify the locations and elevations of all areas of floodplain fill and associated compensatory storage areas. It should demonstrate that the compensatory areas will function to offset the proposed fill in each location based on localized flow patterns and elevations within and adjacent to the site.**

The Project includes grading work within the 100-year floodplain that will consist of cutting and filling. A floodplain compensation area will be provided in the vicinity of the Project entrance. The Project will not result in any net filling of the 100-year floodplain; Section 2.3.5 summarizes floodplain cuts and fills.

The locations of proposed impacts to BLSF and compensatory flood storage areas are described in Section 6.9.1. Compensatory flood storage will be provided for all flood storage volume that will be permanently lost as a result of the Project. The volume will be created in an area not previously used for flood storage and will be incrementally equal to the theoretical volume of flood water lost at each elevation, up to and including the 100-year flood elevation, which will be displaced by the Project.

AUD 13 **Given that the creeks and drainage ditches on and adjacent to the site flow through a developed and constricted landscape, it is important that any changes to the floodplain and flow patterns be carefully designed to avoid redirecting increased flood flows to adjoining properties. The EIR should include a detailed analysis of hydrology and flow patterns within and around the site pre- and post-construction.**

Attachment F contains a drainage summary report that includes existing and proposed conditions drainage conditions. Section 9.3 describes proposed stormwater management.

AUD 14 **Off-site transportation improvements to address traffic congestion associated with the Project are proposed. The EIR should document wetlands impacts associated with those improvements, and should present an analysis of measures to avoid, minimize, and mitigate those impacts.**

Potential impacts to off-site wetlands are described in Section 6.9.2.

AUD 15 **The ENF indicates a commitment by the Proponent to work with MassDOT and to assist with funding for several potential off-site transportation improvements. The evaluation of these improvements should include plans for achieving a significant net improvement in the water quality in stormwater runoff from those roadways.**

Commitments to sustainable design principles for off-site improvements are described in Section 5.5.8.

AUD 16 **The EIR should fully evaluate all potential measures to minimize water use and generation of wastewater including innovative methods such as maximizing use of stormwater for irrigation and reuse of grey water on-site. The goal for landscape use of potable water should be as close to zero as possible once plantings are established.**

The Project includes three rainwater harvesting tanks that will collect stormwater from the building rooftops. Water collected in the tanks will be used for landscape irrigation, track watering, and cooling tower water demand. See Section 9.3 for a discussion of stormwater management; water conservation measures are described in Section 9.2.3.

AUD 17 **Landscaping plants should be non-invasive yet resilient in order to minimize the need for irrigation, fertilizer, and energy use associated with landscape maintenance. Selection of species for planting should include consideration of salt tolerance, especially in areas likely to be subject to coastal storm surge events.**

Sections 4.4 and 4.5 describe plant selections to minimize irrigation and chemical fertilizer needs as well as salt tolerance.

AUD 18 **The EIR should fully evaluate potential for reduction in generation of wastewater through water use efficiencies.**

Potable water demand in the facility itself will be reduced via low-flow fixtures (i.e., fixtures using less water than allowed by code): low-flow fixtures will be used throughout the facility, including in hotel guest rooms; waterless urinals will be used in public spaces, including the podium.

AUD 19 **The EIR should fully document all transportation-related improvements and mitigation including TDM, enhanced access to subway and other transit options, and pedestrian and bicycle access within the site and connecting to off-site roads/sidewalks, open spaces and greenways.**

Physical transportation-related improvements are documented in Sections 5.5 and 5.6. TDM and supporting key transit, pedestrian, and bicycle elements are documented in Section 5.9.

AUD 20 **The proposed Suffolk Downs casino should coordinate with the MBTA to provide additional public transportation, Blue Line, bus, and regional ride-share opportunities. A cars-per-day quota should also be set to reduce traffic congestion and carbon emissions.**

As part of the TDM plan described in Section 5.9, the Proponent has committed to working with MBTA, MassRides, Massport, and other entities to identify additional transit and rideshare opportunities.

AUD 21 **The EIR should document anticipated solid waste streams from the Project and demonstrate a commitment to the highest possible standards for waste reduction, minimization, and recycling.**

Solid waste and recycling are addressed in Section 6.11.

AUD 22 **The potential for the Project to develop an anaerobic digestion facility to manage organic waste from the restaurants and horse manure should be evaluated.**

Anaerobic digestion is evaluated in the context of the GHG analysis in Section 7.2.8.

DB

Mystic River Watershed Association
your community • your watershed

March 25, 2013

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MAR 28 2013
EEPA

Secretary Richard K. Sullivan, Jr.
Executive Office of Energy and Environmental Affairs
MEPA Office; Attn. Deirdre Buckley
100 Cambridge Street, Suite 900
Boston, MA 02114

Re: EEA 15006, Caesars Resort at Suffolk Downs ENF\

Dear Secretary Sullivan:

The Mystic River Watershed Association (MyRWA) appreciates this opportunity to comment on the Environmental Notification Form filed for the proposed Caesars Resort Casino at Suffolk Downs Racetrack in Boston and Revere.

The Mystic River Watershed Association is a 501(c)(3) nonprofit organization founded in 1972 by a group of concerned citizens. MyRWA's mission is to protect and restore clean water and related natural resources in the basin's 22 communities and to promote responsible stewardship of our natural resources through educational initiatives. A small organization, MyRWA accomplishes its mission by forging links with citizens' groups, universities, businesses and government agencies. These alliances permit MyRWA to work throughout the watershed, documenting current conditions and advocating for resource management and protection. This collaborative approach has created a strong watershed voice and is helping to attract much-needed public and private resources to the Mystic.

As an environmental organization MyRWA is particularly attuned to how proposed projects will improve existing conditions within urbanized areas. MyRWA notes that the ENF was comprehensive and thoughtfully prepared and particularly applauds the proponent for including consideration of:

- Integration of LID techniques into the proposed design,
- A commitment for LEED certification for the project,
- A decrease of approximately 13% (9 acres) of impervious cover on the site,
- Improvements to the existing stormwater collection, treatment, and conveyance systems,
- Protection of the Rumney Marsh (Sales Creek) ACEC,
- Consideration of the implications of sea level rise on the area, and
- Consideration of pedestrian, bicycle, mass transit, and waterborne access to the site.

We look forward to seeing details in the DEIR for these and other commitments made in the ENF. We expect your scope for the DEIR to include requirements for design details, appropriate modeling and calculations, and subject area firm commitments on mitigation measures that will help enhance and protect the human and natural environment.

In addition we offer specific comments in the following areas:

Traffic and Transportation

The DEIR should clarify if traffic counts were obtained during races or other events at the racetrack. If not, what would be the impact on the study area if events at the racetrack and the casino were to overlap? The DEIR should also clarify if the existing peak hour turning movement counts obtained in June 2010 were seasonally adjusted. **MRWA 01**

Detailed intersection capacity and LOS analysis for future condition with traffic mitigation should be included in the DEIR for all the study intersections. Conceptual mitigation plans should show roadway widening and drainage impacts clearly. **MRWA 02** **MRWA 03**

Due to the unique nature of the proposed project, the DEIR should include a commitment to monitor project generated traffic and impacts at critical intersections over a number of years beyond completion and occupancy. **MRWA 04**

The DEIR should give further consideration to improving mass transportation access to the site as opposed to simply relying on the existing Blue Line stops and roadway network. Installing a people mover between the T stop and the casino, further investigation of the potential for watercraft/ferry access to the area, and details on potential resort-supplied vanpools from key transit centers would help lessen the impact of traffic on already congested roadways. **MRWA 05**

Wetland Resource Areas/Floodplains

The floodplains on the site have been regulated as Bordering Land Subject to Flooding (BLSF) under the Wetlands Protection Act in the past by both Boston and Revere Conservation Commissions, and should be analyzed as such in the DEIR. Sales Creek and the onsite ditches have Inland Bank and Land Under Water which, technically, should be bound by BLSF. Land Subject to Coastal Storm Flowage (although listed in the Wetland Protection Act and Regulations) does not have performance standards in the regulations against which to judge impact. Since the Proponent intends to impact the floodplain, a BLSF analysis of mitigation required for storage and/or flow disruption per 310 CMR 10.57 should be provided in the DEIR.

Since the Proponent intends to modify floodplain will they be filing a Letter of Map Amendment or Letter of Map Revision with FEMA to reflect the changes in the floodplain? These changes, and any offsite changes they cause, should be memorialized in the FIA mapping for the area. **MRWA 06**

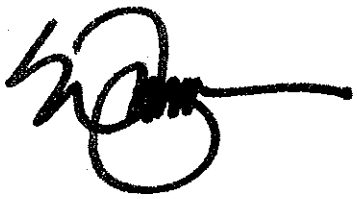
20 Academy Street, Suite 306 • Arlington, MA • 02476-6401 • (781) 316-3438 • www.MysticRiver.org

ACEC/Stormwater Quality

MyRWA asks that the same considerations EEA expressed for water quality improvement/protection that were listed in the Secretary's Certificate on the ENF for EEA 14747 (Suffolk Downs Stabling Area and Racecourse Stormwater Improvements) be incorporated into the design of the stormwater system proposed for discharge to the Rumney Marsh ACEC under the current proposal. The DEIR should detail how the newly proposed system improves upon the concepts presented, and those implemented, in the EEA 14747 project. **MRWA 07**

Thank you again for this opportunity to comment on this significant project proposal. If you have any questions or require additional information please contact me at (781) 316-3438 or at EK@mysticriver.org

Sincerely,



EkOngKar Singh Khalsa, Executive Director
Mystic River Watershed Association

MYSTIC RIVER WATERSHED ASSOCIATION

MRWA 01 **The DEIR should clarify if traffic counts were obtained during races or other events at the racetrack. If not, what would be the impact on the study area if events at the racetrack and the casino were to overlap? The DEIR should also clarify if the existing peak hour turning movement counts obtained in June 2010 were seasonally adjusted.**

As described in Section 5.2.7, all traffic counts were reviewed and validated by MassDOT as representative of existing 2012/2013 conditions. The counts were performed during the racing season.

MRWA 02 **Detailed intersection capacity and LOS analysis for future condition with traffic mitigation should be included in the DEIR for all the study intersections.**

Detailed capacity and LOS for future conditions for the entire study are presented in Sections 5.5 and 5.7.

MRWA 03 **Conceptual mitigation plans should show roadway widening and drainage impacts clearly.**

Roadway widening is indicated in all concept plans for off-site improvements. Drainage will be addressed in coordination with MWRA, MassDOT, DCR, and the cities of Revere and Boston, as appropriate, in the design development process.

MRWA 04 **Due to the unique nature of the proposed Project, the DEIR should include a commitment to monitor Project-generated traffic and impacts at critical intersections over a number of years beyond completion and occupancy.**

Commitments to monitoring, to be coordinated with MassDOT and BTD, are identified in Section 5.9.5.

MRWA 05 **The DEIR should give further consideration to improving mass transportation access to the site as opposed to simply relying on the existing Blue Line stops and roadway network.**

The TDM plan includes strategies to improve mass transit access and encourage its use (see Section 5.9). The Proponent has committed to providing an MBTA bus stop on site (should the MBTA wish to route bus service through the site) and to enhancing the existing shuttle service between Suffolk Downs Station and Resort lobbies.

MRWA 06 **Since the Proponent intends to modify floodplain will they be filing a Letter of Map Amendment or Letter of Map Revision with FEMA to reflect the changes in floodplain?**

A Letter of Map Amendment is not necessary for performing work in the floodplain.

MRWA 07 **MyRWA asks that the same considerations EEA expressed for water quality improvement/protection that were listed in the Secretary's Certificate on the ENF for EEA 14747 (Suffolk Downs Stabling Area and Racecourse Stormwater Improvements) be incorporated into the design of the stormwater system proposed for discharge to the Rumney Marshes ACEC under the current proposal. The DEIR should detail how the newly-proposed system improves upon the concepts presented, and those implemented, in the EEA 14747 project.**

The Project will meet and exceed MassDEP Stormwater Management Guidelines regarding water quality treatment in critical areas. The Project will utilize LID BMPs including bioretention basins, bioswales, water quality swales, pervious pavers, and rainwater reuse tanks to improve the water quality of stormwater discharges to the Belle Isle Inlet and Rumney Marshes ACEC (see Section 9.3).

VIA ELECTRONIC MAIL

March 26, 2013

Secretary Richard K. Sullivan, Jr.
Executive Office of Energy and Environmental Affairs (EEA)
Attn: MEPA Office
Deirdre Buckley, EEA No. 15006
100 Cambridge Street, Suite 900
Boston MA 02114

RE: Environmental Impacts of the Proposed Casino at Suffolk Downs

Dear Secretary Sullivan:

On behalf of the residents of East Boston, we are pleased to submit our comments in response to the Environmental Notification Form (ENF) filed by Suffolk Downs and Caesars Entertainment (hereinafter "Suffolk Downs") related to a proposed casino complex at the current site of the Suffolk Downs Racetrack.

Rich in history and tradition, East Boston is home to hard-working families and small business owners from every corner of the globe. No Eastie Casino is a grassroots, all-volunteer effort that works to educate East Bostonians about the full range of impacts that the proposed Caesars Entertainment casino complex would have on our neighborhoods and small businesses.[1] We believe in positive economic growth that honors the community's history and diversity; enhances the quality of life for all residents; and promotes healthy, environmentally sustainable opportunities for economic growth that support our small business culture and family-friendly streets. We write today to express our concerns about the long-term environmental impacts of the proposed casino complex and share our recommendations for further state review. (We plan to share these recommendations with the City of Boston, as well.)

First, we are very concerned that the long-term environmental and related public health harms for the proposed casino complex outweigh the projected benefits of additional revenue to the Commonwealth of Massachusetts and the City of Boston. To cite one example, the ENF filed by Caesars and Suffolk Downs states that the casino complex will more than double the number of vehicle trips per day, resulting in 14,782,500 vehicle trips through our neighborhood *per year*, or 40,500 vehicle trips per day.[2] Given the association between air pollution, traffic, and chronic **NEC 01**

[1] While our effort is focused on East Boston, we acknowledge that the environmental impacts of the proposed casino complex are likely to extend to the neighboring communities of Chelsea and Winthrop, which have limited protections under the Massachusetts gaming law compared to East Boston and Revere. See Mass. Gaming Commission definitions of host and surrounding communities: http://massgaming.com/about/host-surrounding-communities

[2] These projected numbers stand in contrast to the 15,900 daily vehicle trips currently associated with the site, which amount to 5,730,500 annual vehicle trips. See Environmental Notification Form, Suffolk Downs, page 3.

diseases such as asthma, the increase in vehicle trips related to the proposed casino complex is alarmingly high. Asthma – which disproportionately impacts low-income communities and communities of color – comes with significant economic costs to the local economy, resulting in missed work days, higher rates of hospital use (including higher uncompensated care costs for uninsured and underinsured patients), and even premature death. According to state and local public health officials, the communities of Boston, Chelsea, Revere and Winthrop already have the second highest asthma rates in the Commonwealth.[3] Further, the five-year average death rate due to asthma is higher in these communities than it is in the Commonwealth as a whole.[4] We are concerned that the proposed number of additional vehicle trips brought into the community by the proposed casino complex will negatively impact residents' health and increase rates of disease at levels that are unsustainable for family, employer, and health provider budgets. Given the scope of the proposed casino complex and its impact on air, noise, light, and water quality in a densely populated urban neighborhood, other health issues with economic consequences for families, health care providers and employers may also arise.

Second, we note that East Boston residents already face an incredibly high environmental burden and pollution risks due to factors external to the proposed casino, including the following: **NEC 02**

- The neighborhood's proximity to Logan Airport and related commercial traffic;
- Existing Route 1A and tunnel traffic;
- A plethora of fuel storage facilities;
- A proposed plan by Global Oil to transport ethanol, a highly dangerous and flammable substance, through the area by train; and
- Prior degradations in the environment caused by existing Suffolk Downs Racetrack operations, such as the Concentrated Animal Feeding Operation (CAFO) housed at the existing site, which was cited for violations of the U.S. Environmental Protection Act in 2012.[5]

We believe that the Commonwealth should not consider the environmental impacts of the Suffolk Downs proposal in a vacuum, but should request information from Suffolk Downs that fully captures the context in which the casino complex would be cited.

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[3] "Burden of Asthma in Massachusetts," Department of Public Health, Asthma Prevention and Control Program, April 2009, http://www.mass.gov/eohhs/docs/dph/com-health/asthma/burden-in-mass.pdf, page 13.

[4] The five-year average death rate due to asthma was higher in CHNA 19 [Boston, Chelsea, Revere, Winthrop] : Alliance for Community Health (16.8 per 1,000,000 residents) than the overall statewide rate (10.5 per 1,000,0000 residents). See "Burden of Asthma in Massachusetts," Department of Public Health, Asthma Prevention and Control Program, April 2009, http://www.mass.gov/eohhs/docs/dph/com-health/asthma/burden-in-mass.pdf, page 14.

[5] We note with interest that the Suffolk Downs stable constitutes the only known CAFO in the Commonwealth, and that Suffolk Downs entered into a consent decree with the U.S. Environmental Protection Agency in October 2012 for unauthorized discharge of animal waste into Sales Creek and adjacent wetlands, in violation of federal law. See ENF, Section 2.1.1.

We recommend that the Commonwealth request the following from Suffolk Downs and Caesars Entertainment:

- A detailed impact assessment—including a health impact assessment—of the proposed casino complex on East Boston residents that includes: (a) estimated financial costs for East Boston residents, medical, and social service providers; and (b) strategies for addressing harms directly or indirectly related to the development; **NEC 03**
- A detailed analysis of the *cumulative* environmental burden on East Boston that accounts for the existing private and commercial traffic, the proximity to Logan Airport, and the proximity of fuel storage facilities, in addition to the proposed impacts of the Suffolk Downs and Caesars casino complex; **NEC 04**
- A detailed analysis and plan to reduce vehicle traffic through East Boston that includes, but is not limited to, alternative means of transportation such as pedestrian access, bike, water, and public transportation; **NEC 05**
- A comprehensive parking and traffic analysis that includes a review of the impact on residential parking access and use of local roads by taxis, shuttle services, and single occupancy vehicles; **NEC 06**
- A detailed impact analysis and strategies to address significant increases in light and noise pollution on abutters, including the Orient Heights residential neighborhood; **NEC 07**
- A plan for monitoring and adequately addressing litter associated with advertisement campaigns, casino operations, and additional foot/vehicular traffic through local neighborhoods; **NEC 08**
- A detailed description and analysis of alternatives in addition to the "Build" or "No Build" options listed in the ENF that would adhere to the environmental history and/or agricultural use of the land while addressing community needs, building local wealth and addressing harms caused by the current structures (for example, creating space for a year-round farmers' market that accepts WIC and SNAP; allocating space for an urban garden; or modeling efforts such as the Green City Growers business model started by Cleveland's Evergreen Cooperative[6]; rooftop farming[7]); **NEC 09**
- A detailed consideration of energy and water conservation and alternative energy measures and the use of sustainable building materials **NEC 10**
- Evaluation of local and regional air quality impacts; **NEC 11**
- Analysis on soil and hazardous materials, stormwater management, sea level rise, and storm surge preparedness; and **NEC 12**
- Detailed recommendations for ongoing public reporting and community engagement over the proposed 100-year life of the Project. **NEC 13**

[6] http://evergreencooperatives.com/business/green-city-growers/
[7] http://www.takepart.com/article/2013/01/13/next-epicenter-sustainable-organic-farming-ischina

Finally, we are concerned that the results of a full Environmental Impact Review (EIR)—including detailed public information on the impacts, costs, and value of any proposed mitigation—may not be made available to the public prior to the release of a signed mitigation agreement between the developer and the City of Boston. Under the Massachusetts Gaming Law, the release of a signed agreement triggers a required vote in the host community within 60-90 days. While we recognize the limited scope of the Executive Office of Energy and Environmental Affairs (EEA) review, we feel we must acknowledge the current lack of transparency about long-term costs associated with negative impacts. Thus far, there has not been any *independent* overall analysis of the environmental, economic, and public health impacts of the casino complex on East Boston and surrounding communities. Further, the regulatory structure regarding civil and criminal penalties, licensure requirements, discipline, and enforcement remains incomplete. East Boston residents who wish to evaluate the casino proposal in an objective manner are at a significant disadvantage due to the lack of this important analysis and regulatory information. Therefore, we ask the Commonwealth to proceed quickly through the EIR process. The public release of the results of a full Environmental Impact Review will go a long way towards helping East Boston residents make informed decisions on the casino proposal. **NEC 14**

Again, we thank you for the opportunity to comment on this crucial matter. Please contact Jessica Curtis at jesscurtis@gmail.com with any questions.

Yours sincerely,

Jessica Curtis

Mike Russo

Volunteer with No Eastie Casino

cc: Boston Host Community Advisory Committee c/o Elizabeth Dello Russo

NEC 01 **The ENF filed by Caesars and Suffolk Downs states that the casino complex will more than double the number of vehicle trips per day, resulting in 14,782,500 vehicle trips through our neighborhood per year, or 40,500 trips per day. Given the association between air pollution, traffic, and chronic diseases such as asthma, the increase in vehicle trips related to the proposed casino complex is alarmingly high.**

The Project vehicle trip generation, including its temporal distribution over the 24-day, is presented in Sections 5.4.2 and 5.4.6. The dispersal of trips across the local and regional roadway network is presented in Sections 5.4.7 and 5.4.8. Air quality is discussed in Section 6.5.

NEC 02 **We note that East Boston residents already face an incredibly high environmental burden and pollution risks due to factors external to the proposed casino, including the following:**

- **The neighborhood's proximity to Logan Airport and related commercial traffic;**
- **Existing Route 1A and tunnel traffic;**
- **A plethora of fuel storage facilities;**
- **A proposed plan by Global Oil to transport ethanol, a highly dangerous and flammable substance, through the area by train; and**
- **Prior degradations in the environment caused by existing Suffolk Downs racetrack operations…**

The Project and surrounding Project area is discussed in the context of Environmental Justice in Section 1.10.

NEC 03 **[We request] a detailed impact assessment – including a health impact assessment – of the proposed casino complex on East Boston residents that includes: (a) estimated financial costs for East Boston residents, medical, and social service providers; and (b) strategies for addressing harms directly or indirectly related to the development.**

Section 1.10 details both socioeconomic and environmental justice issues as they pertain to the Project, and Section 6.0 describes potential environmental impacts including air quality and noise along with proposed mitigation.

NEC 04 **[We request] a detailed analysis of the cumulative environmental burden on East Boston that accounts for the existing private and commercial traffic, the proximity to Logan Airport, and the proximity of fuel storage facilities, in addition to the proposed impacts of the Suffolk Downs and Caesars casino complex.**

The transportation analysis provided in Section 5.0 accounts for background conditions, including existing Logan Airport, regional growth as approved by MassDOT, as well as planned projects as requested by the City of Revere and the City of Boston (see Section 5.3.2). In addition, the air and noise analyses provided in Section 6.0 also account for background conditions to realistically predict potential Project impacts in a cumulative fashion.

NEC 05 **[We request] a detailed analysis and plan to reduce vehicle traffic through East Boston that includes, but is not limited to, alternative means of transportation such as pedestrian access, bike, water, and public transportation.**

Alternative transportation modes are describes in Section 5.8, supported by a robust TDM plan described in Section 5.9.

NEC 06 **[We request] a comprehensive parking and traffic analysis that includes a review of the impact on residential parking access and use of local roads by taxis, shuttle services, and single occupancy vehicles.**

The parking analysis is presented in Section 5.10. The Proponent is committed to working with BTD and the City of Revere to protect neighborhood on-street parking for residents. Vehicle trip distribution and assignment to study area roadways are described in 5.4.7.

NEC 07 **[We request] a detailed impact analysis and strategies to address significant increases in light and noise pollution on abutters, including the Orient Heights residential neighborhood.**

The Proponent plans to minimize any potential impact from light pollution to abutters. The Proponent is committed to providing a site lighting design based on Dark Sky policies and strategies. Cutoff fixtures with energy efficient LED lighting will be considered along sensitive residential edges such as the Orient Heights neighborhood. Newly created open spaces between Tomasello Drive and Orient Heights will be landscaped to create a natural buffer zone to minimize light and noise pollution. As the site design further develops, the Proponent will provide a detailed impact analysis and outline further strategies to minimize the lighting and noise impacts from the development to the surrounding abutters. Regarding noise, sensitive receptors within the Orient Heights residential neighborhood have been included in the analysis and potential impacts are discussed in Section 6.6.4.

NEC 08 **[We request] a plan for monitoring and adequately addressing litter associated with advertisement campaigns, casino operations, and additional foot/vehicular traffic through local neighborhoods.**

Communities with casinos are just as safe as communities that do not have casinos. Independent research and data demonstrate that many jurisdictions hosting a single casino or a small number of casinos experience no increase in either crimes or crime rates following the introduction of casino gaming. In some cases, the numbers of crimes and crime rates actually decrease. Where the number of crimes has increased following the introduction of gaming, a scenario sometimes experienced where clusters of casinos have commenced operations or in very small host communities, the increase in the number of crimes is not due to gaming per se, but simply because of the additional population at risk in these communities. That is, when the increased population is properly accounted for, there is no increased risk of being a crime victim when comparing pre- and post-casino periods.

The available literature indicates proximity to a casino is associated with increased house prices and residential property values, rather than declines. A recent dissertation estimated that the magnitude of the housing price benefit of casino gambling is approximately two percent of household value for households living near a casino. We are not aware of any case study examining either at the neighborhood, city, or host county levels which provides evidence that housing property values or home prices declined due to the presence of a casino.

NEC 09 **[We request] a detailed description and analysis of alternatives in addition to the "Build" or "No Build" options...**

An alternatives analysis that includes reasonable development alternatives for the Project site is provided in Section 1.9.

NEC 10 **[We request] a detailed consideration of energy and water conservation and alternative energy measures and the use of sustainable building materials.**

Energy conservation is discussed in Section 9.5, and water conservation is addressed in Section 9.2.3. Alternative energy is discussed in the context of the GHG analysis in Section 7.0, and the use of sustainable building materials is addressed in Section 2.0.

NEC 11 **[We request] an evaluation of local and regional air quality impacts.**

The air quality analysis is provided in Section 6.5.

NEC 12 **[We request] analysis on soil and hazardous materials, stormwater management, sea level rise, and storm surge preparedness.**

Soil and hazardous materials are discussed in Section 6.10 and the Draft CMP in Attachment L. Stormwater management is addressed in detail in Section 9.3. Climate change adaptation and resiliency is discussed in the context of sea level rise and storm surge preparedness in Section 2.3.

NEC 13 **[We request] detailed recommendations for ongoing public reporting and community engagement over the proposed 100-year life of the Project.**

The Proponent has a steadfast commitment to integrity and communication with communities in which we live and work. The Caesars Code of Commitment can be found at http://www.caesars.com/corporate/about-us-code-of-commitment.html.

NEC 14 **We are concerned that the results of a full EIR – including detailed public information on the impacts, costs, and value of any proposed mitigation – may not be made available to the public prior to the release of a signed mitigation agreement between the developer and the City of Boston. Under the Massachusetts Gaming Law, the release of a signed agreement triggers a required vote in the host community within 60-90 days.**

In cooperation with the cities of Boston and Revere, the Proponent will comply with all relevant provisions of the Expanded Gaming Act related to the scheduling of the host community votes.

To: Buckley, Deirdre (EEA)
Subject: EEA No.15006

Dear,

Deirdre Buckley and To Whom it May Concern,

My concerns about such a large scale project like a possible Casino at Suffolk Downs would be the increased strain on an already over burdened community like East Boston. We have to deal with Jet Fuel Exhaust, Taxis cutting through our neighborhood instead of taking the tunnel, We have the rental car facility next door to us, we have cars going through both ways on the Ted Williams Tunnel, We have traffic and cars and exhaust from the Callahan and the Sumner Tunnels, We have heavy industry along the Chelsea Creek, Highway 1a running the entire length our East Boston, Fuel Tank Farm off of Chelsea St.,The airport/massport has public domained hundreds, thousands if you include the islands that made up East Boston, of acres or our land, … and now we get to have 10's of thousands of additional cars and people adding to our heavy burdens with added pollution and traffic??? How much more will we be subjected to? What is the limit of abuse we can take? How much Pollution is too much? When is enough/ enough? Is there not an environmental limit on how much one community can subjected to? **PUR 01**

Thank you for taking the time to read my concerns,

Sincerely,
Jesse Purvis
551 Sumner St.
East Boston, MA 02128

PURVIS, JESSE

PUR 01 **My concerns about such a large-scale project like a possible casino at Suffolk Downs would be the increased strain on an already overburdened community like East Boston… exhaust… heavy industry… traffic… How much pollution is too much?**

The Project and surrounding Project area is discussed in the context of Environmental Justice in Section 1.10.

Saugus River Watershed Council

26 March 2013

Secretary Richard Sullivan
Executive Office of Energy and Environmental Affairs
Attention: MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114

Re: Caesars Resort at Suffolk Downs, Environmental Notification Form (EOEEA #15006)

Dear Secretary Sullivan:

The Saugus River Watershed Council is a non-profit organization founded in 1991 to protect and restore the natural resources of the Saugus River watershed. We have reviewed the Environmental Notification Form for Caesars Resort at Suffolk Downs and are pleased to submit the following comments for your consideration.

Background
The Saugus River Watershed Council has been working with local, state and regional public officials for many years to protect and restore the natural resources of the Rumney Marshes Area of Critical Environmental Concern (ACEC). We were active participants in the development of the Salt Marsh Restoration Plan for the Rumney Marshes ACEC. The Rumney Marshes ACEC encompasses over 2,200 acres of salt marsh at Rumney Marsh in Lynn, Saugus and Revere, as well as over 350 acres of salt marsh at Belle Isle Marsh in Revere, Winthrop and Boston. The Saugus River empties into Rumney Marsh which is one of the most important natural areas in our watershed, providing critical flood storage protection as well as valuable habitat for birds, fish and other wildlife.

While the footprint of the proposed Caesars Resort falls outside of the boundaries of the Saugus River watershed, we are submitting comments on the ENF because a project of this scale and magnitude will have an impact on the region.

The Saugus River Watershed Council was selected to receive $90,000 from Suffolk over four years to reestablish a water quality monitoring program for the Saugus River watershed. Suffolk's provision of funding toward this project was undertaken in connection with the settlement of an enforcement action, *United States v. Sterling Suffolk Racecourse, LLC*, on behalf of the U.S. Environmental Protection Agency under the Clean Water Act. The results of our new water quality sampling program will be used to track and improve water quality conditions in the Saugus River and the Rumney Marshes ACEC.

Project Scope
Caesars Resort at Suffolk Downs proposes redeveloping 161 acres in Boston and Revere to create a major gaming facility with two hotels, 200,000 square feet of gaming space, retail establishments, restaurants, parking and associated support infrastructure. When complete, the site will include 1.8 million square feet of new development and generate approximately 24,600 vehicle trips per day. As noted in the ENF, this project requires preparation of a full Environmental Impact Report because it

alters more than 50 acres of land, and generates more than 3,000 vehicle trips per day. The proposed project will also have an impact on the Belle Isle Marsh portion of the Rumney Marshes Area of Critical Environmental Concern.

Sustainable Building and Landscape Design

The ENF indicates a very high level of commitment by the development team to ensure that buildings, landscape, and site design incorporate environmentally sustainable strategies. We are pleased, that the developer is committed to achieving a minimum Gold standard of Leadership in Energy and Environmental Design (LEED) in the following categories:

- Sustainable sites credits encourage strategies that minimize the impact on ecosystems and water resources.
- Water efficiency credits promote smarter use of water, inside and out, to reduce potable water consumption.
- Energy & atmosphere credits promote better building energy performance through innovative strategies.
- Materials & resources credits encourage using sustainable building materials and reducing waste.
- Indoor environmental quality credits promote better indoor air quality and access to daylight and views.

The ENF also indicates that stormwater management techniques will reduce stormwater impacts to resource areas. The ENF should fully document all of the stormwater and low impact design techniques planned to ensure that there is no negative impact on the Rumney Marshes Area of Critical Environmental Concern. **SRWC 01**

Climate Change Adaptation and Mitigation

With funding from the Massachusetts Environmental Trust, the Saugus River Watershed Council is working in partnership with Geosyntec Consultants to promote climate adaptation and mitigation plans on a site-specific and community-wide basis. We are pleased to see that the ENF includes consideration of risks associated with sea level rise and other anticipated impacts of climate change. As a large-scale new development in the region, Caesars Resort presents an opportunity to incorporate climate adaptation strategies in the initial design of building, stormwater and landscape features. As part of the mitigation package for this project, we encourage the developer to consider funding site-specific climate adaptation and coastal resiliency strategies for adjacent properties and / or broader efforts focused on community or region-wide strategies. In addition to planning for climate change, we encourage the development team to incorporate educational opportunities at the site that so that climate change mitigation and adaptation strategies (and LEED features) at Caesars Resort can serve as a model for other developments in the region. **SRWC 02**

Potential Impact on Water Resources

The Environmental Impact Report should fully document all wetlands and associated impacts of the project both on site and for any proposed mitigation areas. The Saugus River Watershed Council supports the City of Revere's determination that floodplain areas on the site are classified as Bordering Land Subject to Flooding and that compensatory flood storage is required for any fill. Ensuring compensatory flood storage will also support the project proponent's goals of ensuring that the site is 'climate ready' to withstand rainstorms with increasing intensity. **SRWC 03**

We support the project proponent's proposal to decrease impervious areas by nine acres as part of their overall stormwater management plan. The proposed vegetated filters are an important strategy for improving water quality, reducing runoff and management flow onsite. We encourage the developer to work with the MA Department of Transportation to incorporate similar environmentally sustainable design features into all offsite roadway improvement projects. **SRWC 04**

Transportation

Development of this project will have a significant impact on roadways throughout the region, many of which travel through the Saugus River watershed. Portions of Route 1, Route 1A and Route 60 in Revere and Saugus drain directly to the Rumney Marshes Area of Critical Environmental Concern within the Saugus River watershed. Offsite roadway improvement projects identified in the Environmental Impact Report should document impacts to adjacent wetlands, and incorporate improvements to stormwater management and drainage. Several mitigation opportunities for stormwater and drainage improvements associated with Route 1 and Route 60 have previously been identified by state and environmental agencies. **SRWC 05**

Long-term Support for Environmental Sustainability

We encourage the developers of this project to commit to long-term support for environmental restoration and protection as well as education projects throughout the region. Both on site and off site opportunities for salt marsh restoration, environmental education programs, water quality improvements, and public access should be fully documented in the Environmental Impact Report. In additional to the specific mitigation strategies suggested in this letter, several opportunities for salt marsh restoration are documented in the Salt Marsh Restoration Plan for the Rumney Marshes ACEC. **SRWC 06**

Please feel free to contact me at srw@shore.net or 781-233-5046 if you have any questions regarding the Saugus River Watershed Council or our comments regarding this project. Thank you in advance for your consideration.

Sincerely,



Joan LeBlanc
Executive Director

Cc: Andrew DeSantis, Revere Conservation Commission

SAUGUS RIVER WATERSHED COUNCIL

SRWC 01 **The [EIR] should fully document all of the stormwater and LID techniques planned to ensure that there is no negative impact on the Rumney marshes ACEC.**

The Project will meet and exceed MassDEP Stormwater Management Guidelines regarding water quality treatment in critical areas (see Section 9.3). The Project will utilize LID BMPs including bioretention basins, bioswales, water quality swales, pervious pavers, and rainwater reuse tanks to improve the water quality of stormwater discharges to the Belle Isle Inlet and Rumney Marshes ACEC (see Section 9.3.

SRWC 02 **We encourage the developer to consider funding site-specific climate adaptation and coastal resiliency strategies for adjacent properties and/or broader efforts focused on community or region-wide strategies… We encourage the development team to incorporate educational opportunities at the site so that climate change mitigation and adaptation strategies (and LEED features) at Caesars Resort can serve as a model for other developments in the region.**

The Proponent intends to provide educational displays throughout the property that will show the results of energy savings and other sustainable measures. The Proponent can also include information placards at certain points along the public walkway to discuss LEED strategies that pertain to that specific area. For example, near the wetlands a display may discuss stormwater management and plant filtering.

SRWC 03 **The Draft EIR should fully document all wetlands and associated impacts of the Project both on site and for any proposed mitigation areas.**

Information describing the delineated wetland resource areas is provided in Section 6.9. A more detailed discussion describing on-site wetlands can be found in Attachment I. Information demonstrating compliance with applicable WPA performance standards is provided in Section 6.9.

SRWC 04 **We support the Project Proponent's proposal to decrease impervious areas… We encourage the developer to work with MassDOT to incorporate similar environmentally sustainable design features into all offsite roadway improvement projects.**

Commitments to sustainable design principles for off-site improvements are described in Section 5.5.8.

SRWC 05 **Offsite roadway improvement projects identified in the EIR should document impacts to adjacent wetlands and incorporate improvements to stormwater management and drainage.**

Potential impacts to off-site wetlands are described in Section 6.9.2.

SRWC 06 **We encourage the developers of this Project to commit to long-term support for environmental restoration and protection as well as education projects throughout the region. Both on-site and off-site opportunities for salt marsh restoration, environmental education programs, water quality improvements, and public access should be fully documented in the EIR.**

Section 4.4 describes ecological restoration on-site, and Section 1.4 describes public access opportunities. As demonstrated herein, Caesars and Suffolk Downs maintain a deep commitment to sustainability; however, they are still evaluating which educational programs they will support.

26 March 2013

Secretary Richard K. Sullivan, Jr.
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114
ATT: MEPA Office

RE: EOEA No.15006- Environmental Notification Form
Caesars Resort at Suffolk Downs, East Boston and Revere

Dear Secretary Sullivan:

The Boston Harbor Association, a non-profit, public interest organization founded in 1973 to promote a clean, alive, and accessible Boston Harbor, is in receipt of the Environmental Notification Form for the proposed Caesars Resort at Suffolk Downs. The project proponent, Sterling Suffolk Racecourse, LLC, has filed an application with the Massachusetts Gaming Commission for a license to operate a gaming facility on their 161-acre property in East Boston and Revere. Besides enhancements to the existing Suffolk Downs horse racing facility, the proponent proposes two distinct gaming areas, two hotels with 450 rooms, multi-purpose meeting/entertainment space, parking, and retail/ restaurant uses.

The project proponent and its team briefed The Boston Harbor Association on the proposed project at TBHA's 18 December 2012 Harbor Use Committee meeting. Based on that meeting and review of the Environmental Notification Form (ENF), we ask that the following be incorporated into the Secretary's Certificate for the scope of the Draft Environmental Impact Report (DEIR):

Transportation: Section 3 of the ENF outlines four scenarios to be analyzed in the Draft EIR: existing condition; 2020 no-build; 2020 future conditions with the project; and 2020 build with mitigation. The ENF acknowledges significant traffic congestion on a number of existing roads, and states that project benefits may include new ramp connections and roadways to be funded by the proponent. Parking will be reduced from the existing 6,000 spaces to 5,150 spaces, which we strongly support. Consistent with the decreased amount of parking, we urge the proponent to help subsidize transit usage by employees; to provide shuttle service to transit stations; to limit employee parking to only those employees who require ADA access; and to provide employee parking only during work shifts when MBTA service is not available. Improved pedestrian connections from the MBTA Suffolk Downs station to the project site by the proponent will help make transit usage more attractive for residents, workers, and visitors. **TBHA 01**

The ENF examined water transportation opportunities (pages 2-9 to 2-13 of ENF), with mixed results. While the proponent will continue to explore water transportation options, "...analysis has concluded that water transportation dedicated to the Project is not practical" (page 2-10 of ENF). We concur that docking along Chelsea Creek is not feasible, given navigational constraints and the conflicting uses in the designated port area (DPA). While the Boston Inner Harbor routes to Logan Airport and to Boston Harbor Shipyard & Marina require physically longer landside connections, visitors to the casino resort destination will no doubt consider the boat trip part of the destination experience. We ask that the Secretary's Certificate for the DEIR require further analysis of the water transportation options, including coordination with the Massachusetts Port Authority which owns the aforementioned docks, with the Boston Redevelopment Authority which will be initiating boat service between the South Boston Innovation District and East Boston, and with private boat operators who may initiate service from the South Shore and other locations for visitors going to the site. **TBHA 02**

The project proponent proposes to expand the existing bicycle network from Saratoga Street along Bennington Street to Eliot Circle at Revere Beach, creating what the project proponent calls a "beach-to-beach connection between Constitution Beach to the south and Revere Beach to the north" (page 3-20 of ENF). We are highly supportive of this connection, and look forward to greater detail in the Draft EIR. **TBHA 03**

Pedestrian Access: Due to the close proximity of the project site to residential neighborhoods, many local residents walk to and from the site. The ENF notes that currently, Orient Heights residents access nearby retail stores by going through the Suffolk Downs property (page 3-20 of ENF). While the two proposed hotels have relatively low building heights (135 feet and 166 feet), it is not clear whether there may be micro-climate impacts upon pedestrians' and cyclists' use and enjoyment of the site. As part of the Draft Environmental Impact Report, we ask that an analysis of potential wind and shadow impacts to the pedestrian and cyclist experiences be included, with particular attention to minimizing any adverse impacts upon local pedestrians. **TBHA 04**

Open Spaces: The project proponent proposes to transform approximately 9 acres of existing impervious paving in the parking lots to landscaping, which will make these areas more attractive and help create a more resilient landscape. The Boston Harbor Association highly commends the proponent for this environmentally sustainable and climate change adaptation measure.

As part of a consent decree between the U.S. Environmental Protection Agency and Sterling Suffolk Racecourse, the Racecourse was required to make improvements to its stormwater system, cease unauthorized discharges from its concentrated animal feeding operation, and apply a portion of the proposed penalty to supplemental environmental projects. One of the supplemental environmental projects is the construction of a boardwalk and related signage at Belle Isle Marsh Reservation, the last remaining salt marsh within Boston.

As the project proponent continues to identify community benefit projects during the various permitting and review processes, we ask that consideration be given to the following:

---Salt marsh restoration in the Rumney Marshes Area of Critical Environmental Concern (ACEC), which includes Belle Isle Marsh and Rumney Marsh. Besides proposed improvements to the quality of the stormwater being discharged, the proponent should also help support projects identified within the Rumney Marshes ACEC Salt Marsh Restoration Plan to restore degraded salt marsh in the ACEC. **TBHA 05**

---East Boston Greenway. As noted in the Environmental Notification Form, the City of Boston and the Massachusetts Port Authority are working together and with others to complete the East Boston Greenway between Constitution Beach and Belle Isle Marsh. We ask that the proponent also help support the completion of this important link along the water's edge for the enjoyment of local residents and the general public. **TBHA 06**

Climate change mitigation and adaptation: Caesars Entertainment is to be commended for its strong commitment to environmental sustainability, and for setting a "green" standard within the gaming industry. This commitment is reflected in the ENF, with significant attention to low impact development and best management practices. Besides striving for LEED Gold, the proponent is also examining possible usage of renewable energy.

As part of a further analysis of climate change preparedness, "the Proponent will consider in the DEIR potential impacts or changes resulting from a storm surge, increased frequency of storms, rising temperatures, increased frequency of extreme hot days, precipitation changes, as appropriate" (page 4-15 of ENF). We look forward to seeing this detailed analysis. **TBHA 07**

As part of the December, 2012 TBHA Harbor Use Committee discussion, there was significant support for the proponent's conversion of existing impervious paving to pervious landscaping. Incorporation of such a climate change adaptation measure will no doubt help increasing the project's resilience. It was further **TBHA 08**

suggested that the proponent might want to host a design charrette to receive additional "soft engineering" suggestions, which we hope the proponent will convene.

Thank you for your consideration.

Sincerely,

Vivien Li
President
The Boston Harbor Association

THE BOSTON HARBOR ASSOCIATION

TBHA 01 **Consistent with the decreased amount of parking, we urge the Proponent to help subsidize transit usage by employees, to provide shuttle service to transit stations, to limit employee parking to only those employees who require ADA access, and to provide employee parking only during work shifts when MBTA service is not available.**

The TDM plan in Section 5.9 includes commitments to subsidize employee transit use and enhance the shuttle service to Suffolk Downs Station. The employee parking plan described in Section 5.10.3 will cater to employees when MBTA service is not available.

TBHA 02 **While the Boston Inner Harbor [water transportation routes] to Logan Airport and to Boston Harbor Shipyard & Marina require physically longer landside connections, visitors to the casino resort destination will no doubt consider the boat trip part of the destination experience. We ask that the Secretary's Certificate for the DEIR require further analysis of the water transportation options, including coordination with the Massachusetts Port Authority which owns the aforementioned docks, with the Boston Redevelopment Authority (BRA) which will be initiating boat service between the South Boston Innovation District and East Boston, and with private boat operators who may initiate service from the South Shore and other locations for visitors going to the site.**

The Proponent supports Mayor Menino's vision to enhance water transportation options to East Boston by instituting regular water shuttle service between the South Boston and East Boston waterfronts. As such, the Boston HCA includes a contribution that will assist the City in establishing this service.

TBHA 03 **We look forward to greater detail [on the expansion of the existing bicycle network from Saratoga Street along Bennington Street to Eliot Circle at revere Beach].**

The concept for the on-street bicycle accommodations is described in Section 5.6.3.

TBHA 04 **As part of the Draft EIR, we ask that an analysis of potential wind and shadow impacts to the pedestrian and cyclist experiences be included, with particular attention to minimizing any adverse impacts upon local pedestrians.**

An analysis of potential wind impacts is provided in Section 6.1, and a shadow analysis is provided in Section 6.2.

TBHA 05 **[We ask that the Proponent consider] salt marsh restoration in the Rumney Marshes ACEC, which includes Belle Isle Marsh and Rumney Marsh. Besides proposed improvements to the quality of the stormwater being discharged, the Proponent should also help support projects identified within the Rumney Marshes ACEC Salt Marsh Restoration Plan to restore degraded salt marsh in the ACEC.**

The proposed stormwater management at the Project site will result in significant water quality improvements in the downstream ACEC. Stormwater management and associated water quality benefits are described in Section 9.3.

TBHA 06 **As noted in the ENF, the City of Boston and the Massachusetts Port Authority are working together and with others to complete the East Boston Greenway between Constitution Beach and Belle Isle Marsh. We ask that the Proponent also help support the completion of this important link along the water's edge for the enjoyment of local residents and the general public.**

Section 4.1 describes the Project's proximity to East Boston's network of open spaces.

TBHA 07 **We look forward to seeing a detailed analysis [of potential impacts or changes resulting from storm surge, increased frequency of storms, rising temperatures, increased frequency of hot days, and precipitation changes].**

The Resort has been designed to accommodate sea level rise (see Section 2.3). The 100-year floodplain on the site is at elevation 15.46 feet (BCB), and MHHW on the Project site is at elevation 10.44 feet. Consistent with The Boston Harbor Association's sea level rise analysis, the Project team applied a sea level rise of 7.5 feet to MHHW to obtain a sea level rise "mitigation elevation" of 18.7 feet, and has located the proposed buildings, entrance road, and critical infrastructure above this elevation to provide resiliency to sea level rise.

The major building infrastructure is designed with a modular approach so that if necessary, additional infrastructure can be added in the future to respond to climate change. For example, if temperatures increase, additional cooling capacity could be added via a new chiller and cooling tower. If severe storms become more frequent, emergency generators can be added to back-up more of the facility's functions.

TBHA 08 As part of the December 2012 TBHA Harbor Use Committee discussion, there was significant support for the Proponent's conversion of existing impervious paving to pervious landscaping... It was further suggested that the Proponent might want to host a design charrette to receive additional "soft engineering" suggestions, which we hope the Proponent will convene.

Section 4.4 describes how impervious paving will be replaced with a stormwater treatment landscape employing native plantings.

March 26, 2013

Secretary Richard K. Sullivan, Jr.
Executive Office of Energy and Environmental Affairs (EEA)
100 Cambridge Street, Suite 900
Boston MA 02114

RE: **Comments on ENF for Caesars Resort at Suffolk Downs - EEA #15006**

Dear Secretary Sullivan:

WalkBoston has reviewed the ENF for Caesars Resort at Suffolk Downs. We find agreement with the general design, as it seems directed toward providing safe facilities for pedestrians. A number of design details should be more closely investigated as part of the DEIR. Our comments about those details follow.

Underlying Assumptions

Many of the patrons and staff of the casino complex and racetrack will arrive on foot from transit stations or parking lots. Thus walking should be a significant element of the project design, coordinated with vehicular routes to minimize potential conflicts. Walking, transit and bike use should be maximize d in keeping with the Commonwealth's goal of tripling the share of walking, biking and transit use. Access to and from the two MBTA stations and the Route 1A bus lines, and access between distant parking locations and the casinos and the racetrack are the primary routes to be addressed. Walking access between the site and adjacent residential areas should also be addressed. **WB 01**

Good information about the projected volumes of pedestrians (and bicycles) should inform the design and size of facilities.

For example, the ENF states that most employees will come to the site via public transportation. While not explicitly stated, we would anticipate that nearly all would walk from the MBTA stations into the site (unless shuttle service is provided). Because the Suffolk Downs Station is considerably closer to the proposed buildings than Beachmont Station, it will likely attract more users. The walkway from the station into the site should be designed to accommodate the anticipated volume of walkers (and bicyclists if they will use the same route) and the projected volumes should be included in the DEIR. **WB 02**

Overall Design Issues to be addressed

- <u>The design of walkways and walk routes should be attractive, include high quality landscaping, and feel inviting both day and night, winter and summer. Designs should include:</u> **WB 03**
  - A network of short distance walkways to encourage people to walk on site.
  - Lighting for safety, using designs that do not spill into residential areas or obscure the night sky
  - Safety and security especially given late night operations for employees and patrons, where there are fairly long walks such as the one to the Suffolk Downs MBTA station
  - Benches
  - Smooth surfaces on all walkways
  - Year round maintenance including snow shoveling
  - Shade while walking to the casinos and hotels

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- In New England, inclement weather is inevitable, suggesting the possibility of providing shelters or coverings along walkways, or alternative means of reaching destinations, such as a shuttle bus service **WB 04**
- Wayfinding for pedestrians – Signage should be employed as fully as possible to help pedestrians find their routes within this very large site. Signs would also encourage the use of MBTA bus routes and subway facilities, and should be used to designate access points in the event an on-site bus shuttle service is provided. Other off-site locations of interest should be included, such as the Belle Isle Marsh Reservation, Revere Beach and potentially the Target/Super Stop and Shop complex , the racetrack's horse barns and other sites that might improve the experience of nearby residents as well as patrons of the casinos, the racetrack, and the hotels. **WB 05**
- Parking lots should be designed attractively, with trees and with defined walking paths that are separated from moving vehicle areas within the lots **WB 06**

- Multi-use path design.
  The paths on the site that are walking/biking multi-use paths should provide appropriate widths to allow for safe shared use. MassDOT standards (Mass Highway Department Project Development and Design Guide, 2006), call for multi-use paths to be 10—14 feet wide to accommodate both pedestrians and bicycles, and for wider facilities if substantial volumes of foot and bike traffic are anticipated. **WB 07**

Tomasello Way/Rte 1A intersection and Tomasello Way Design

- Bus service
  Bus service along Rte 1A is already substantial. Routes along the roadway connect Salem Center, Marblehead and Peabody Square to Haymarket and Downtown Crossing – 6 bus routes in total. Well-designed and highly-visible bus stops, along with weather-protecting shelters, should be included in the revamping of the intersection of the Tomasello Way/Rte 1A intersection. **WB 08**
- Signals and crosswalks
  In keeping with the intersection's importance as the front door of the proposed development, the intersection will need to be fully signalized for safety for all users, including pedestrians who will be crossing Rte 1A to and from the new bus stops and shelters. In the re-signalization of the intersection, pedestrian count-down signals should be employed. **WB 09**
- Access between the intersection and the on-site facilities
  The proposal includes a major pedestrian way leading from the intersection of Tomasello Way and Rte 1A into the main entrance to the casinos, the racetrack and the hotels. It appears to be useful and attractive, but it must be made safe for walkers and is worthy of significant improvements to make it safe. According to the preliminary drawings, the walkway will be located in the median strip of the rebuilt south portion of Tomasello Way. This is a formal design that could be handsome, but it results in a strip of walkway in the median that could be difficult for walkers to access, because it requires them to cross roadways on both ends of the walkway – near Rte 1A and at the casino/racetrack entrances, as well as at intermediate locations in between – five crosswalks in all. A better solution might be to have the pedestrian way located on the south side of Tomasello Way, with more direct access across the street at a point where the walkway is closest to the casino. This would reduce potential pedestrian/vehicle conflicts along the full length of this stretch of Tomasello Way. **WB 10**
- Amenities along Tomasello Way

Pedestrians walking via Tomasello Way have a relatively long walk between Rte 1A and the site (roughly equivalent to 3-4 city blocks). The preliminary drawings show lines of trees that will be very appropriate to make a pleasant walk. Seating along the way would also make the route more attractive and allow people to rest as they make their way to the casinos or the racetrack. **WB 11**

- A sidewalk connecting Tomasello Way and Waldemar Avenue in Orient Heights
  A wholly new but short on-site sidewalk connecting Tomasello Way and Waldemar Avenue would allow Orients Heights residents to reach the bus stops at the intersection of Rte 1A and Tomasello Way, and to be able to walk to the casinos or the racetrack. **WB 12**
- A roadway connecting Tomasello Way to Waldemar Avenue in Orient Heights
  Consideration of a sidewalk connecting Tomasello Way and Waldemar Avenue should include examination of a future road connection as well. A new, relatively short street to link Tomasello Way to Waldemar Avenue could reduce problems at the intersection of Waldemar Avenue and Route 1A near the Tomasello Way entrance to the site because it would allow Orient Heights access to be diverted to the Tomasello Way entrance to the site. The connection could include options for improving the safety of nearby residents:
  - Waldemar Avenue could become a dead-end street before reaching Rte 1A; or
  - It could be made one-way inbound toward the residences; or
  - It might be connected to Vallar Road if gradients are favorable.

The continuation of Tomasello Way to the Suffolk Downs MBTA station

A driveway currently exists along the proponent's property line between the Rte 1A entrance to the site and the small turnaround space in front of Suffolk Downs T station. The west half of this route has been covered above. However, the future of the east half of the driveway is unclear, even though it could be used for vehicular and pedestrian traffic as part of the larger plan. An explanation should be provided as to: **WB 13**

- Whether this driveway will become an access roadway providing service both to the south entrance to the casino, and to the Suffolk Downs MBTA Station.
- Whether this driveway will be extended to connect into the local roadways of Orient Heights, such as Waldemar Avenue, Walley Street and Bonito Square. This connection could relatively easily reach Bennington Street as well, and could become a major route for vehicles entering or leaving the site.
- Whether an improvement is planned for the pedestrian component of the service plaza at the MBTA Station.
- What the pedestrian connections along this roadway will become, as it provides a major walkway between the MBTA station and the casinos and hotels. This connection might also be used to enhance direct access from neighborhood walkways into the station.

Pedestrian access from off-site locations

- Pedestrian access between Orient Heights and a potential Route 1A bus stop at Boardman Avenue.
  A partial interchange is proposed for the intersection of Boardman Avenue (Route 145) and Route 1A. The proposal calls for a northbound overpass above Rte 1A to pass over the turning between Rte 1A and Boardman Avenue. The overpass design and focus of turning traffic at the intersection suggests some difficult crossings for pedestrians from Orient Heights. Bus stop access for pedestrians should be explored as part of the proposed partial interchange. It may be possible to link Boardman Street access to the bus stop at Tomasello Way. **WB 14**
- Pedestrian access between Orient Heights and the Target/Super Stop and Shop complex
  The ENF notes that walkers from Orient Heights need to cross the Suffolk Downs site to get to **WB 15**

the shopping complex located near the intersection of Tomasello Way and Furlong Drive, which are important businesses for Orient Heights residents to use. Data support-ing this suggestion would be useful. The multi-use path along Tomasello Way will improve this walk. From a pedestrian point-of-view, the suggested location of the walkway on the east side of Tomasello Way results in pedestrians from Orient Heights crossing at least 6 streets on route to the shopping complex, unless they follow the alternative walking route that hugs the buildings. The proponent should examine whether the walkway could be moved to the west side of Tomasello Way to reduce the number of crossings. Pedestrians walking along Tomasello Way should also be protected from walking through either of the two roundabouts at the approach to the hotels and casinos. Roundabouts are not very safe for pedestrian because of the potential conflicts with turning vehicles.

- Pedestrian access between Crescent Heights and the Target/Super Stop and Shop complex
  Residents of the Crescent Heights neighborhood at the north edge of the site could also reach the shopping area via the Tomasello Way walkway.
- Racetrack walkway to the Target/Super Stop and Shop complex
  The plan includes a walkway between the racetrack and the Target/Super Stop and Shop via the edge of the northern parking lots. The intersection of this walkway and Tomasello Way should be moved slightly to align with the front entrance to the shopping complex. The volume of foot traffic at this intersection may be low, but further exploration may suggest the need for a traffic signal with WALK signals. **WB 16**

Potential shuttle bus service

Shuttle buses should be considered to help people get around and to provide options during inclement weather. Options for shuttle bus stops include main entrances to the casino and race track, the Suffolk Downs and Beachmont MBTA stations, bus stops on Route 1A at Tomasello Way, the bus stop on Winthrop Avenue, and for access to the more remote parking areas. Facilities to support shuttle bus service may include the addition of a turnaround area in front of Suffolk Downs MBTA Station and a u-turn on Tomasello Way just short of Route 1A. Shuttles may also be useful to serve future night transit service on the Blue Line and elsewhere. **WB 17**

Local Community Benefits - pedestrian improvements at other locations

The ENF includes suggestions that certain improvements outlined by the Lower North Shore Traffic Study of 2000 could be included as part of the mitigation for the construction of this facility. Although no detail has been supplied on these locations, they appear to include intersections at Route 16 at Winthrop Avenue/Harris Street, the vicinity of the Beachmont MBTA Station in Revere, in the vicinity of Route 16/Route 1A/Bell Circle in Revere, and, in East Boston, at Bennington & Saratoga Streets at Orient Heights MBTA station and Boardman St. in East Boston. Many of these improvements have been requested by the affected communities and will need to be detailed in further submittals to show potential impacts on pedestrians. **WB 18**

We appreciate your consideration of our comments and your responses to them. Please feel free to contact WalkBoston with any questions you may have.

Sincerely,

Wendy Landman

Wendy Landman
Executive Director

WALK BOSTON

WB 01 Walking, transit and bike use should be maximized in keeping with the Commonwealth's goal of tripling the share of walking, biking, and transit use. Access to and from the two MBTA stations and the Route 1A bus lines, and access between distant parking locations and the casino and the racetrack are the primary routes to be addressed. Walking access between the site and adjacent residential areas should also be addressed.

Sections 1.4 and 4.4 describe pedestrian and bicycle connectivity from surrounding neighborhoods to the Project site.

WB 02 The walkway from [Suffolk Downs] station into the site should be designed to accommodate the anticipated volume of walkers (and bicyclists if they will use the same route) and the projected volumes should be included in the DEIR.

Sections 1.4 and 4.4 describe pedestrian and bicycle connectivity from surrounding neighborhoods to the Project site.

WB 03 The design of walkways and walk routes should be attractive, include high quality landscaping, and feel inviting both day and night, winter and summer. Designs should include:

- A network of short distance walkways to encourage people to walk on site;
- Lighting for safety, using designs that do not spill into residential areas or obscure the night sky;
- Safety and security, especially given late-night operations for employees and patrons, where there are fairly long walks such as the one to Suffolk Downs MBTA station;
- Benches;
- Smooth surfaces on all walkways;
- Year-round maintenance including snow shoveling; and
- Shade while walking to the casino and hotels.

Sections 1.4 and 4.4 describe pedestrian and bicycle connections from surrounding communities to the Project site as well as amenities for pedestrians and bicyclists.

WB 04 In New England, inclement weather is inevitable, suggesting the possibility of providing shelters or coverings along walkways, or alternative means of reaching destinations, such as a shuttle bus service.

Sections 1.4 and 4.4 describe pedestrian and bicycle connections to the Project from surrounding neighborhoods. Walkways and paths will be shaded whenever possible.

WB 05 **Signage should be employed as fully as possible to help pedestrians find their routes within this very large site. Signs should also encourage the use of MBTA bus routes and subway facilities... Other off-site locations of interest should be included, such as the Belle Isle Marsh Reservation, Revere Beach, and potentially the Target/Super Stop and Shop complex, the racetrack's horse barns and other sites...**

The Proponent has engaged a signage consultant to develop a comprehensive way-finding system for both the interior building and exterior site signage. The preliminary framework of signage will include: identification, direction, information, regulation and amenities. This framework of signs will incorporate all the comments listed above.

WB 06 **Parking lots should be designed attractively, with trees and with defined walking paths that are separated from moving vehicle areas within the lots.**

Section 4.4.9 describes how the parking lots are designed to be both functional and attractive.

WB 07 **The paths on the site that are walking/biking multi-use paths should provide appropriate widths to allow for safe shared use.**

Sections 1.4 and 4.4 describe pedestrian and bicycle connections to the Project from surrounding neighborhoods.

WB 08 **Well-designed and highly-visible bus stops, along with weather-protecting shelters, should be included in the revamping of the intersection of the Tomasello Way/Route 1A intersection.**

The enhancement of bus stops on Route 1A will be investigated as part of the design development of the option concepts presented in Section 5.5.

WB 09 **In keeping with the [Tomasello Way/Route 1A] intersection's importance as the front door of the proposed development, the intersection will need to be fully signalized for safety for all users, including pedestrians who will be crossing Route 1A to and from the new bus stops and shelters. In the re-signalization of the intersection, pedestrian countdown signals should be employed.**

Pedestrian accommodations at this intersection will be refined as part of the design development of the option concepts presented in Section 5.5.

WB 10 The proposal includes a major pedestrian way leading from the intersection of Tomasello Way and Route 1A into the main entrance to the casino, racetrack, and hotels. It appears to be useful and attractive, but it must be made safe for walkers and is worthy of significant improvements... According to the preliminary drawings, the walkway will be located in the median strip of the rebuilt south portion of Tomasello Way. This is a formal design that could be handsome, but it results in a strip of walkway in the median that could be difficult for walkers to access because it requires them to cross roadways on both ends of the walkway – near Route 1A and at the casino/racetrack entrances, as well as at intermediate locations in between – five crosswalks in all. A better solution might be to have the pedestrian way located on the south side of Tomasello Way, with more direct access across the street at a point where the walkway is closest to the casino.

Since the ENF filing, the pathway has been reconfigured to keep it separate from the roadway, moving it through the ecological landscape to provide a more enjoyable pedestrian experience.

WB 11 Pedestrians walking via Tomasello Way have a relatively long walk between Route 1A and the site (roughly equivalent to 3-4 city blocks). The preliminary drawings show lines of trees that will be very appropriate to make a pleasant walk. Seating along the way would also make the route more attractive and allow people to rest...

Sections 1.4 and 4.4 describe the pedestrian connections to the Project, which will be shaded whenever possible and will include site furnishings and amenities.

WB 12 A wholly new but short on-site sidewalk connecting Tomasello Way and Waldemar Avenue would allow Orient Heights residents to reach the bus stops at the intersection of Route 1A and Tomasello Way, and to be able to walk to the casino or racetrack... Consideration of a sidewalk connecting Tomasello Way and Waldemar Avenue should include examination of a future road connection as well.

Sections 1.4 and 4.4 describe a pedestrian connection from Orient Heights to the Project. Through the extensive public outreach that has accompanied the Project, the Proponent has learned that a future vehicular road connection is not favored by the community due to the potential to attract Project trips through the neighborhood.

WB 13 A driveway currently exists along the Proponent's property line between the Route 1A entrance to the site and the small turnaround space in front of Suffolk Downs T station... The future of the east half of the driveway is unclear... An explanation should be provided as to:

- Whether this driveway will become an access roadway providing service both to the south entrance to the casino and to the Suffolk Downs MBTA station;

- Whether this driveway will be extended to connect into the local roadways of Orient Heights...;
- Whether an improvement is planned for the pedestrian component of the service plaza at the MBTA station; and
- What the pedestrian connections along this roadway will become, as it provides a major walkway between the MBTA station and the casino and hotels.

Pedestrian and bicycle connections are described in Sections 1.4 and 4.4.

WB 14 A partial interchange is proposed for the intersection of Boardman Street (Route 145) and Route 1A. The proposal calls for a northbound overpass above Route 1A to pass over the turning between Route 1A and Boardman Street. The overpass design and focus of turning traffic at the intersection suggests some difficult crossings for pedestrians from Orient Heights. Bus stop access for pedestrians should be explored as part of the proposed partial interchange. It may be possible to link Boardman Street access to the bus stop at Tomasello Way.

The concept plan for the flyover solution (Option 4) includes such a pedestrian connection.

WB 15 The ENF notes that walkers from Orient Heights need to cross the Suffolk Downs site to get to the shopping complex located near the intersection of Tomasello Way and Furlong Drive... Data supporting this suggestion would be useful. The multi-use path along Tomasello Way will improve this walk... The Proponent should examine whether the walkway could be moved to the west side of Tomasello Way to reduce the number of [pedestrian] crossings. Pedestrians walking along Tomasello Way should also be protected from walking through either of the two roundabouts at the approach to the hotels and casino.

Sections 1.4 and 4.4 describe pedestrian and bicycle connections as well as the streetscape design along Tomasello Drive. The proposed site layout will require that pedestrian cross the traffic circle areas. Proposed walkways have been designed to maintain all pedestrian traffic on the east side of Tomasello Drive closest to Project activities. All pedestrian crossings of proposed roadways and traffic circles will be designed to maximize pedestrian safety, including the incorporation of crosswalks and ramps.

WB 16 The plan includes a walkway between the racetrack and the Target/Super Stop and Shop via the edge of the northern parking lots. The intersection of this walkway and Tomasello Way should be moved slightly to align with the front entrance to the shopping complex.

Pedestrian and bicycle connections are described in Sections 1.4 and 4.4; pathways along Tomasello Drive have been carefully designed to consider access to the adjacent shopping center.

WB 17 **Shuttle buses should be considered to help people get around and to provide options during inclement weather.**

On-site shuttle service to the MBTA Suffolk Downs Station will be enhanced. An off-site shuttle plan is presented in Section 5.8.3.

WB 18 **The ENF includes suggestions that certain improvements outlined by the Lower North Shore Traffic Study of 2000 could be included as part of the mitigation for the construction of this facility... Many of these improvements have been requested by the affected communities and will need to be detailed in further submittals to show potential impacts on pedestrians.**

Concept plans for many off-site improvements include improved pedestrian accommodations and safety. These aspects will be refined during the design development of the concept plans.

Attachment A

Transportation Technical Appendices

ATTACHMENT A – TRANSPORTATION

DRAFT ENVIRONMENTAL IMPACT REPORT/ EXPANDED PROJECT NOTIFICATION FORM

CAESARS RESORT AT SUFFOLK DOWNS

EEA #15006

VHB Vanasse Hangen Brustlin, Inc.

September 2013

Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

Existing Transit Data

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Thursday, September 20, 2012 5:00 AM to 1:00 AM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	6,108	0	6,108	0	6,001	0
Revere Beach	3,160	40	9,228	40	3,170	6,001
Beachmont	2,957	152	12,033	153	3,020	9,131
Suffolk Downs	793	82	12,744	65	818	11,998
Orient Heights	3,979	225	16,498	208	4,040	12,751
Wood Island	1,992	181	18,309	161	1,989	16,583
Airport	6,985	825	24,469	1,033	6,161	18,411
Maverick	9,410	1,030	32,849	965	9,599	23,539
Aquarium	2,547	4,152	31,244	4,302	2,902	32,173
State Blue	1,245	15,655	16,834	14,234	1,336	30,773
Govt Ctr Blue	168	15,430	1,572	16,523	111	17,875
Bowdoin	0	1,572	0	1,463	0	1,463
Total Blue Line	39,344	39,344		39,147	39,147	
Two-way Tota	78,491	78,491				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Thursday, September 20, 2012 5:00 to 6:00 AM

Stations	Westbound (Read Down)			Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	193	0	193	0	32	0
Revere Beach	149	0	342	0	21	32
Beachmont	141	0	483	5	14	53
Suffolk Downs	9	0	492	1	3	62
Orient Heights	169	2	659	2	24	64
Wood Island	97	2	754	4	26	86
Airport	311	32	1,033	13	88	108
Maverick	483	12	1,504	21	69	183
Aquarium	1	138	1,367	25	36	231
State Blue	8	650	725	146	4	242
Govt Ctr Blue	5	664	66	91	0	100
Bowdoin	0	66	0	9	0	9
Total Blue Line	1,566	1,566		317	317	
Two-way Tota	1,883	1,883				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Thursday, September 20, 2012 6:00 to 7:00 AM

Stations	Westbound (Read Down)			Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	516	0	516	0	73	0
Revere Beach	252	2	766	0	44	73
Beachmont	290	3	1,053	2	29	117
Suffolk Downs	56	3	1,106	3	9	144
Orient Heights	406	13	1,499	6	33	150
Wood Island	231	8	1,722	5	67	177
Airport	500	53	2,169	32	205	239
Maverick	1,007	22	3,154	39	177	412
Aquarium	25	265	2,914	23	74	550
State Blue	41	1,420	1,535	461	7	601
Govt Ctr Blue	5	1,359	181	144	1	147
Bowdoin	0	181	0	4	0	4
Total Blue Line	3,329	3,329		719	719	
Two-way Tota	4,048	4,048				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Thursday, September 20, 2012 7:00 to 8:00 AM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	1,009	0	1,009	0	86	0
Revere Beach	397	1	1,405	2	54	86
Beachmont	431	3	1,833	7	22	138
Suffolk Downs	100	2	1,931	0	7	153
Orient Heights	581	6	2,506	14	50	160
Wood Island	293	20	2,779	5	43	196
Airport	662	60	3,381	24	185	234
Maverick	1,219	71	4,529	29	255	395
Aquarium	44	526	4,047	49	265	621
State Blue	117	1,849	2,315	575	42	837
Govt Ctr Blue	13	1,985	343	292	3	304
Bowdoin	0	343	0	15	0	15
Total Blue Line	4,866	4,866		1,012	1,012	
Two-way Tota	5,878	5,878				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Thursday, September 20, 2012 8:00 to 9:00 AM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	1,312	0	1,312	0	77	0
Revere Beach	427	0	1,739	1	50	77
Beachmont	558	6	2,291	4	20	126
Suffolk Downs	126	0	2,417	3	12	142
Orient Heights	740	10	3,147	7	50	151
Wood Island	274	10	3,411	9	27	194
Airport	632	41	4,002	22	127	212
Maverick	1,204	72	5,134	35	225	317
Aquarium	65	819	4,380	49	451	507
State Blue	206	2,025	2,561	576	88	909
Govt Ctr Blue	13	2,230	344	397	11	421
Bowdoin	0	344	0	35	0	35
Total Blue Line	5,557	5,557		1,138	1,138	
Two-way Tota	6,695	6,695				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Thursday, September 20, 2012 9:00 to 10:00 AM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	669	0	669	0	87	0
Revere Beach	236	4	901	6	52	87
Beachmont	283	8	1,176	3	47	133
Suffolk Downs	59	0	1,235	5	14	177
Orient Heights	368	5	1,598	9	56	186
Wood Island	160	5	1,753	7	30	233
Airport	450	26	2,177	26	93	256
Maverick	811	45	2,943	35	171	323
Aquarium	86	480	2,549	32	279	459
State Blue	91	1,214	1,426	393	66	706
Govt Ctr Blue	14	1,289	151	350	2	379
Bowdoin	0	151	0	31	0	31
Total Blue Line	3,227	3,227		897	897	
Two-way Tota	4,124	4,124				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Thursday, September 20, 2012 10:00 to 11:00 AM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	321	0	321	0	95	
Revere Beach	170	1	490	4	67	95
Beachmont	180	4	666	4	45	158
Suffolk Downs	52	6	712	0	24	199
Orient Heights	232	7	937	6	68	223
Wood Island	126	7	1,056	2	32	285
Airport	387	57	1,386	30	121	315
Maverick	540	56	1,870	33	191	406
Aquarium	72	268	1,674	36	180	564
State Blue	49	782	941	361	39	708
Govt Ctr Blue	14	882	73	351	4	386
Bowdoin	0	73		39	0	39
Total Blue Line	2,143	2,143		866	866	
Two-way Tota	3,009	3,009				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Thursday, September 20, 2012 11:00 AM to Noon

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	241	0	241	0	150	0
Revere Beach	173	5	409	2	91	150
Beachmont	125	5	529	11	81	239
Suffolk Downs	25	6	548	3	41	309
Orient Heights	159	12	695	14	100	347
Wood Island	62	10	747	3	43	433
Airport	325	76	996	50	190	473
Maverick	334	58	1,272	47	252	613
Aquarium	89	173	1,188	56	199	818
State Blue	56	543	701	500	55	961
Govt Ctr Blue	14	666	49	472	2	516
Bowdoin	0	49	0	46	0	46
Total Blue Line	1,603	1,603		1,204	1,204	
Two-way Tota	2,807	2,807				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Thursday, September 20, 2012 Noon to 1:00 PM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	219	0	219	0	191	0
Revere Beach	114	1	332	3	102	191
Beachmont	117	8	441	10	96	290
Suffolk Downs	25	5	461	6	72	376
Orient Heights	141	6	596	14	127	442
Wood Island	70	4	662	7	63	555
Airport	322	60	924	31	223	611
Maverick	366	52	1,238	53	311	803
Aquarium	130	123	1,245	107	161	1,061
State Blue	47	598	694	561	88	1,115
Govt Ctr Blue	9	656	47	590	4	642
Bowdoin	0	47	0	56	0	56
Total Blue Line	1,560	1,560		1,438	1,438	
Two-way Tota	2,998	2,998				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Thursday, September 20, 2012 1:00 to 2:00 PM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	227	0	227	0	235	0
Revere Beach	171	3	395	2	160	235
Beachmont	100	10	485	14	133	393
Suffolk Downs	35	14	506	4	48	512
Orient Heights	139	26	619	16	140	556
Wood Island	67	14	672	10	53	680
Airport	324	58	938	55	208	723
Maverick	358	56	1,240	53	412	876
Aquarium	117	142	1,215	145	189	1,235
State Blue	60	590	685	622	84	1,279
Govt Ctr Blue	11	646	50	685	13	741
Bowdoin	0	50	0	69	0	69
Total Blue Line	1,609	1,609		1,675	1,675	
Two-way Tota	3,284	3,284				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Thursday, September 20, 2012 2:00 to 3:00 PM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	239	0	239	0	347	0
Revere Beach	199	2	436	1	200	347
Beachmont	131	19	548	24	203	546
Suffolk Downs	40	4	584	8	65	725
Orient Heights	158	17	725	24	317	782
Wood Island	83	14	794	6	161	1,075
Airport	505	58	1,241	88	432	1,230
Maverick	611	98	1,754	73	663	1,574
Aquarium	184	207	1,731	271	173	2,164
State Blue	53	880	904	942	95	2,066
Govt Ctr Blue	14	867	51	1,119	9	1,219
Bowdoin	0	51	0	109	0	109
Total Blue Line	2,217	2,217		2,665	2,665	
Two-way Tota	4,882	4,882				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Thursday, September 20, 2012 3:00 to 4:00 PM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	207	0	207	0	530	0
Revere Beach	170	6	371	5	314	530
Beachmont	116	8	479	16	312	839
Suffolk Downs	38	10	507	19	90	1,135
Orient Heights	180	27	660	19	425	1,206
Wood Island	103	15	748	13	214	1,612
Airport	462	48	1,162	86	549	1,813
Maverick	557	79	1,640	84	994	2,276
Aquarium	233	196	1,677	324	182	3,186
State Blue	81	768	990	1,417	159	3,044
Govt Ctr Blue	12	971	31	1,548	14	1,786
Bowdoin	0	31	0	252	0	252
Total Blue Line	2,159	2,159		3,783	3,783	
Two-way Tota	5,942	5,942				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Thursday, September 20, 2012 4:00 to 5:00 PM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	216	0	216	0	933	0
Revere Beach	172	3	385	5	384	933
Beachmont	92	6	471	18	421	1,312
Suffolk Downs	47	7	511	5	92	1,715
Orient Heights	190	28	673	12	509	1,802
Wood Island	125	10	788	17	240	2,299
Airport	443	45	1,186	85	635	2,522
Maverick	574	91	1,669	98	1,040	3,072
Aquarium	353	233	1,789	603	230	4,014
State Blue	80	942	927	1,613	140	3,641
Govt Ctr Blue	7	913	21	1,833	18	2,168
Bowdoin	0	21	0	353	0	353
Total Blue Line	2,299	2,299		4,642	4,642	
Two-way Tota	6,941	6,941				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Thursday, September 20, 2012 5:00 to 6:00 PM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	200	0	200	0	1,127	0
Revere Beach	159	3	356	3	328	1,127
Beachmont	127	15	468	11	497	1,452
Suffolk Downs	48	4	512	0	103	1,938
Orient Heights	151	11	652	11	570	2,041
Wood Island	85	20	717	16	209	2,600
Airport	466	43	1,140	90	578	2,793
Maverick	490	88	1,542	94	1,002	3,281
Aquarium	443	277	1,708	701	146	4,189
State Blue	140	993	855	1,695	173	3,634
Govt Ctr Blue	16	833	38	1,811	20	2,112
Bowdoin	0	38	0	321	0	321
Total Blue Line	2,325	2,325		4,753	4,753	
Two-way Tota	7,078	7,078				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Thursday, September 20, 2012 6:00 to 7:00 PM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	124	0	124	0	604	0
Revere Beach	72	3	193	4	261	604
Beachmont	60	20	233	12	221	861
Suffolk Downs	28	6	255	0	50	1,070
Orient Heights	94	18	331	27	317	1,120
Wood Island	49	17	363	19	145	1,410
Airport	268	40	591	75	403	1,536
Maverick	204	64	731	65	706	1,864
Aquarium	309	61	979	394	107	2,505
State Blue	94	556	517	1,135	73	2,218
Govt Ctr Blue	1	507	11	1,077	5	1,156
Bowdoin	0	11	0	84	0	84
Total Blue Line	1,303	1,303		2,892	2,892	
Two-way Tota	4,195	4,195				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Thursday, September 20, 2012 7:00 to 8:00 PM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	101	0	101	0	344	0
Revere Beach	62	3	160	0	219	344
Beachmont	51	16	195	6	184	563
Suffolk Downs	17	8	204	1	29	741
Orient Heights	60	22	242	11	269	769
Wood Island	23	13	252	6	103	1,027
Airport	216	32	436	69	360	1,124
Maverick	200	55	581	78	494	1,415
Aquarium	129	44	666	261	81	1,831
State Blue	37	368	335	742	48	1,651
Govt Ctr Blue	2	329	8	957	0	957
Bowdoin	0	8	0	0	0	0
Total Blue Line	898	898		2,131	2,131	
Two-way Tota	3,029	3,029				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Thursday, September 20, 2012 8:00 to 9:00 PM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	116	0	116	0	306	0
Revere Beach	47	5	158	0	184	306
Beachmont	33	8	183	9	150	490
Suffolk Downs	30	3	210	1	48	631
Orient Heights	53	8	255	6	240	678
Wood Island	37	3	289	7	93	912
Airport	178	52	415	136	314	998
Maverick	138	31	522	56	444	1,176
Aquarium	100	34	588	216	57	1,564
State Blue	22	361	249	622	33	1,405
Govt Ctr Blue	0	241	8	816	0	816
Bowdoin	0	8	0	0	0	0
Total Blue Line	754	754		1,869	1,869	
Two-way Tota	2,623	2,623				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Thursday, September 20, 2012 9:00 to 10:00 PM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	86	0	86	0	249	0
Revere Beach	51	2	135	0	197	249
Beachmont	20	11	144	4	148	446
Suffolk Downs	2	1	145	1	27	590
Orient Heights	40	9	176	2	192	616
Wood Island	15	8	183	7	114	806
Airport	177	22	338	81	369	913
Maverick	81	41	378	59	543	1,201
Aquarium	78	26	430	254	46	1,685
State Blue	25	276	179	556	21	1,477
Govt Ctr Blue	1	175	5	942	0	942
Bowdoin	0	5	0	0	0	0
Total Blue Line	576	576		1,906	1,906	
Two-way Tota	2,482	2,482				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Thursday, September 20, 2012 10:00 to 11:00 PM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	45	0	45	0	220	0
Revere Beach	39	0	84	1	169	220
Beachmont	33	7	110	2	141	388
Suffolk Downs	6	0	116	2	25	527
Orient Heights	50	7	159	9	215	550
Wood Island	23	4	178	10	121	756
Airport	198	23	353	66	510	867
Maverick	101	41	413	26	651	1,311
Aquarium	54	41	426	366	25	1,936
State Blue	18	271	173	595	24	1,595
Govt Ctr Blue	1	169	5	1,024	0	1,024
Bowdoin	0	5	0	0	0	0
Total Blue Line	568	568		2,101	2,101	
Two-way Tota	2,669	2,669				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Thursday, September 20, 2012 11:00 PM to Midnight

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	43	0	0	0	134	134
Revere Beach	37	0	43	0	160	294
Beachmont	13	7	80	0	135	429
Suffolk Downs	9	3	86	0	19	448
Orient Heights	37	0	92	6	200	642
Wood Island	23	2	129	3	108	747
Airport	98	21	150	40	351	1,058
Maverick	75	26	227	13	657	1,702
Aquarium	46	19	276	263	2	1,441
State Blue	7	207	303	440	5	1,006
Govt Ctr Blue	0	99	103	1,006	0	0
Bowdoin	0	4	4	0	0	0
Total Blue Line	388	388		1,771	1,771	
Two-way Tota	2,159	2,159				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Thursday, September 20, 2012 Midnight to 1:00 AM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	12	0	12	0	39	0
Revere Beach	13	0	25	0	50	39
Beachmont	1	0	26	0	38	89
Suffolk Downs	1	1	26	0	4	127
Orient Heights	3	0	29	2	45	131
Wood Island	5	1	33	0	34	174
Airport	20	3	50	9	132	208
Maverick	6	12	44	3	185	331
Aquarium	10	0	54	69	3	513
State Blue	3	33	24	118	4	447
Govt Ctr Blue	0	23	1	333	0	333
Bowdoin	0	1	0	0	0	0
Total Blue Line	74	74		534	534	
Two-way Total	608	608				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Saturday, September 22, 2012 5:00 AM to 1:00 AM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	3,858	0	3,858	0	3,713	0
Revere Beach	2,293	41	6,110	25	2,381	3,713
Beachmont	1,687	156	7,641	138	1,714	6,069
Suffolk Downs	1,081	93	8,629	75	1,213	7,645
Orient Heights	2,274	284	10,619	297	2,354	8,783
Wood Island	1,216	167	11,668	157	1,280	10,840
Airport	5,600	788	16,480	930	5,220	11,963
Maverick	6,554	943	22,091	827	7,053	16,253
Aquarium	2,729	2,837	21,983	3,201	3,324	22,479
State Blue	754	9,670	13,067	8,852	975	22,602
Govt Ctr Blue	0	13,067	0	14,725	0	14,725
Bowdoin	0	0	0	0	0	0
Total Blue Line	28,046	28,046		29,227	29,227	
Two-way Tota	57,273	57,273				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Saturday, September 22, 2012 5:00 to 6:00 AM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	31	0	31	0	23	0
Revere Beach	48	0	79	0	15	23
Beachmont	37	0	116	0	13	38
Suffolk Downs	3	0	119	0	7	51
Orient Heights	66	2	183	3	23	58
Wood Island	43	2	224	1	17	78
Airport	142	15	351	19	86	94
Maverick	204	8	547	14	58	161
Aquarium	2	58	491	23	13	205
State Blue	1	242	250	86	0	195
Govt Ctr Blue	0	250	0	109	0	109
Bowdoin	0	0	0	0	0	0
Total Blue Line	577	577		255	255	
Two-way Tota	832	832				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Saturday, September 22, 2012 6:00 to 7:00 AM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	153	0	153	0	57	0
Revere Beach	126	0	279	0	23	57
Beachmont	74	1	352	1	11	80
Suffolk Downs	7	1	358	0	5	90
Orient Heights	84	10	432	0	17	95
Wood Island	61	8	485	7	21	112
Airport	265	32	718	15	81	126
Maverick	381	14	1,085	14	40	192
Aquarium	7	98	994	12	39	218
State Blue	3	429	568	140	0	245
Govt Ctr Blue	0	568	0	105	0	105
Bowdoin	0	0	0	0	0	0
Total Blue Line	1,161	1,161		294	294	
Two-way Tota	1,455	1,455				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Saturday, September 22, 2012 7:00 to 8:00 AM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	246	0	0	0	87	0
Revere Beach	143	0	246	0	52	87
Beachmont	120	3	389	10	21	139
Suffolk Downs	9	0	506	0	8	150
Orient Heights	135	3	515	3	28	158
Wood Island	105	9	647	3	16	183
Airport	349	33	743	19	91	196
Maverick	429	29	1,059	27	84	268
Aquarium	20	162	1,459	19	62	325
State Blue	11	578	1,317	196	5	368
Govt Ctr Blue	0	750	750	177	0	177
Bowdoin	0	0	0	0	0	0
Total Blue Line	1,567	1,567		454	454	
Two-way Tota	2,021	2,021				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Saturday, September 22, 2012 8:00 to 9:00 AM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	229	0	229	0	68	0
Revere Beach	154	1	382	0	29	68
Beachmont	117	5	494	3	19	97
Suffolk Downs	44	0	538	0	3	113
Orient Heights	178	7	709	9	32	116
Wood Island	101	10	800	6	16	139
Airport	366	32	1,134	25	97	149
Maverick	488	45	1,577	13	108	221
Aquarium	17	212	1,382	25	116	316
State Blue	16	608	790	206	22	407
Govt Ctr Blue	0	790	0	223	0	223
Bowdoin	0	0	0	0	0	0
Total Blue Line	1,710	1,710		510	510	
Two-way Tota	2,220	2,220				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Saturday, September 22, 2012 9:00 to 10:00 AM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	264	0	264	0	70	0
Revere Beach	160	2	422	1	54	70
Beachmont	127	2	547	6	21	123
Suffolk Downs	23	6	564	5	37	138
Orient Heights	154	10	708	7	39	170
Wood Island	99	6	801	11	25	202
Airport	409	37	1,173	20	106	216
Maverick	546	51	1,668	34	128	302
Aquarium	29	251	1,446	26	225	396
State Blue	13	610	849	304	23	595
Govt Ctr Blue	0	849	0	314	0	314
Bowdoin	0	0	0	0	0	0
Total Blue Line	1,824	1,824		728	728	
Two-way Tota	2,552	2,552				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Saturday, September 22, 2012 10:00 to 11:00 AM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	262	0	262	0	116	0
Revere Beach	170	0	432	3	70	116
Beachmont	105	13	524	10	48	183
Suffolk Downs	28	4	548	0	99	221
Orient Heights	160	16	692	23	52	320
Wood Island	108	3	797	9	26	349
Airport	461	57	1,201	25	105	366
Maverick	420	53	1,568	44	152	446
Aquarium	82	239	1,411	40	253	554
State Blue	41	634	818	381	37	767
Govt Ctr Blue	0	818	0	423	0	423
Bowdoin	0	0	0	0	0	0
Total Blue Line	1,837	1,837		958	958	
Two-way Tota	2,795	2,795				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Saturday, September 22, 2012 11:00 AM to Noon

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	320	0	320	0	130	0
Revere Beach	123	7	436	1	84	130
Beachmont	119	8	547	8	51	213
Suffolk Downs	30	9	568	4	195	256
Orient Heights	160	15	713	8	82	447
Wood Island	61	7	767	11	50	521
Airport	399	86	1,080	39	238	560
Maverick	413	64	1,429	44	258	759
Aquarium	145	239	1,335	78	296	973
State Blue	52	537	850	550	47	1,191
Govt Ctr Blue	0	850	0	688	0	688
Bowdoin	0	0	0	0	0	0
Total Blue Line	1,822	1,822		1,431	1,431	
Two-way Tota	3,253	3,253				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Saturday, September 22, 2012 Noon to 1:00 PM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	384	0	384	0	177	0
Revere Beach	154	7	531	5	136	177
Beachmont	113	10	634	12	89	308
Suffolk Downs	70	20	684	5	231	385
Orient Heights	170	17	837	29	116	611
Wood Island	67	10	894	7	77	698
Airport	374	78	1,190	70	283	768
Maverick	401	78	1,513	72	387	981
Aquarium	161	166	1,508	131	250	1,296
State Blue	74	590	992	576	45	1,415
Govt Ctr Blue	0	992	0	884	0	884
Bowdoin	0	0	0	0	0	0
Total Blue Line	1,968	1,968		1,791	1,791	
Two-way Tota	3,759	3,759				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Saturday, September 22, 2012 1:00 to 2:00 PM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	311	0	311	0	211	0
Revere Beach	148	0	459	1	127	211
Beachmont	89	16	532	16	79	337
Suffolk Downs	78	16	594	5	184	400
Orient Heights	163	12	745	25	110	579
Wood Island	60	13	792	9	50	664
Airport	267	62	997	56	252	705
Maverick	399	49	1,347	48	393	901
Aquarium	165	210	1,302	160	308	1,246
State Blue	73	519	856	647	62	1,394
Govt Ctr Blue	0	856	0	809	0	809
Bowdoin	0	0	0	0	0	0
Total Blue Line	1,753	1,753		1,776	1,776	
Two-way Tota	3,529	3,529				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Saturday, September 22, 2012 2:00 to 3:00 PM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	248	0	248	0	230	0
Revere Beach	164	0	412	1	140	230
Beachmont	130	10	532	11	130	369
Suffolk Downs	92	7	617	9	69	488
Orient Heights	164	28	753	30	141	548
Wood Island	84	9	828	9	52	659
Airport	408	59	1,177	51	295	702
Maverick	547	70	1,654	66	448	946
Aquarium	192	219	1,627	207	293	1,328
State Blue	84	658	1,053	641	70	1,414
Govt Ctr Blue	0	1,053	0	843	0	843
Bowdoin	0	0	0	0	0	0
Total Blue Line	2,113	2,113		1,868	1,868	
Two-way Tota	3,981	3,981				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Saturday, September 22, 2012 3:00 to 4:00 PM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	258	0	258	0	262	0
Revere Beach	201	5	454	1	191	262
Beachmont	110	8	556	7	131	452
Suffolk Downs	104	9	651	11	51	576
Orient Heights	189	25	815	21	154	616
Wood Island	93	11	897	9	81	749
Airport	405	58	1,244	73	380	821
Maverick	566	74	1,736	65	633	1,128
Aquarium	247	289	1,694	255	328	1,696
State Blue	52	627	1,119	710	110	1,769
Govt Ctr Blue	0	1,119	0	1,169	0	1,169
Bowdoin	0	0	0	0	0	0
Total Blue Line	2,225	2,225		2,321	2,321	
Two-way Tota	4,546	4,546				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Saturday, September 22, 2012 4:00 to 5:00 PM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	239	0	239	0	304	0
Revere Beach	148	5	382	1	214	304
Beachmont	88	10	460	10	153	517
Suffolk Downs	166	7	619	6	44	660
Orient Heights	132	31	720	29	191	698
Wood Island	68	10	778	13	118	860
Airport	301	33	1,046	52	452	965
Maverick	437	67	1,416	66	611	1,365
Aquarium	278	160	1,534	288	230	1,910
State Blue	80	617	997	716	105	1,852
Govt Ctr Blue	0	997	0	1,241	0	1,241
Bowdoin	0	0	0	0	0	0
Total Blue Line	1,937	1,937		2,422	2,422	
Two-way Tota	4,359	4,359				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Saturday, September 22, 2012 5:00 to 6:00 PM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	234	0	234	0	379	0
Revere Beach	101	0	335	0	184	379
Beachmont	107	19	423	8	172	563
Suffolk Downs	210	6	627	9	32	727
Orient Heights	114	21	720	20	223	750
Wood Island	69	7	782	20	101	953
Airport	314	43	1,053	80	363	1,034
Maverick	335	83	1,305	42	522	1,317
Aquarium	376	124	1,557	296	212	1,797
State Blue	53	712	898	592	100	1,713
Govt Ctr Blue	0	898	0	1,221	0	1,221
Bowdoin	0	0	0	0	0	0
Total Blue Line	1,913	1,913		2,288	2,288	
Two-way Tota	4,201	4,201				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Saturday, September 22, 2012 6:00 to 7:00 PM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	173	0	173	0	304	0
Revere Beach	115	6	282	4	194	304
Beachmont	83	13	352	14	138	494
Suffolk Downs	68	3	417	3	39	618
Orient Heights	93	22	488	26	165	654
Wood Island	49	11	526	14	84	793
Airport	290	40	776	54	359	863
Maverick	211	67	920	47	427	1,168
Aquarium	263	137	1,046	222	228	1,548
State Blue	39	498	587	523	114	1,554
Govt Ctr Blue	0	587	0	1,145	0	1,145
Bowdoin	0	0	0	0	0	0
Total Blue Line	1,384	1,384		2,052	2,052	
Two-way Tota	3,436	3,436				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Saturday, September 22, 2012 7:00 to 8:00 PM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	185	0	185	0	294	0
Revere Beach	84	2	267	0	172	294
Beachmont	72	11	328	9	98	466
Suffolk Downs	56	3	381	4	41	555
Orient Heights	71	16	436	11	158	592
Wood Island	37	10	463	5	99	739
Airport	174	29	608	95	334	833
Maverick	218	62	764	72	420	1,072
Aquarium	293	93	964	214	160	1,420
State Blue	36	454	546	481	87	1,366
Govt Ctr Blue	0	546	0	972	0	972
Bowdoin	0	0	0	0	0	0
Total Blue Line	1,226	1,226		1,863	1,863	
Two-way Tota	3,089	3,089				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Saturday, September 22, 2012 8:00 to 9:00 PM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	101	0	101	0	247	0
Revere Beach	50	0	151	6	139	247
Beachmont	35	10	176	3	104	380
Suffolk Downs	20	0	196	2	34	481
Orient Heights	67	9	254	11	191	513
Wood Island	32	13	273	7	66	693
Airport	188	24	437	84	328	752
Maverick	127	44	520	69	360	996
Aquarium	152	51	621	200	83	1,287
State Blue	28	310	339	469	49	1,170
Govt Ctr Blue	0	339	0	750	0	750
Bowdoin	0	0	0	0	0	0
Total Blue Line	800	800		1,601	1,601	
Two-way Tota	2,401	2,401				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Saturday, September 22, 2012 9:00 to 10:00 PM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	69	0	69	0	274	0
Revere Beach	52	3	118	0	159	274
Beachmont	46	12	152	2	96	433
Suffolk Downs	26	2	176	3	47	527
Orient Heights	51	15	212	15	155	571
Wood Island	25	13	224	7	68	711
Airport	175	25	374	66	282	772
Maverick	129	34	469	57	320	988
Aquarium	106	35	540	188	71	1,251
State Blue	34	320	254	379	27	1,134
Govt Ctr Blue	0	254	0	782	0	782
Bowdoin	0	0	0	0	0	0
Total Blue Line	713	713		1,499	1,499	
Two-way Tota	2,212	2,212				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Saturday, September 22, 2012 10:00 to 11:00 PM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	89	0	89	0	256	0
Revere Beach	46	2	133	0	148	256
Beachmont	46	6	173	8	146	404
Suffolk Downs	11	2	182	0	32	542
Orient Heights	37	20	199	22	152	574
Wood Island	32	7	224	2	106	704
Airport	149	14	359	70	343	808
Maverick	134	20	473	28	457	1,081
Aquarium	123	35	561	234	65	1,510
State Blue	19	316	264	507	27	1,341
Govt Ctr Blue	0	264	0	861	0	861
Bowdoin	0	0	0	0	0	0
Total Blue Line	686	686		1,732	1,732	
Two-way Tota	2,418	2,418				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Saturday, September 22, 2012 11:00 PM to Midnight

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	65	0	65	0	169	0
Revere Beach	37	2	100	0	162	169
Beachmont	17	6	111	1	112	331
Suffolk Downs	11	0	122	5	28	442
Orient Heights	45	9	158	3	190	465
Wood Island	18	2	174	7	113	652
Airport	114	23	265	37	445	758
Maverick	91	38	318	17	710	1,166
Aquarium	100	31	387	319	40	1,859
State Blue	22	230	179	501	21	1,580
Govt Ctr Blue	0	179	0	1,100	0	1,100
Bowdoin	0	0	0	0	0	0
Total Blue Line	520	520		1,990	1,990	
Two-way Tota	2,510	2,510				

CharlieCard Trip Paths Phase 2 Study

Rapid Transit and Light Rail Line-Volume Tables

for Saturday, September 22, 2012 Midnight to 1:00 AM

Stations	Westbound	(Read Down)		Eastbound	(Read Up)	
BLUE LINE	Ons	Offs	Line Vol.	Ons	Offs	Line Vol.
Wonderland	27	0	27	0	74	0
Revere Beach	15	2	40	0	91	74
Beachmont	7	2	45	0	64	165
Suffolk Downs	3	0	48	0	15	229
Orient Heights	15	6	57	2	122	244
Wood Island	11	8	60	0	76	364
Airport	29	12	77	22	273	440
Maverick	52	12	117	12	464	691
Aquarium	34	5	146	232	12	1,143
State Blue	11	82	75	249	10	923
Govt Ctr Blue	0	75	0	684	0	684
Bowdoin	0	0	0	0	0	0
Total Blue Line	204	204		1,201	1,201	
Two-way Tota	1,405	1,405				

Type and Time of Day Station Summary

Date Range: 07/01/2011 03:00:00 AM - 07/01/2012 02:59:59 AM
Station: All
Sorting: Line, Station

Line: All

Total Weekdays	Total Saturdays	Total Sundays	Total Holidays	Total Days
251	53	51	11	366

Line: Silver Line

Station	wd avg 00:00	wd avg 01:00	wd avg 02:00	wd avg 03:00	wd avg 04:00	wd avg 05:00	wd avg 06:00	wd avg 07:00	wd avg 08:00	wd avg 09:00	wd avg 10:00	wd avg 11:00	wd avg 12:00	wd avg 13:00	wd avg 14:00	wd avg 15:00	wd avg 16:00	wd avg 17:00	wd avg 18:00	wd avg 19:00	wd avg 20:00	wd avg 21:00	wd avg 22:00	wd avg 23:00	wd avg
Courthouse	5	0	0	0	0	3	5	14	24	15	12	21	30	32	42	79	157	212	120	50	40	28	21	21	933
World Trade Cente	18	1	0	0	0	7	9	31	41	43	48	67	89	76	104	169	381	513	231	113	65	54	54	45	2,160
Line Total:	23	1	0	0	0	10	14	45	65	58	60	88	119	108	146	248	538	725	351	163	105	82	75	66	3,093

Line: Subway Blue Line

Station	wd avg 00:00	wd avg 01:00	wd avg 02:00	wd avg 03:00	wd avg 04:00	wd avg 05:00	wd avg 06:00	wd avg 07:00	wd avg 08:00	wd avg 09:00	wd avg 10:00	wd avg 11:00	wd avg 12:00	wd avg 13:00	wd avg 14:00	wd avg 15:00	wd avg 16:00	wd avg 17:00	wd avg 18:00	wd avg 19:00	wd avg 20:00	wd avg 21:00	wd avg 22:00	wd avg 23:00	wd avg
Airport	48	4	0	0	4	335	487	559	570	447	374	325	322	356	523	474	499	456	326	273	282	247	223	142	7,277
Aquarium	98	9	0	0	1	21	40	83	87	71	78	116	163	211	327	446	606	691	374	238	227	261	277	247	4,671
Beachmont	5	1	0	0	2	177	276	437	470	219	143	123	125	127	137	145	130	101	71	51	42	37	34	17	2,871
Bowdoin	0	0	0	0	0	5	8	19	29	36	44	57	68	69	109	231	345	314	67	0	0	0	0	0	1,401
Maverick	29	2	0	0	5	485	888	1,091	1,094	731	505	403	398	428	597	616	632	557	285	217	178	151	135	80	9,508
Orient Heights	9	0	0	0	11	191	393	580	620	293	175	177	145	159	179	194	209	157	105	74	62	53	59	30	3,876
Revere Beach	8	1	0	0	4	200	284	381	404	241	183	164	168	182	200	211	207	167	98	74	58	58	43	25	3,360
Suffolk Downs	2	1	0	0	0	19	59	100	113	47	34	30	35	40	47	54	60	58	27	22	15	11	10	6	790
Wonderland	5	0	0	0	5	171	516	962	947	384	226	205	185	180	161	166	167	144	115	73	52	46	41	21	4,772
Wood Island	7	1	0	0	2	124	213	233	239	138	99	76	71	74	92	106	142	95	51	38	36	29	27	19	1,913
Line Total:	211	19	0	0	34	1,728	3,164	4,445	4,573	2,607	1,861	1,676	1,680	1,826	2,372	2,643	2,997	2,740	1,519	1,060	952	893	849	587	40,439

Line: Subway Green Line

Station	wd avg 00:00	wd avg 01:00	wd avg 02:00	wd avg 03:00	wd avg 04:00	wd avg 05:00	wd avg 06:00	wd avg 07:00	wd avg 08:00	wd avg 09:00	wd avg 10:00	wd avg 11:00	wd avg 12:00	wd avg 13:00	wd avg 14:00	wd avg 15:00	wd avg 16:00	wd avg 17:00	wd avg 18:00	wd avg 19:00	wd avg 20:00	wd avg 21:00	wd avg 22:00	wd avg 23:00	wd avg
Arlington	85	3	0	0	2	23	46	134	233	201	214	261	363	364	431	661	1,168	1,510	882	546	388	359	286	205	8,365
Boylston	138	6	0	0	0	23	42	115	162	179	228	246	300	360	400	512	699	796	573	442	393	474	410	282	6,777
Copley Square	187	5	0	0	4	71	151	535	771	506	431	505	637	712	857	1,077	1,357	1,910	1,550	1,078	886	667	535	413	14,846
Government Cente	124	2	0	0	2	22	79	181	258	226	238	337	445	507	619	857	1,305	1,875	1,067	661	512	443	338	273	10,374
Hynes	162	4	0	0	2	38	120	348	579	344	260	287	358	412	471	610	792	1,003	905	707	597	528	500	343	9,372
Kenmore Square	165	3	0	0	2	56	127	349	578	394	297	334	412	450	482	641	800	883	620	472	435	607	759	519	9,386
Lechmere	13	0	0	0	6	49	101	224	336	192	136	148	171	190	221	282	360	421	333	228	179	191	91	53	3,924
Park Street	197	8	1	0	3	39	122	292	451	394	425	601	841	1,002	1,121	1,462	2,173	3,212	2,018	1,321	939	872	646	439	18,579
Prudential	34	1	0	0	0	12	38	111	186	142	128	139	167	195	219	254	323	432	359	265	216	196	124	82	3,624
Riverside	2	0	0	0	4	24	115	239	232	135	115	108	95	85	93	124	173	227	130	51	36	29	24	11	2,052
Science Park	1	1	0	0	2	1	6	14	20	16	16	23	32	43	54	67	84	116	51	35	24	17	9	6	638
Symphony	17	0	0	0	0	8	42	114	181	103	73	75	87	91	92	105	112	127	119	90	75	81	102	34	1,728
Line Total:	1,125	33	1	0	27	366	989	2,656	3,987	2,832	2,561	3,064	3,908	4,411	5,060	6,652	9,346	12,512	8,607	5,896	4,680	4,464	3,824	2,660	89,665

Line: Subway Orange Line

Station	wd avg 00:00	wd avg 01:00	wd avg 02:00	wd avg 03:00	wd avg 04:00	wd avg 05:00	wd avg 06:00	wd avg 07:00	wd avg 08:00	wd avg 09:00	wd avg 10:00	wd avg 11:00	wd avg 12:00	wd avg 13:00	wd avg 14:00	wd avg 15:00	wd avg 16:00	wd avg 17:00	wd avg 18:00	wd avg 19:00	wd avg 20:00	wd avg 21:00	wd avg 22:00	wd avg 23:00	wd avg
Back Bay	106	6	0	0	1	47	426	1,162	1,576	711	413	450	584	630	856	1,143	1,986	2,891	1,722	957	709	576	505	355	17,811
Chinatown	52	5	0	0	1	17	52	101	150	169	214	274	362	412	439	534	741	789	492	365	292	292	257	161	6,169
Community Colleg	14	2	0	0	1	31	87	185	314	229	189	343	369	308	430	400	408	507	273	225	324	175	60	42	4,916
Downtown Crossi	110	10	0	0	2	54	131	273	369	383	524	726	991	1,179	1,419	1,894	3,024	4,493	2,775	1,457	901	641	397	247	22,000
Forest Hills	20	2	0	0	17	468	1,335	2,420	2,392	1,101	667	584	603	595	719	727	742	656	444	286	206	206	171	100	14,464
Green Street	7	1	0	0	2	67	156	413	653	317	161	143	140	137	162	227	195	207	144	86	58	41	44	20	3,381
Haymarket	91	8	0	0	8	384	658	830	832	599	457	472	530	568	715	851	1,057	1,069	700	461	445	457	376	244	11,813

Type and Time of Day Station Summary

Date Range: 07/01/2011 03:00:00 AM - 07/01/2012 02:59:59 AM
Station: All
Sorting: Line, Station

Line: All

Total Weekdays	Total Saturdays	Total Sundays	Total Holidays	Total Days
251	53	51	11	366

Line: Subway Orange Line

Station	wd avg 00:00	wd avg 01:00	wd avg 02:00	wd avg 03:00	wd avg 04:00	wd avg 05:00	wd avg 06:00	wd avg 07:00	wd avg 08:00	wd avg 09:00	wd avg 10:00	wd avg 11:00	wd avg 12:00	wd avg 13:00	wd avg 14:00	wd avg 15:00	wd avg 16:00	wd avg 17:00	wd avg 18:00	wd avg 19:00	wd avg 20:00	wd avg 21:00	wd avg 22:00	wd avg 23:00	wd avg
Jackson Square	16	2	0	0	2	140	401	693	721	430	292	253	258	266	299	338	388	376	227	149	118	113	84	48	5,614
Malden Center	19	1	0	0	5	353	939	1,899	2,286	1,237	696	588	565	521	570	515	525	477	318	197	171	170	136	69	12,259
Mass Ave	56	6	0	0	2	48	166	382	627	334	228	240	289	277	326	426	557	639	426	291	242	228	223	144	6,159
North Station	91	6	0	0	3	50	707	2,117	2,560	976	678	556	583	617	718	1,047	1,517	2,023	1,090	657	422	790	676	406	18,290
Oak Grove	4	1	0	0	10	260	735	1,568	1,367	485	232	187	182	158	153	158	179	207	179	86	50	45	43	15	6,305
Roxbury Crossin	19	2	0	0	2	47	157	325	467	286	205	198	222	292	536	345	362	338	228	168	147	112	82	55	4,596
Ruggles	36	4	0	0	1	92	318	551	632	410	319	405	417	505	806	973	1,235	1,248	689	454	386	285	189	119	10,075
State Street	97	10	0	1	2	42	79	162	180	177	212	312	446	535	775	1,105	2,016	2,808	1,368	700	486	398	365	204	12,481
Stony Brook	11	1	0	0	1	69	171	425	692	341	172	158	148	151	154	170	182	188	139	96	63	52	40	26	3,450
Sullivan Square	38	3	0	0	3	393	625	952	1,171	751	474	404	413	427	512	638	730	699	434	259	184	167	157	92	9,525
Tufts Medical Cent	27	3	0	0	1	28	134	227	256	234	222	238	272	269	368	615	894	880	464	274	193	135	124	117	5,974
Wellington	16	1	0	0	1	221	642	1,182	1,476	726	385	296	295	256	287	303	410	478	301	173	126	106	92	57	7,831
Line Total:	830	74	0	1	65	2,811	7,919	15,867	18,721	9,896	6,740	6,827	7,669	8,103	10,244	12,409	17,148	20,973	12,413	7,341	5,523	4,989	4,021	2,521	183,112

Line: Subway Red Line

Station	wd avg 00:00	wd avg 01:00	wd avg 02:00	wd avg 03:00	wd avg 04:00	wd avg 05:00	wd avg 06:00	wd avg 07:00	wd avg 08:00	wd avg 09:00	wd avg 10:00	wd avg 11:00	wd avg 12:00	wd avg 13:00	wd avg 14:00	wd avg 15:00	wd avg 16:00	wd avg 17:00	wd avg 18:00	wd avg 19:00	wd avg 20:00	wd avg 21:00	wd avg 22:00	wd avg 23:00	wd avg
Alewife	17	3	0	0	4	141	674	1,774	2,091	951	495	410	380	331	340	404	567	776	593	282	148	167	138	62	10,749
Andrew Square	25	3	0	0	2	183	365	532	628	393	284	276	269	290	370	421	480	454	276	207	146	121	108	67	5,899
Ashmont	18	2	0	0	15	379	815	1,387	1,292	597	414	383	357	378	489	432	393	343	247	163	150	143	110	63	8,570
Braintree	5	1	0	0	27	338	770	1,113	569	207	142	132	133	124	147	192	219	226	153	80	66	60	45	27	4,774
Broadway	28	3	0	0	2	72	227	474	739	308	179	167	176	216	262	335	407	462	315	193	129	91	89	58	4,934
Central Square	161	6	0	0	1	126	398	1,023	1,944	1,165	689	615	660	649	682	926	1,246	1,600	1,173	814	612	553	469	353	15,862
Charles MGH	75	3	0	0	0	23	109	390	654	430	335	378	400	419	603	1,131	1,552	1,734	1,045	784	475	311	273	290	11,416
Davis Square	50	2	0	0	1	157	555	1,665	2,644	1,186	614	491	446	430	426	447	492	623	569	404	286	266	249	152	12,154
Fields Corner	11	2	0	0	2	212	475	635	546	340	239	227	232	253	325	303	282	253	174	129	104	98	72	36	4,948
Harvard	181	4	0	0	1	149	435	1,149	1,872	1,204	808	849	994	1,111	1,279	1,706	2,030	2,588	1,765	1,303	994	1,009	742	474	22,649
JFK/U Mass	22	2	0	0	1	115	332	531	688	455	349	374	473	518	703	817	763	858	562	384	331	225	124	66	8,692
Kendall Square	100	4	0	0	1	35	131	363	619	429	351	450	547	585	746	1,122	2,153	3,014	1,833	1,002	639	494	342	242	15,202
North Quincy	10	0	0	0	5	192	501	1,038	1,146	667	361	273	271	241	345	309	402	484	233	118	89	90	62	33	6,870
Porter Square	32	2	0	0	2	96	338	1,155	1,790	820	411	332	307	270	299	295	352	479	419	310	247	229	195	102	8,483
Quincy Adams	6	1	0	0	2	162	392	787	823	383	199	168	135	116	116	148	224	259	149	66	45	62	41	23	4,308
Quincy Center	21	1	0	0	4	289	702	1,443	1,521	724	411	345	349	315	377	343	349	353	255	178	149	140	117	64	8,450
Savin Hill	7	2	0	0	3	75	175	319	378	188	119	98	89	95	109	143	122	116	81	55	42	38	28	15	2,298
Shawmut	4	1	0	0	3	110	251	419	384	173	110	97	97	101	96	96	91	87	60	39	31	29	24	9	2,315
South Station	141	6	1	1	4	81	841	1,690	2,227	997	575	676	771	855	969	1,373	2,452	3,938	2,378	1,221	799	647	576	392	23,609
Wollaston	5	0	0	0	2	175	433	853	874	455	245	168	156	152	138	133	138	140	106	58	47	41	45	20	4,383
Line Total:	919	48	1	1	82	3,110	8,919	18,740	23,429	12,072	7,330	6,909	7,242	7,449	8,821	11,076	14,714	18,787	12,386	7,790	5,529	4,814	3,849	2,548	186,566

Type and Time of Day Station Summary

Date Range: 07/01/2011 03:00:00 AM - 07/01/2012 02:59:59 AM
Station: All
Sorting: Line, Station

Line: All

Total Weekdays	Total Saturdays	Total Sundays	Total Holidays	Total Days
251	53	51	11	366

Line: Silver Line

Station	sa avg 00:00	sa avg 01:00	sa avg 02:00	sa avg 03:00	sa avg 04:00	sa avg 05:00	sa avg 06:00	sa avg 07:00	sa avg 08:00	sa avg 09:00	sa avg 10:00	sa avg 11:00	sa avg 12:00	sa avg 13:00	sa avg 14:00	sa avg 15:00	sa avg 16:00	sa avg 17:00	sa avg 18:00	sa avg 19:00	sa avg 20:00	sa avg 21:00	sa avg 22:00	sa avg 23:00	sa avg
Courthouse	11	0	0	0	0	1	2	6	2	4	8	10	15	20	30	43	48	47	23	22	15	18	20	26	372
World Trade Cente	29	1	0	0	0	7	8	17	18	33	47	54	67	66	88	104	120	114	86	64	44	48	55	60	1,131
Line Total:	40	1	0	0	0	8	10	10	20	37	55	64	82	86	118	147	168	161	109	86	59	66	75	86	1,503

Line: Subway Blue Line

Station	sa avg 00:00	sa avg 01:00	sa avg 02:00	sa avg 03:00	sa avg 04:00	sa avg 05:00	sa avg 06:00	sa avg 07:00	sa avg 08:00	sa avg 09:00	sa avg 10:00	sa avg 11:00	sa avg 12:00	sa avg 13:00	sa avg 14:00	sa avg 15:00	sa avg 16:00	sa avg 17:00	sa avg 18:00	sa avg 19:00	sa avg 20:00	sa avg 21:00	sa avg 22:00	sa avg 23:00	sa avg
Airport	53	5	0	0	3	174	291	347	351	376	410	378	361	378	436	437	387	331	312	281	260	224	203	132	6,130
Aquarium	219	22	0	0	0	18	16	33	38	57	95	144	186	263	352	453	520	512	388	265	231	255	275	346	4,686
Beachmont	6	2	0	0	1	47	74	107	115	113	116	123	112	118	120	115	94	76	72	60	47	39	33	22	1,611
Bowdoin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Maverick	41	4	0	0	1	219	377	472	434	456	438	428	425	446	538	542	401	294	232	204	187	167	158	106	6,572
Orient Heights	15	1	0	0	3	72	105	148	149	162	171	181	185	192	198	206	157	139	119	96	78	64	63	44	2,549
Revere Beach	16	1	0	0	1	87	196	200	185	191	189	194	202	210	236	238	197	180	149	111	88	101	74	40	3,087
Suffolk Downs	2	1	0	0	0	8	14	21	25	23	24	29	35	43	56	66	76	64	51	39	30	26	24	10	667
Wonderland	12	0	0	0	0	48	76	137	139	153	175	199	203	193	194	177	159	155	125	97	62	63	50	37	2,453
Wood Island	8	1	0	0	2	43	73	89	84	90	89	79	79	78	92	91	69	53	49	38	36	31	28	20	1,220
Line Total:	372	37	0	0	11	716	1,222	1,222	1,520	1,621	1,707	1,755	1,788	1,921	2,222	2,325	2,060	1,804	1,497	1,191	1,019	970	908	757	28,975

Line: Subway Green Line

Station	sa avg 00:00	sa avg 01:00	sa avg 02:00	sa avg 03:00	sa avg 04:00	sa avg 05:00	sa avg 06:00	sa avg 07:00	sa avg 08:00	sa avg 09:00	sa avg 10:00	sa avg 11:00	sa avg 12:00	sa avg 13:00	sa avg 14:00	sa avg 15:00	sa avg 16:00	sa avg 17:00	sa avg 18:00	sa avg 19:00	sa avg 20:00	sa avg 21:00	sa avg 22:00	sa avg 23:00	sa avg
Arlington	166	4	0	0	2	19	20	37	64	116	169	218	261	313	372	458	531	503	484	360	283	272	261	283	5,196
Boylston	273	15	0	0	0	17	26	48	75	119	201	215	286	344	386	442	454	452	427	424	380	482	534	432	6,033
Copley Square	367	8	0	0	4	44	60	103	153	265	389	526	646	776	936	1,111	1,317	1,230	1,108	896	748	638	586	569	12,480
Government Cente	298	4	0	0	1	20	29	55	83	128	183	272	361	480	664	804	881	841	748	613	534	558	464	447	8,466
Hynes	277	6	0	0	3	25	49	92	140	218	267	356	424	517	624	728	854	858	817	683	593	529	580	463	9,101
Kenmore Square	248	7	0	0	3	38	67	134	180	263	317	399	453	500	555	601	594	546	594	678	540	544	660	503	8,424
Lechmere	22	0	0	0	2	16	36	54	77	107	143	182	218	248	283	333	337	353	338	273	217	213	119	71	3,643
Park Street	370	15	0	0	3	22	50	93	134	234	349	477	636	766	920	1,122	1,215	1,170	1,033	835	700	696	738	635	12,213
Prudential	64	1	0	0	0	9	16	32	51	96	134	165	201	247	282	335	376	398	395	341	286	247	187	125	3,989
Riverside	2	0	0	0	2	8	17	33	70	125	192	209	191	171	145	128	124	143	95	59	40	34	26	15	1,828
Science Park	2	1	0	0	1	1	2	4	7	10	16	31	51	60	81	110	140	143	52	31	16	13	9	7	790
Symphony	25	0	0	0	0	4	17	23	36	55	68	85	101	109	117	122	123	120	106	90	73	103	178	59	1,616
Line Total:	2,114	61	0	0	21	223	389	389	1,070	1,736	2,428	3,135	3,829	4,531	5,365	6,294	6,946	6,757	6,197	5,283	4,410	4,329	4,342	3,609	73,779

Line: Subway Orange Line

Station	sa avg 00:00	sa avg 01:00	sa avg 02:00	sa avg 03:00	sa avg 04:00	sa avg 05:00	sa avg 06:00	sa avg 07:00	sa avg 08:00	sa avg 09:00	sa avg 10:00	sa avg 11:00	sa avg 12:00	sa avg 13:00	sa avg 14:00	sa avg 15:00	sa avg 16:00	sa avg 17:00	sa avg 18:00	sa avg 19:00	sa avg 20:00	sa avg 21:00	sa avg 22:00	sa avg 23:00	sa avg
Back Bay	190	12	0	0	1	24	54	133	121	214	257	356	401	438	532	616	753	702	634	519	452	416	417	413	7,654
Chinatown	98	9	0	0	1	11	28	43	60	94	141	193	271	302	328	343	343	344	308	304	243	272	281	245	4,260
Community Colleg	23	2	0	0	1	8	19	34	51	71	97	197	160	158	233	210	159	116	100	78	59	53	49	35	1,915
Downtown Crossi	179	24	0	0	2	27	54	89	121	194	339	466	626	763	877	1,007	1,100	1,066	956	725	552	444	348	289	10,249
Forest Hills	44	4	0	0	4	114	279	364	450	495	447	511	514	529	538	519	449	402	357	297	224	199	186	135	7,063
Green Street	13	1	0	0	2	21	32	60	92	108	124	146	162	179	176	160	153	133	125	91	60	50	54	33	1,975

Type and Time of Day Station Summary

Date Range: 07/01/2011 03:00:00 AM - 07/01/2012 02:59:59 AM
Station: All
Sorting: Line, Station

Line: All

Total Weekdays	Total Saturdays	Total Sundays	Total Holidays	Total Days
251	53	51	11	366

Line: Subway Orange Line

Station	sa avg 00:00	sa avg 01:00	sa avg 02:00	sa avg 03:00	sa avg 04:00	sa avg 05:00	sa avg 06:00	sa avg 07:00	sa avg 08:00	sa avg 09:00	sa avg 10:00	sa avg 11:00	sa avg 12:00	sa avg 13:00	sa avg 14:00	sa avg 15:00	sa avg 16:00	sa avg 17:00	sa avg 18:00	sa avg 19:00	sa avg 20:00	sa avg 21:00	sa avg 22:00	sa avg 23:00	sa avg
Haymarket	194	15	0	0	4	139	238	293	303	361	417	506	587	709	798	929	966	906	788	635	575	603	538	427	10,931
Jackson Square	25	2	0	0	2	46	101	139	170	182	194	207	223	240	239	235	202	177	151	130	108	103	98	62	3,035
Malden Center	26	1	0	0	3	145	248	356	468	585	507	504	504	497	503	439	367	327	289	203	162	154	146	94	6,530
Mass Ave	76	6	0	0	2	20	56	93	129	163	183	215	237	244	261	266	273	257	241	215	174	179	234	166	3,690
North Station	121	10	0	0	1	21	51	126	315	267	342	562	431	502	549	886	712	689	766	514	394	552	537	345	8,692
Oak Grove	10	1	0	0	3	43	81	125	190	248	230	266	267	230	206	193	187	189	179	131	84	75	65	29	3,034
Roxbury Crossin	33	3	0	0	2	20	41	66	96	125	131	156	186	185	197	172	154	136	125	111	100	94	107	71	2,310
Ruggles	40	4	0	0	1	49	113	158	189	227	231	286	358	369	357	358	339	307	268	223	187	170	179	110	4,523
State Street	162	17	0	0	1	31	27	56	48	70	121	179	234	295	368	446	469	457	383	316	255	235	209	213	4,592
Stony Brook	22	2	0	0	1	21	41	61	93	127	133	187	211	221	216	192	175	146	124	109	78	69	59	44	2,333
Sullivan Square	53	4	0	0	2	143	264	326	364	435	451	485	472	469	483	471	400	359	326	246	186	181	170	104	6,395
Tufts Medical Cent	37	4	0	0	0	15	42	77	81	108	141	152	164	173	181	219	215	189	161	142	110	103	109	108	2,529
Wellington	21	2	0	0	1	55	111	150	185	225	243	289	304	294	294	292	257	253	232	176	124	108	92	56	3,765
Line Total:	1,367	123	0	0	34	953	1,880	1,880	3,526	4,299	4,729	5,863	6,312	6,797	7,336	7,953	7,673	7,155	6,513	5,165	4,127	4,060	3,878	2,979	95,475

Line: Subway Red Line

Station	sa avg 00:00	sa avg 01:00	sa avg 02:00	sa avg 03:00	sa avg 04:00	sa avg 05:00	sa avg 06:00	sa avg 07:00	sa avg 08:00	sa avg 09:00	sa avg 10:00	sa avg 11:00	sa avg 12:00	sa avg 13:00	sa avg 14:00	sa avg 15:00	sa avg 16:00	sa avg 17:00	sa avg 18:00	sa avg 19:00	sa avg 20:00	sa avg 21:00	sa avg 22:00	sa avg 23:00	sa avg
Alewife	16	2	0	0	3	36	58	105	186	250	325	380	364	333	309	282	267	281	247	182	121	114	102	58	4,023
Andrew Square	33	2	0	0	2	56	110	134	180	238	236	251	269	259	256	268	244	230	201	177	138	118	110	83	3,594
Ashmont	30	3	0	0	3	103	206	246	295	287	290	309	331	341	337	328	263	236	208	154	173	137	112	83	4,475
Braintree	6	1	0	0	5	34	44	84	118	130	168	201	203	181	179	179	189	190	142	109	80	81	63	29	2,418
Broadway	46	3	0	0	1	27	48	71	103	135	142	164	182	183	185	181	160	167	158	142	109	89	90	80	2,464
Central Square	290	11	0	0	4	66	164	238	346	469	564	685	774	779	779	773	733	707	728	653	504	495	484	450	10,698
Charles MGH	113	4	0	0	1	11	33	117	112	158	204	247	295	303	332	426	397	414	360	357	265	236	202	224	4,813
Davis Square	83	1	0	0	2	41	89	142	227	300	350	412	453	455	434	396	358	356	396	363	282	281	264	198	5,881
Fields Corner	17	2	0	0	2	60	117	155	187	185	186	191	200	210	203	201	172	137	127	108	86	85	74	43	2,750
Harvard	336	10	0	0	2	94	188	318	493	675	897	1,156	1,431	1,596	1,668	1,760	1,717	1,594	1,410	1,170	982	980	958	735	20,171
JFK/U Mass	34	4	0	0	0	45	106	142	208	262	273	299	315	317	324	367	300	276	230	181	147	136	121	99	4,185
Kendall Square	121	5	0	0	1	30	62	109	153	239	335	396	450	469	498	551	578	584	565	443	340	286	262	256	6,734
North Quincy	15	1	0	0	1	55	126	185	236	317	287	242	238	226	204	184	156	145	124	96	73	68	63	46	3,087
Porter Square	45	2	0	0	0	29	54	81	146	185	246	266	314	299	290	270	253	239	271	235	186	181	174	131	3,897
Quincy Adams	8	1	0	0	1	22	35	61	93	124	160	184	172	154	155	133	138	141	124	81	50	46	45	28	1,957
Quincy Center	24	1	0	0	3	78	147	211	257	307	285	288	285	295	280	257	262	228	203	165	120	114	109	82	4,001
Savin Hill	12	2	0	0	1	20	42	66	85	98	93	97	97	102	100	96	80	73	67	59	47	42	37	24	1,339
Shawmut	5	1	0	0	1	34	47	67	78	80	79	85	89	90	82	73	63	66	59	42	32	33	29	15	1,149
South Station	180	8	0	0	2	64	111	204	203	298	382	560	654	645	750	700	821	716	652	518	503	436	409	473	9,289
Wollaston	7	0	0	0	1	40	83	121	182	271	222	181	173	165	148	138	116	117	100	73	59	62	41	37	2,335
Line Total:	1,421	64	0	0	36	945	1,870	1,870	3,888	5,008	5,724	6,594	7,289	7,402	7,513	7,563	7,267	6,897	6,372	5,308	4,297	4,020	3,749	3,174	99,262

Type and Time of Day Station Summary

Date Range: 07/01/2011 03:00:00 AM - 07/01/2012 02:59:59 AM
Station: All
Sorting: Line, Station

Line: All

Total Weekdays	Total Saturdays	Total Sundays	Total Holidays	Total Days
251	53	51	11	366

Line: Silver Line

Station	su avg 00:00	su avg 01:00	su avg 02:00	su avg 03:00	su avg 04:00	su avg 05:00	su avg 06:00	su avg 07:00	su avg 08:00	su avg 09:00	su avg 10:00	su avg 11:00	su avg 12:00	su avg 13:00	su avg 14:00	su avg 15:00	su avg 16:00	su avg 17:00	su avg 18:00	su avg 19:00	su avg 20:00	su avg 21:00	su avg 22:00	su avg 23:00	su avg
Courthouse	3	0	0	0	1	1	1	4	2	4	6	8	12	15	21	29	29	31	12	10	12	12	11	12	237
World Trade Cente	9	1	0	0	0	4	11	17	21	36	46	55	68	57	67	82	80	86	67	41	30	29	31	30	866
Line Total:	12	1	0	0	1	5	12	21	23	40	52	63	80	72	88	111	109	117	79	51	42	41	42	42	1,103

Line: Subway Blue Line

Station	su avg 00:00	su avg 01:00	su avg 02:00	su avg 03:00	su avg 04:00	su avg 05:00	su avg 06:00	su avg 07:00	su avg 08:00	su avg 09:00	su avg 10:00	su avg 11:00	su avg 12:00	su avg 13:00	su avg 14:00	su avg 15:00	su avg 16:00	su avg 17:00	su avg 18:00	su avg 19:00	su avg 20:00	su avg 21:00	su avg 22:00	su avg 23:00	su avg
Airport	51	5	0	0	0	42	242	270	251	312	362	340	339	342	386	378	325	313	303	276	296	257	239	146	5,473
Aquarium	64	4	0	0	0	4	20	28	30	42	72	111	158	204	281	364	411	377	321	225	179	166	199	160	3,421
Beachmont	4	1	0	0	0	28	50	61	64	85	100	103	93	106	99	87	72	59	51	44	33	35	25	12	1,209
Bowdoin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Maverick	21	3	0	0	0	36	282	311	303	337	344	326	318	383	410	397	277	213	171	143	140	116	118	63	4,711
Orient Heights	8	1	0	0	0	23	78	99	100	108	139	155	147	146	149	136	110	99	90	68	53	51	52	27	1,840
Revere Beach	9	1	0	0	0	46	101	150	135	139	154	150	155	173	184	175	155	146	119	96	74	78	53	23	2,317
Suffolk Downs	2	1	0	0	0	4	11	11	12	16	19	29	32	30	35	38	39	40	35	27	21	10	7	5	424
Wonderland	5	0	0	0	0	22	49	62	88	99	134	161	156	152	137	121	107	93	75	59	47	44	33	19	1,663
Wood Island	6	1	0	0	0	11	58	60	60	71	75	70	70	60	71	61	45	40	37	28	30	22	23	14	912
Line Total:	170	17	0	0	0	216	891	1,052	1,043	1,209	1,399	1,445	1,468	1,596	1,752	1,757	1,541	1,380	1,202	966	873	779	749	469	21,972

Line: Subway Green Line

Station	su avg 00:00	su avg 01:00	su avg 02:00	su avg 03:00	su avg 04:00	su avg 05:00	su avg 06:00	su avg 07:00	su avg 08:00	su avg 09:00	su avg 10:00	su avg 11:00	su avg 12:00	su avg 13:00	su avg 14:00	su avg 15:00	su avg 16:00	su avg 17:00	su avg 18:00	su avg 19:00	su avg 20:00	su avg 21:00	su avg 22:00	su avg 23:00	su avg
Arlington	40	2	0	0	0	8	22	29	44	94	144	201	301	289	291	346	369	361	307	219	190	161	141	117	3,677
Boylston	81	4	0	0	0	6	24	38	55	90	169	207	275	321	332	406	379	356	329	317	288	301	286	200	4,463
Copley Square	95	5	0	0	0	19	62	70	110	186	286	401	553	629	736	843	941	856	785	623	431	360	311	253	8,555
Government Cente	59	2	0	0	0	11	27	39	49	79	132	199	281	336	443	532	538	521	485	392	301	226	205	151	5,007
Hynes	94	4	0	0	0	12	40	63	104	178	241	306	386	454	499	583	641	679	606	456	345	285	269	185	6,431
Kenmore Square	102	4	0	0	0	12	52	89	140	219	293	330	356	379	406	469	732	702	431	296	232	201	221	204	5,870
Lechmere	10	0	0	0	0	7	27	36	49	75	106	123	143	168	202	226	245	255	222	243	84	52	44	31	2,350
Park Street	96	5	0	0	0	12	39	63	95	183	284	398	645	660	721	847	887	936	756	613	468	404	355	234	8,699
Prudential	18	1	0	0	0	4	17	28	42	76	119	159	182	213	251	271	301	303	294	217	147	107	77	54	2,884
Riverside	1	0	0	0	0	6	11	17	36	91	151	176	157	101	71	60	59	66	51	38	32	23	23	10	1,184
Science Park	1	1	0	0	0	2	2	3	5	11	13	25	37	45	58	68	89	87	25	13	8	4	4	3	503
Symphony	9	0	0	0	0	2	12	16	27	39	55	65	76	83	89	94	99	138	83	63	51	47	39	20	1,107
Line Total:	606	28	0	0	0	101	335	491	756	1,321	1,993	2,590	3,392	3,678	4,099	4,745	5,280	5,260	4,374	3,490	2,577	2,171	1,975	1,462	50,731

Line: Subway Orange Line

Station	su avg 00:00	su avg 01:00	su avg 02:00	su avg 03:00	su avg 04:00	su avg 05:00	su avg 06:00	su avg 07:00	su avg 08:00	su avg 09:00	su avg 10:00	su avg 11:00	su avg 12:00	su avg 13:00	su avg 14:00	su avg 15:00	su avg 16:00	su avg 17:00	su avg 18:00	su avg 19:00	su avg 20:00	su avg 21:00	su avg 22:00	su avg 23:00	su avg
Back Bay	51	4	0	0	0	10	49	90	80	127	188	248	313	326	389	438	520	524	497	399	296	288	247	195	5,280
Chinatown	35	3	0	0	2	5	24	34	47	69	110	155	224	275	284	318	294	277	254	243	212	219	203	113	3,400
Community Colleg	7	1	0	0	0	2	16	22	33	48	68	100	98	108	192	138	106	82	61	54	39	36	31	22	1,264
Downtown Crossi	58	6	0	0	0	12	45	65	78	125	192	280	407	509	593	684	728	705	639	495	349	240	171	132	6,512
Forest Hills	18	2	0	0	0	48	168	196	247	337	367	393	381	387	388	362	300	249	216	181	155	149	131	63	4,739
Green Street	5	1	0	0	0	9	24	30	50	75	100	118	119	107	101	83	76	68	57	47	37	28	33	15	1,185
Haymarket	49	4	0	0	0	59	161	163	189	214	273	281	325	362	415	461	449	411	393	377	359	319	245	143	5,654

Type and Time of Day Station Summary

Date Range: 07/01/2011 03:00:00 AM - 07/01/2012 02:59:59 AM
Station: All
Sorting: Line, Station

Line: All

Total Weekdays	Total Saturdays	Total Sundays	Total Holidays	Total Days
251	53	51	11	366

Line: Subway Orange Line

Station	su avg 00:00	su avg 01:00	su avg 02:00	su avg 03:00	su avg 04:00	su avg 05:00	su avg 06:00	su avg 07:00	su avg 08:00	su avg 09:00	su avg 10:00	su avg 11:00	su avg 12:00	su avg 13:00	su avg 14:00	su avg 15:00	su avg 16:00	su avg 17:00	su avg 18:00	su avg 19:00	su avg 20:00	su avg 21:00	su avg 22:00	su avg 23:00	su avg
Jackson Square	10	1	0	0	0	17	70	80	99	117	145	150	158	171	177	168	144	125	104	92	73	74	61	34	2,073
Malden Center	12	1	0	0	1	80	164	218	278	410	450	419	383	381	356	301	245	217	173	125	114	110	103	47	4,588
Mass Ave	36	3	0	0	0	4	47	60	90	118	146	165	178	185	194	192	194	213	174	150	121	122	129	84	2,603
North Station	53	4	0	0	0	7	45	86	185	195	289	448	354	369	426	607	488	554	590	477	459	228	219	241	6,326
Oak Grove	3	1	0	0	0	21	46	58	105	152	189	199	188	158	137	110	95	91	66	54	39	37	30	11	1,789
Roxbury Crossin	13	1	0	0	0	8	26	44	59	85	103	102	125	129	132	124	106	96	84	76	60	53	53	38	1,516
Ruggles	26	3	0	0	0	9	102	95	123	155	174	220	229	240	241	239	230	226	191	166	145	131	116	75	3,136
State Street	54	5	0	0	0	5	25	46	34	44	71	108	151	195	259	310	329	325	281	218	165	127	113	102	2,970
Stony Brook	7	2	0	0	0	7	28	37	57	89	106	116	124	121	120	105	83	81	72	52	40	32	33	19	1,330
Sullivan Square	24	2	0	0	0	20	179	187	234	280	333	358	347	327	317	295	242	213	180	150	124	112	116	67	4,110
Tufts Medical Cent	13	3	0	0	0	5	36	55	58	71	109	122	141	137	152	185	159	148	109	94	82	70	71	56	1,876
Wellington	9	2	0	0	0	8	63	84	102	143	175	214	211	196	196	176	154	150	135	103	77	62	57	30	2,347
Line Total:	483	49	0	0	3	336	1,318	1,650	2,148	2,854	3,588	4,196	4,456	4,683	5,069	5,296	4,942	4,755	4,276	3,553	2,946	2,437	2,162	1,487	62,697

Line: Subway Red Line

Station	su avg 00:00	su avg 01:00	su avg 02:00	su avg 03:00	su avg 04:00	su avg 05:00	su avg 06:00	su avg 07:00	su avg 08:00	su avg 09:00	su avg 10:00	su avg 11:00	su avg 12:00	su avg 13:00	su avg 14:00	su avg 15:00	su avg 16:00	su avg 17:00	su avg 18:00	su avg 19:00	su avg 20:00	su avg 21:00	su avg 22:00	su avg 23:00	su avg
Alewife	11	2	0	0	0	21	50	65	106	162	225	296	295	234	188	165	155	141	134	111	73	84	61	28	2,606
Andrew Square	19	1	0	0	0	10	55	94	112	154	196	180	196	182	217	224	192	179	161	135	116	83	73	50	2,631
Ashmont	16	3	0	0	0	37	103	137	144	193	211	221	223	223	236	198	171	150	124	111	100	108	82	49	2,841
Braintree	3	1	0	0	0	16	27	43	74	99	125	175	167	117	117	118	111	110	103	72	62	57	32	20	1,649
Broadway	20	3	0	0	0	6	37	43	62	80	113	135	153	156	190	184	175	166	133	115	77	64	60	38	2,011
Central Square	81	3	0	0	0	19	104	152	235	332	506	571	693	712	655	628	582	547	491	398	303	274	272	195	7,755
Charles MGH	31	2	0	0	0	4	24	88	79	116	194	237	274	266	258	333	303	292	271	250	178	129	136	112	3,575
Davis Square	20	1	0	0	0	12	65	80	136	206	295	333	374	367	329	295	251	225	224	175	138	125	110	60	3,821
Fields Corner	8	1	0	0	0	30	82	89	111	130	138	137	137	150	152	142	115	96	91	78	57	61	53	29	1,887
Harvard	109	3	1	0	0	18	137	219	351	491	779	909	1,147	1,299	1,295	1,350	1,296	1,153	975	724	606	560	479	300	14,201
JFK/U Mass	15	2	0	0	0	13	81	91	128	181	232	239	247	244	240	236	233	212	161	114	92	85	75	47	2,966
Kendall Square	42	3	0	0	0	8	44	76	110	174	314	332	370	377	370	428	434	410	367	278	202	163	147	121	4,772
North Quincy	7	1	0	0	0	8	81	128	154	236	247	216	181	170	148	122	105	90	71	60	53	45	49	24	2,197
Porter Square	15	1	0	0	0	10	43	53	98	130	214	220	268	246	221	210	192	165	171	130	105	99	91	53	2,735
Quincy Adams	4	1	0	0	0	10	22	33	52	83	128	156	131	90	76	64	64	56	53	38	28	21	14	8	1,133
Quincy Center	13	1	0	0	0	22	69	124	197	232	233	231	232	213	193	179	169	149	146	105	87	87	91	46	2,820
Savin Hill	6	2	0	0	0	6	28	37	49	75	86	89	82	79	75	63	54	46	42	33	25	27	21	13	940
Shawmut	3	1	0	0	0	16	33	40	45	57	66	60	66	67	65	52	47	36	32	25	23	24	22	7	788
South Station	134	3	1	0	1	24	91	126	134	170	267	478	585	582	721	695	806	782	723	729	748	659	587	451	9,498
Wollaston	3	1	0	0	0	9	51	94	132	202	217	164	154	134	111	98	75	68	51	40	35	33	38	11	1,721
Line Total:	560	36	2	0	1	299	1,227	1,812	2,509	3,503	4,786	5,379	5,975	5,908	5,857	5,784	5,530	5,073	4,524	3,721	3,108	2,788	2,493	1,662	72,545

Type and Time of Day Station Summary

Date Range: 07/01/2011 03:00:00 AM - 07/01/2012 02:59:59 AM
Station: All
Sorting: Line, Station

Line: All

Total Weekdays	Total Saturdays	Total Sundays	Total Holidays	Total Days
251	53	51	11	366

Line: Silver Line

Station	hd avg 00:00	hd avg 01:00	hd avg 02:00	hd avg 03:00	hd avg 04:00	hd avg 05:00	hd avg 06:00	hd avg 07:00	hd avg 08:00	hd avg 09:00	hd avg 10:00	hd avg 11:00	hd avg 12:00	hd avg 13:00	hd avg 14:00	hd avg 15:00	hd avg 16:00	hd avg 17:00	hd avg 18:00	hd avg 19:00	hd avg 20:00	hd avg 21:00	hd avg 22:00	hd avg 23:00	hd avg
Courthouse	2	0	0	0	0	2	3	5	6	7	7	12	14	17	18	28	37	47	26	16	10	11	10	7	285
World Trade Cente	8	1	0	0	0	9	14	20	22	45	50	49	57	43	53	66	107	113	83	45	33	48	22	21	909
Line Total:	10	1	0	0	0	11	17	25	28	52	57	61	71	60	71	94	144	160	109	61	43	59	32	28	1,194

Line: Subway Blue Line

Station	hd avg 00:00	hd avg 01:00	hd avg 02:00	hd avg 03:00	hd avg 04:00	hd avg 05:00	hd avg 06:00	hd avg 07:00	hd avg 08:00	hd avg 09:00	hd avg 10:00	hd avg 11:00	hd avg 12:00	hd avg 13:00	hd avg 14:00	hd avg 15:00	hd avg 16:00	hd avg 17:00	hd avg 18:00	hd avg 19:00	hd avg 20:00	hd avg 21:00	hd avg 22:00	hd avg 23:00	hd avg
Airport	46	3	0	0	3	170	299	301	296	341	368	343	351	352	415	410	423	372	345	320	327	280	218	131	6,115
Aquarium	36	4	0	0	0	9	21	34	40	60	81	118	178	211	313	399	477	432	305	202	160	162	163	103	3,509
Beachmont	3	1	0	0	0	57	83	112	113	112	104	113	111	117	114	107	91	72	64	53	42	40	24	12	1,545
Bowdoin	0	0	0	0	0	0	1	2	2	3	3	5	3	6	8	16	20	18	5	1	2	1	0	0	97
Maverick	22	2	0	0	1	181	380	407	375	358	349	320	327	364	412	432	350	280	206	157	149	138	114	55	5,380
Orient Heights	8	1	0	0	2	61	114	138	143	125	136	140	134	142	150	150	132	105	96	73	56	51	51	25	2,033
Revere Beach	7	1	0	0	1	84	152	204	176	161	143	173	166	213	233	246	235	207	164	136	105	89	56	27	2,978
Suffolk Downs	2	1	0	0	0	5	17	25	24	22	24	28	30	34	46	51	58	45	30	31	21	11	7	4	519
Wonderland	3	0	0	0	1	55	121	192	199	188	206	206	201	173	175	143	153	139	116	106	71	61	39	21	2,567
Wood Island	5	1	0	0	1	42	78	76	72	66	75	68	62	61	75	77	74	49	38	35	37	27	21	11	1,050
Line Total:	132	14	0	0	9	664	1,266	1,491	1,440	1,436	1,489	1,514	1,563	1,673	1,941	2,031	2,013	1,719	1,369	1,114	970	860	693	389	25,794

Line: Subway Green Line

Station	hd avg 00:00	hd avg 01:00	hd avg 02:00	hd avg 03:00	hd avg 04:00	hd avg 05:00	hd avg 06:00	hd avg 07:00	hd avg 08:00	hd avg 09:00	hd avg 10:00	hd avg 11:00	hd avg 12:00	hd avg 13:00	hd avg 14:00	hd avg 15:00	hd avg 16:00	hd avg 17:00	hd avg 18:00	hd avg 19:00	hd avg 20:00	hd avg 21:00	hd avg 22:00	hd avg 23:00	hd avg
Arlington	36	2	0	0	1	13	27	50	93	143	197	236	274	346	426	502	608	630	479	331	245	239	185	124	5,185
Boylston	60	2	0	0	0	11	24	48	68	103	166	187	227	268	295	359	377	333	340	303	244	272	194	130	4,010
Copley Square	66	2	0	0	1	28	50	90	137	189	260	358	423	479	572	672	763	776	698	550	436	357	266	184	7,358
Government Cente	43	3	0	0	1	14	35	62	88	126	189	242	320	363	459	592	691	665	519	406	320	260	176	118	5,690
Hynes	77	2	0	0	1	24	67	100	171	178	212	268	335	391	505	618	708	724	625	464	354	327	242	164	6,559
Kenmore Square	51	1	0	0	1	25	69	124	196	203	237	265	330	454	591	682	940	760	503	323	264	243	198	152	6,611
Lechmere	9	0	0	0	2	27	57	58	96	114	122	142	161	194	234	256	293	309	276	226	165	161	65	37	3,004
Park Street	69	2	0	0	1	18	62	95	141	208	307	398	528	692	825	1,006	1,105	1,136	949	699	501	423	297	215	9,677
Prudential	16	1	0	0	0	10	24	33	59	87	117	130	164	208	243	304	324	333	286	205	157	131	70	50	2,953
Riverside	0	0	0	0	3	13	31	65	90	136	180	189	165	103	75	70	72	95	76	59	46	28	19	10	1,527
Science Park	1	1	0	0	1	2	4	5	8	11	16	27	44	50	63	80	104	102	40	24	9	5	4	4	604
Symphony	11	0	0	0	0	4	15	31	43	48	56	68	72	76	80	95	86	88	77	56	42	34	28	20	1,030
Line Total:	439	16	0	0	12	189	465	761	1,190	1,546	2,059	2,510	3,043	3,624	4,368	5,236	6,071	5,951	4,868	3,646	2,783	2,480	1,744	1,208	54,207

Line: Subway Orange Line

Station	hd avg 00:00	hd avg 01:00	hd avg 02:00	hd avg 03:00	hd avg 04:00	hd avg 05:00	hd avg 06:00	hd avg 07:00	hd avg 08:00	hd avg 09:00	hd avg 10:00	hd avg 11:00	hd avg 12:00	hd avg 13:00	hd avg 14:00	hd avg 15:00	hd avg 16:00	hd avg 17:00	hd avg 18:00	hd avg 19:00	hd avg 20:00	hd avg 21:00	hd avg 22:00	hd avg 23:00	hd avg
Back Bay	51	3	0	0	0	20	81	199	222	210	222	272	328	381	522	723	886	932	666	498	364	339	266	188	7,374
Chinatown	29	3	0	0	1	8	23	38	62	72	119	156	223	269	296	338	334	323	273	265	220	206	184	91	3,534
Community Colleg	7	1	0	0	0	9	25	42	64	62	73	78	90	73	92	96	97	109	72	60	43	37	28	25	1,183
Downtown Crossi	51	5	0	0	1	18	54	91	119	162	260	363	510	648	809	946	1,096	1,316	993	645	448	336	193	126	9,192
Forest Hills	19	2	0	0	4	113	305	400	432	402	396	408	447	465	460	456	413	341	295	232	207	191	137	66	6,191
Green Street	5	1	0	0	1	20	43	70	113	102	98	107	115	116	109	118	105	92	68	55	46	46	31	11	1,469
Haymarket	42	4	0	0	1	123	239	247	243	239	269	289	316	383	474	530	507	475	395	337	323	295	212	118	6,063

Type and Time of Day Station Summary

Date Range: 07/01/2011 03:00:00 AM - 07/01/2012 02:59:59 AM
Station: All
Sorting: Line, Station

Line: All

Total Weekdays	Total Saturdays	Total Sundays	Total Holidays	Total Days
251	53	51	11	366

Line: Subway Orange Line

Station	hd avg 00:00	hd avg 01:00	hd avg 02:00	hd avg 03:00	hd avg 04:00	hd avg 05:00	hd avg 06:00	hd avg 07:00	hd avg 08:00	hd avg 09:00	hd avg 10:00	hd avg 11:00	hd avg 12:00	hd avg 13:00	hd avg 14:00	hd avg 15:00	hd avg 16:00	hd avg 17:00	hd avg 18:00	hd avg 19:00	hd avg 20:00	hd avg 21:00	hd avg 22:00	hd avg 23:00	hd avg
Jackson Square	9	2	0	0	1	46	117	138	152	148	152	166	177	203	201	195	201	163	134	115	97	101	66	37	2,620
Malden Center	13	1	0	0	2	142	280	394	485	542	481	462	445	428	411	372	309	273	237	199	180	167	112	50	5,986
Mass Ave	28	3	0	0	0	16	61	99	144	134	136	140	172	172	203	227	226	230	183	143	121	124	113	70	2,745
North Station	35	3	0	0	0	18	125	297	550	340	412	489	384	465	480	811	603	765	583	377	287	334	779	163	8,300
Oak Grove	5	1	0	0	3	55	133	240	270	239	221	228	210	155	142	126	115	120	113	101	80	57	31	11	2,656
Roxbury Crossin	11	1	0	0	1	15	46	70	92	86	93	102	111	131	127	126	123	118	98	82	69	68	46	33	1,648
Ruggles	22	3	0	0	1	28	124	133	151	154	169	188	227	259	277	319	317	272	214	169	148	148	117	64	3,505
State Street	42	3	1	0	1	15	32	58	54	64	103	146	206	259	342	452	563	625	423	265	211	171	130	83	4,248
Stony Brook	6	1	0	0	0	22	44	77	116	108	104	134	144	145	146	142	136	88	85	68	53	50	31	20	1,719
Sullivan Square	24	2	0	0	1	100	263	313	337	366	348	342	345	334	339	341	317	297	231	182	154	149	110	63	4,958
Tufts Medical Cent	9	2	0	0	1	10	44	85	72	94	122	119	122	121	145	195	201	177	135	117	89	71	56	54	2,042
Wellington	9	1	0	0	1	51	158	270	324	267	251	273	268	225	235	206	200	220	182	139	126	100	65	39	3,608
Line Total:	417	42	1	0	20	829	2,197	3,261	4,002	3,791	4,029	4,462	4,840	5,232	5,810	6,719	6,749	6,936	5,380	4,049	3,266	2,990	2,707	1,312	79,039

Line: Subway Red Line

Station	hd avg 00:00	hd avg 01:00	hd avg 02:00	hd avg 03:00	hd avg 04:00	hd avg 05:00	hd avg 06:00	hd avg 07:00	hd avg 08:00	hd avg 09:00	hd avg 10:00	hd avg 11:00	hd avg 12:00	hd avg 13:00	hd avg 14:00	hd avg 15:00	hd avg 16:00	hd avg 17:00	hd avg 18:00	hd avg 19:00	hd avg 20:00	hd avg 21:00	hd avg 22:00	hd avg 23:00	hd avg
Alewife	12	3	0	0	1	60	151	298	380	377	406	418	391	311	305	279	302	323	310	247	187	195	100	36	5,092
Andrew Square	17	2	0	0	0	51	113	141	193	184	204	196	203	213	209	234	229	208	158	129	125	115	76	48	3,050
Ashmont	15	2	0	0	2	94	198	262	245	240	236	263	273	295	286	266	231	202	177	140	154	148	106	45	3,879
Braintree	3	1	0	0	4	63	118	180	153	157	167	178	161	134	134	142	153	176	142	130	96	79	38	18	2,427
Broadway	17	3	0	0	0	22	56	104	160	123	132	145	150	137	141	145	136	145	115	107	85	67	62	33	2,087
Central Square	55	4	0	0	1	50	161	280	451	444	459	506	549	550	556	575	593	633	530	422	332	316	270	177	7,917
Charles MGH	22	2	0	0	0	10	35	128	145	150	172	205	228	246	288	470	439	414	342	303	215	170	171	136	4,290
Davis Square	21	1	0	0	0	46	142	296	462	410	409	438	445	462	369	351	308	307	330	273	266	265	144	73	5,818
Fields Corner	9	1	0	0	1	68	119	139	146	141	152	158	166	177	191	175	155	131	115	94	88	100	60	30	2,416
Harvard	76	3	0	0	1	55	153	294	449	496	627	739	842	932	1,034	1,145	1,132	1,095	875	729	665	622	405	230	12,599
JFK/U Mass	18	2	0	0	0	41	114	134	198	211	202	227	231	242	256	255	260	241	217	181	163	120	78	40	3,431
Kendall Square	42	3	0	0	0	24	81	137	157	208	280	327	357	373	402	495	625	733	561	344	259	212	160	103	5,884
North Quincy	10	0	0	0	1	43	136	227	272	300	247	195	179	174	147	137	132	155	94	72	67	62	49	19	2,718
Porter Square	19	2	0	0	0	33	100	222	341	269	289	282	304	279	274	254	258	245	260	218	182	200	128	58	4,219
Quincy Adams	4	0	0	0	1	34	78	144	163	155	166	190	155	117	81	81	97	107	100	64	54	45	24	15	1,874
Quincy Center	12	0	1	0	1	77	155	281	361	316	254	242	240	241	222	210	224	209	178	143	123	114	88	39	3,733
Savin Hill	6	3	0	0	1	22	46	65	78	81	81	83	80	84	83	82	70	57	52	45	41	32	23	11	1,127
Shawmut	3	1	0	0	1	38	59	71	76	68	67	60	75	82	76	63	53	51	48	38	37	34	25	9	1,034
South Station	110	5	1	0	1	58	188	349	391	363	366	580	633	684	794	890	1,144	1,361	1,030	863	790	678	563	346	12,189
Wollaston	4	0	0	0	0	43	109	177	228	253	205	165	153	139	113	95	91	85	67	58	51	39	39	11	2,124
Line Total:	475	38	2	0	16	932	2,312	3,929	5,049	4,946	5,121	5,597	5,815	5,872	5,961	6,344	6,632	6,878	5,701	4,600	3,980	3,613	2,609	1,477	87,908

Type and Time of Day Station Summary

Date Range: 07/01/2011 03:00:00 AM - 07/01/2012 02:59:59 AM
Station: All
Sorting: Line, Station

Line: All

Total Weekdays	Total Saturdays	Total Sundays	Total Holidays	Total Days
251	53	51	11	366

Line: Silver Line

Station	total# 00:00	total# 01:00	total# 02:00	total# 03:00	total# 04:00	total# 05:00	total# 06:00	total# 07:00	total# 08:00	total# 09:00	total# 10:00	total# 11:00	total# 12:00	total# 13:00	total# 14:00	total# 15:00	total# 16:00	total# 17:00	total# 18:00	total# 19:00	total# 20:00	total# 21:00	total# 22:00	total# 23:00	total#
Courthouse	2,156	52	23	20	105	973	1,517	3,958	6,370	4,325	3,867	6,349	9,061	10,075	13,377	23,886	43,722	57,798	32,383	14,517	11,599	8,752	6,974	7,277	269,136
World Trade Cente	6,485	222	32	18	53	2,503	3,512	9,765	12,643	14,978	17,379	23,027	29,845	25,825	34,823	52,913	107,309	140,261	66,923	34,423	20,585	18,217	18,321	16,253	656,315
Line Total:	**8,641**	**274**	**55**	**38**	**158**	**3,476**	**5,029**	**13,723**	**19,013**	**19,303**	**21,246**	**29,376**	**38,906**	**35,900**	**48,200**	**76,799**	**151,031**	**198,059**	**99,306**	**48,940**	**32,184**	**26,969**	**25,295**	**23,530**	**925,451**

Line: Subway Blue Line

Station	total# 00:00	total# 01:00	total# 02:00	total# 03:00	total# 04:00	total# 05:00	total# 06:00	total# 07:00	total# 08:00	total# 09:00	total# 10:00	total# 11:00	total# 12:00	total# 13:00	total# 14:00	total# 15:00	total# 16:00	total# 17:00	total# 18:00	total# 19:00	total# 20:00	total# 21:00	total# 22:00	total# 23:00	total#
Airport	18,006	1,579	75	29	1,278	97,321	153,258	175,824	177,734	151,745	138,164	122,649	121,117	130,711	178,688	166,014	166,935	152,004	117,701	101,045	103,145	90,033	81,263	51,427	2,497,745
Aquarium	39,954	3,686	38	25	265	6,392	12,122	24,421	25,782	23,548	29,259	43,796	60,663	79,605	118,403	158,919	205,948	224,526	134,202	87,354	80,068	89,257	96,037	89,643	1,633,913
Beachmont	1,929	421	26	5	640	48,973	76,801	119,787	128,501	66,451	48,245	43,788	43,337	44,868	46,979	48,064	42,216	33,212	24,955	18,704	15,189	13,464	11,856	6,237	884,648
Bowdoin	30	70	17	17	27	1,239	1,935	4,760	7,312	9,170	10,975	14,328	17,157	17,325	27,372	58,258	86,860	79,036	16,905	44	31	21	10	10	352,909
Maverick	10,653	1,007	74	31	1,331	137,063	261,350	319,206	317,115	228,800	171,375	144,057	142,252	154,580	203,896	208,461	197,801	169,424	94,867	74,199	63,453	54,291	49,433	29,463	3,034,182
Orient Heights	3,598	219	12	8	3,002	53,588	109,275	159,981	170,209	89,099	61,601	63,597	55,118	59,134	64,748	68,263	67,779	52,931	38,288	28,071	22,946	19,806	21,243	11,618	1,224,134
Revere Beach	3,383	315	24	16	1,115	58,109	88,472	116,086	119,994	79,543	65,397	60,914	62,706	67,889	74,544	77,139	72,948	61,281	40,327	30,789	24,035	24,771	18,086	9,951	1,157,834
Suffolk Downs	640	373	43	4	135	5,565	16,230	26,947	30,479	14,150	11,036	10,915	12,531	14,286	16,993	19,459	21,768	20,525	11,527	9,242	6,741	4,767	4,263	2,430	261,049
Wonderland	2,285	91	11	15	1,221	47,152	137,363	253,989	251,718	111,547	75,156	72,443	67,341	65,099	59,537	58,865	57,598	50,611	40,565	27,510	19,521	17,679	15,052	8,542	1,440,911
Wood Island	2,596	461	46	18	630	34,441	61,239	67,119	68,189	43,711	34,155	27,697	26,142	26,327	32,424	35,422	42,482	29,155	17,795	13,241	13,010	10,308	9,718	6,562	602,888
Line Total:	**83,074**	**8,222**	**366**	**168**	**9,644**	**469,843**	**918,045**	**1,268,120**	**1,297,033**	**817,764**	**645,363**	**604,184**	**608,364**	**659,824**	**823,584**	**898,864**	**962,335**	**872,705**	**537,132**	**390,199**	**348,139**	**324,397**	**306,961**	**215,883**	**13,090,213**

Line: Subway Green Line

Station	total# 00:00	total# 01:00	total# 02:00	total# 03:00	total# 04:00	total# 05:00	total# 06:00	total# 07:00	total# 08:00	total# 09:00	total# 10:00	total# 11:00	total# 12:00	total# 13:00	total# 14:00	total# 15:00	total# 16:00	total# 17:00	total# 18:00	total# 19:00	total# 20:00	total# 21:00	total# 22:00	total# 23:00	total#
Arlington	32,505	1,084	80	46	513	7,355	14,011	37,497	65,187	63,022	72,263	89,953	123,307	126,410	147,411	213,402	346,832	431,054	268,063	171,009	124,713	115,318	94,793	73,832	2,819,660
Boylston	53,973	2,412	83	46	131	7,217	13,511	33,830	48,069	56,839	78,201	85,712	106,889	127,809	141,018	176,450	222,875	245,661	187,043	152,785	136,147	162,748	147,845	105,231	2,292,525
Copley Square	72,057	1,827	96	67	1,104	21,337	44,780	144,328	208,778	152,539	146,250	179,100	227,110	257,236	308,671	379,581	466,688	596,845	495,394	355,952	288,881	223,626	184,108	148,627	4,904,982
Government Cente	50,430	862	93	73	441	7,409	23,149	51,014	72,615	68,956	78,350	111,896	148,639	173,743	218,245	291,423	409,419	549,001	338,004	222,913	175,731	155,189	121,730	101,132	3,370,457
Hynes	61,032	1,468	31	43	785	11,830	35,592	96,592	159,963	108,787	94,132	109,481	135,617	158,271	182,204	228,224	284,613	339,946	308,334	242,030	202,670	178,741	172,565	121,915	3,234,866
Kenmore Square	60,291	1,337	52	46	593	17,031	38,898	100,493	164,006	126,337	109,031	124,788	149,150	163,715	177,492	224,096	279,924	294,678	214,718	172,971	152,625	194,156	239,029	168,877	3,174,334
Lechmere	5,089	5	7	2	1,627	13,787	29,407	61,525	91,973	58,947	48,397	54,610	63,494	71,590	83,443	102,678	123,942	140,689	115,728	86,659	62,501	63,646	32,013	19,153	1,330,912
Park Street	74,665	3,041	201	144	804	11,837	35,982	82,545	126,736	123,078	143,127	200,828	283,417	333,340	375,855	480,693	667,308	928,445	610,231	414,722	302,076	280,964	222,620	158,062	5,860,721
Prudential	13,166	371	38	21	71	3,829	11,370	31,449	52,297	45,686	46,735	53,215	63,758	75,206	85,480	98,584	119,886	148,537	129,128	97,998	78,684	69,128	45,662	30,366	1,300,665
Riverside	646	31	19	11	1,216	6,978	30,635	63,347	64,887	46,622	48,840	49,194	43,733	36,610	35,545	41,612	53,724	69,010	41,140	18,549	13,187	10,615	8,834	4,086	689,071
Science Park	530	274	27	14	579	506	1,725	3,925	5,734	5,145	5,813	8,960	13,155	16,857	21,419	27,005	34,201	42,152	17,218	11,462	7,282	5,235	3,076	1,960	234,254
Symphony	6,127	127	23	23	67	2,437	12,335	30,961	49,280	31,158	25,226	27,286	31,894	33,740	34,608	38,719	40,536	46,230	40,666	31,094	25,767	28,633	37,349	12,934	587,220
Line Total:	**430,511**	**12,839**	**750**	**536**	**7,931**	**111,553**	**291,395**	**737,506**	**1,109,526**	**887,116**	**896,365**	**1,096,023**	**1,390,163**	**1,574,627**	**1,811,391**	**2,302,467**	**3,049,948**	**3,832,248**	**2,765,667**	**1,979,144**	**1,570,264**	**1,487,599**	**1,309,624**	**946,175**	**29,599,667**

Line: Subway Orange Line

Station	total# 00:00	total# 01:00	total# 02:00	total# 03:00	total# 04:00	total# 05:00	total# 06:00	total# 07:00	total# 08:00	total# 09:00	total# 10:00	total# 11:00	total# 12:00	total# 13:00	total# 14:00	total# 15:00	total# 16:00	total# 17:00	total# 18:00	total# 19:00	total# 20:00	total# 21:00	total# 22:00	total# 23:00	total#
Back Bay	39,753	2,366	126	105	255	13,804	113,081	305,499	408,591	198,519	129,318	147,412	187,419	202,231	268,637	349,750	574,558	799,700	498,385	293,527	220,900	185,148	164,351	123,155	5,226,590
Chinatown	20,359	1,851	55	17	293	5,123	16,005	29,801	43,848	51,822	68,125	88,639	119,202	136,341	145,366	172,103	222,688	233,922	155,685	122,947	99,281	101,150	91,892	60,037	1,986,552
Community Colleg	5,129	594	34	4	302	8,546	23,837	49,830	83,853	64,358	56,819	102,473	107,124	92,063	131,062	119,551	117,405	138,941	77,688	64,077	86,836	48,967	19,685	13,820	1,412,998
Downtown Crossi	40,483	4,233	149	126	649	15,882	38,557	77,581	104,387	114,546	162,118	225,162	308,301	369,460	441,805	574,180	866,411	1,234,769	790,599	436,428	278,098	200,258	128,938	85,327	6,498,447
Forest Hills	8,555	943	101	60	4,638	127,134	361,701	641,100	641,691	324,221	214,340	198,226	202,901	202,230	233,852	233,450	229,986	202,521	144,648	99,390	73,764	72,006	61,018	36,199	4,314,675
Green Street	2,704	398	76	14	731	18,736	42,496	109,073	172,642	90,174	53,093	50,782	51,102	50,660	56,428	70,976	62,046	63,463	46,377	29,484	20,057	14,790	15,953	7,543	1,029,798
Haymarket	36,010	3,025	111	74	2,263	108,058	188,654	234,924	237,154	183,167	153,706	162,739	184,132	202,918	248,084	292,084	345,032	342,563	241,767	172,397	164,081	166,173	137,774	92,577	3,899,467

Type and Time of Day Station Summary

Date Range: 07/01/2011 03:00:00 AM - 07/01/2012 02:59:59 AM
Station: All
Sorting: Line, Station

Line: All

Total Weekdays	Total Saturdays	Total Sundays	Total Holidays	Total Days
251	53	51	11	366

Line: Subway Orange Line

Station	total# 00:00	total# 01:00	total# 02:00	total# 03:00	total# 04:00	total# 05:00	total# 06:00	total# 07:00	total# 08:00	total# 09:00	total# 10:00	total# 11:00	total# 12:00	total# 13:00	total# 14:00	total# 15:00	total# 16:00	total# 17:00	total# 18:00	total# 19:00	total# 20:00	total# 21:00	total# 22:00	total# 23:00	total#
Jackson Square	5,960	628	70	23	570	39,047	110,851	186,873	196,809	125,106	92,652	83,900	86,607	90,498	98,916	107,896	117,668	112,055	71,711	50,338	40,124	38,634	29,989	17,562	1,704,487
Malden Center	6,750	380	53	34	1,401	102,022	260,288	510,986	617,984	368,427	229,730	200,862	192,950	181,335	192,460	172,023	167,104	151,112	106,561	68,832	59,433	58,308	48,474	25,355	3,722,864
Mass Ave	20,223	1,921	34	19	624	13,386	47,729	105,082	170,285	100,028	75,911	81,641	96,042	93,812	107,884	133,437	166,709	187,382	130,611	93,571	77,482	74,401	76,225	49,927	1,904,366
North Station	32,377	2,230	119	74	732	14,171	183,869	545,672	674,824	272,854	207,685	197,559	191,330	205,302	236,457	349,546	450,105	580,955	350,554	220,527	153,335	242,789	217,876	134,368	5,465,310
Oak Grove	1,756	392	51	36	2,712	69,132	192,546	405,928	361,502	145,305	82,584	73,587	71,646	61,606	57,878	57,011	61,019	67,926	58,910	32,439	19,973	17,899	16,020	5,952	1,863,810
Roxbury Crossin	7,380	728	45	24	512	13,329	43,454	88,168	126,328	83,741	64,593	64,408	73,162	90,970	153,183	103,499	105,728	98,310	69,262	52,830	46,055	36,420	29,510	19,819	1,371,458
Ruggles	12,578	1,385	89	49	471	26,454	92,276	152,910	176,675	124,551	103,140	130,123	137,795	161,385	236,598	278,975	343,291	343,957	199,289	136,083	115,716	88,766	64,256	40,146	2,966,958
State Street	36,201	3,629	146	173	638	12,501	22,975	46,616	50,208	51,094	64,428	94,889	134,384	162,708	230,964	321,792	553,856	752,435	382,561	206,608	146,355	120,780	109,753	68,651	3,574,345
Stony Brook	4,306	531	63	25	385	18,929	47,037	112,647	182,674	98,145	56,859	57,057	56,157	57,454	57,820	59,854	60,546	60,018	46,009	33,295	22,464	19,023	15,089	9,963	1,076,350
Sullivan Square	13,767	1,162	72	40	863	108,384	182,921	269,101	328,945	229,953	163,588	149,040	150,160	152,402	173,968	203,949	220,275	208,674	137,913	87,697	63,974	58,835	55,504	32,693	2,993,880
Tufts Medical Cent	9,533	1,091	80	29	250	8,260	38,136	64,859	72,253	69,100	70,160	75,295	85,375	84,972	111,264	177,520	246,038	240,442	132,058	82,253	59,394	43,590	41,079	38,578	1,751,609
Wellington	5,736	483	41	12	442	59,238	172,103	311,795	389,012	204,428	121,176	103,479	103,922	92,413	100,120	102,751	126,524	143,379	96,719	59,415	43,574	36,588	31,706	19,325	2,324,381
Line Total:	309,560	27,970	1,515	938	18,731	782,136	2,178,516	4,248,448	5,039,666	2,899,839	2,170,026	2,287,273	2,539,711	2,690,760	3,262,746	3,880,347	5,036,999	5,962,524	3,737,307	2,342,138	1,790,896	1,624,526	1,368,092	880,997	55,088,345

Line: Subway Red Line

Station	total# 00:00	total# 01:00	total# 02:00	total# 03:00	total# 04:00	total# 05:00	total# 06:00	total# 07:00	total# 08:00	total# 09:00	total# 10:00	total# 11:00	total# 12:00	total# 13:00	total# 14:00	total# 15:00	total# 16:00	total# 17:00	total# 18:00	total# 19:00	total# 20:00	total# 21:00	total# 22:00	total# 23:00	total#
Alewife	5,762	893	112	43	1,246	39,023	176,562	457,346	544,263	264,429	157,478	142,849	133,190	116,132	114,723	127,933	167,638	220,518	172,248	88,698	49,353	54,266	44,325	20,411	3,100,241
Andrew Square	9,113	856	45	25	593	49,855	101,562	147,064	174,935	121,089	96,099	93,936	93,972	98,101	119,768	133,841	145,761	137,516	89,851	69,530	51,255	42,259	37,473	24,425	1,838,924
Ashmont	6,982	861	74	39	3,908	103,412	222,977	371,137	349,689	177,558	132,697	126,658	121,543	127,510	155,800	138,713	123,826	108,422	81,160	56,283	53,734	50,430	38,988	23,162	2,575,763
Braintree	1,695	316	88	54	7,134	88,118	198,319	288,006	154,448	65,518	52,707	54,755	54,295	48,104	53,743	65,244	72,241	74,278	52,756	30,924	25,083	23,059	16,778	9,486	1,437,149
Broadway	10,704	1,068	91	32	462	20,054	61,936	126,146	195,907	89,868	59,798	59,013	63,304	73,465	86,756	104,754	121,162	134,975	95,487	63,048	42,973	31,543	30,878	21,127	1,494,551
Central Square	60,440	2,301	82	54	464	36,521	115,701	280,151	523,128	339,023	233,606	225,418	248,116	246,662	251,979	311,682	387,677	473,839	363,850	263,834	199,384	182,417	160,233	124,290	5,030,852
Charles MGH	26,557	1,146	98	61	183	6,750	30,748	110,012	175,817	123,856	106,752	122,414	132,400	137,427	185,219	328,708	430,980	476,641	298,958	231,741	144,648	99,123	88,078	91,761	3,350,078
Davis Square	18,203	526	91	34	455	42,600	148,877	432,719	687,588	328,606	192,254	166,844	159,834	155,737	150,746	152,067	158,676	190,053	178,734	132,633	96,804	91,007	83,667	52,554	3,621,309
Fields Corner	4,048	574	70	32	725	58,589	130,901	173,552	154,258	103,251	78,451	75,812	77,660	84,170	102,084	95,801	87,442	77,232	56,386	43,151	34,460	33,259	25,385	13,118	1,510,411
Harvard	69,725	1,819	139	70	509	43,896	127,901	319,578	518,847	368,495	296,863	328,830	393,004	439,880	486,821	603,088	679,156	804,961	577,169	433,856	339,839	340,738	265,853	175,827	7,616,864
JFK/U Mass	8,310	891	32	11	152	32,238	94,195	146,887	192,333	139,590	115,986	124,508	150,601	161,914	208,738	239,315	222,105	243,560	163,823	113,792	97,445	69,383	42,081	24,677	2,592,567
Kendall Square	34,171	1,498	53	40	422	10,996	39,361	102,256	170,909	131,545	124,906	154,534	183,887	195,093	236,867	338,005	600,027	816,394	514,764	293,076	191,642	149,823	108,936	81,535	4,480,740
North Quincy	3,828	159	58	21	1,210	51,906	137,950	279,417	310,983	199,585	121,273	94,454	91,964	83,180	106,566	94,961	116,027	135,366	69,680	38,597	29,556	29,041	21,990	12,275	2,030,047
Porter Square	11,431	779	83	42	427	26,480	90,916	299,324	465,800	225,088	130,352	111,683	110,684	99,317	104,816	101,815	114,489	144,005	131,039	99,386	79,336	74,265	64,259	35,784	2,521,600
Quincy Adams	2,225	284	55	46	672	42,725	102,192	204,020	216,052	108,598	66,699	62,059	51,441	43,183	42,116	48,287	67,932	76,433	47,816	23,591	15,867	19,542	13,541	7,941	1,263,317
Quincy Center	7,446	372	105	44	1,087	78,518	189,086	382,755	409,457	213,350	132,965	116,151	117,231	108,349	121,646	111,262	112,624	110,682	84,102	60,293	49,652	46,807	40,699	23,214	2,517,897
Savin Hill	2,793	852	17	13	697	20,420	48,041	86,288	102,753	57,045	39,934	35,283	32,695	34,321	37,414	45,103	38,394	35,987	26,530	19,187	14,857	13,428	10,173	5,938	708,163
Shawmut	1,427	391	22	18	865	30,731	67,888	111,536	103,787	51,253	35,791	32,602	33,373	34,551	32,479	31,281	29,259	27,811	20,341	13,695	11,048	10,692	9,064	3,579	693,484
South Station	53,003	2,017	181	157	1,257	25,565	223,611	445,371	580,956	278,676	182,242	230,070	265,016	286,059	328,400	426,881	712,652	1,081,220	679,751	380,505	273,926	226,592	202,446	150,159	7,036,713
Wollaston	1,737	162	54	16	619	46,946	116,860	227,254	238,141	141,737	86,606	61,873	57,883	55,317	49,278	46,702	45,568	45,652	35,278	20,996	17,326	15,525	15,850	7,659	1,335,039
Line Total:	339,600	17,765	1,550	852	23,087	855,343	2,425,684	4,990,819	6,270,251	3,628,160	2,443,468	2,419,746	2,572,893	2,628,472	2,975,969	3,648,443	4,433,836	5,416,545	3,739,723	2,476,816	1,818,188	1,603,199	1,329,697	908,922	56,755,709

END OF REPORT

Attachment:

End of Attachment List

Exits Type and Time of Day Station Summary

Date Range: 09/01/2012 03:00:00 AM - 10/01/2012 02:59:59 AM
Station: All
Sorting: Line, Station

Line: All

Total Weekdays	Total Saturdays	Total Sundays	Total Holidays	Total Days
19	5	5	1	30

Line: Silver Line

Station	su avg 00:00	su avg 01:00	su avg 02:00	su avg 03:00	su avg 04:00	su avg 05:00	su avg 06:00	su avg 07:00	su avg 08:00	su avg 09:00	su avg 10:00	su avg 11:00	su avg 12:00	su avg 13:00	su avg 14:00	su avg 15:00	su avg 16:00	su avg 17:00	su avg 18:00	su avg 19:00	su avg 20:00	su avg 21:00	su avg 22:00	su avg 23:00	su avg
Courthouse	3	0	1	0	0	1	5	6	6	18	16	16	19	16	31	24	23	8	7	7	7	8	8	2	234
World Trade Cente	3	2	0	0	0	1	15	24	26	29	23	35	31	46	32	41	46	38	40	32	16	20	19	6	525
Line Total:	6	2	1	0	0	2	20	30	32	47	39	51	50	62	63	65	69	46	39	39	23	28	27	8	759

Line: Subway Blue Line

Station	su avg 00:00	su avg 01:00	su avg 02:00	su avg 03:00	su avg 04:00	su avg 05:00	su avg 06:00	su avg 07:00	su avg 08:00	su avg 09:00	su avg 10:00	su avg 11:00	su avg 12:00	su avg 13:00	su avg 14:00	su avg 15:00	su avg 16:00	su avg 17:00	su avg 18:00	su avg 19:00	su avg 20:00	su avg 21:00	su avg 22:00	su avg 23:00	su avg
Airport	22	6	0	0	0	1	128	144	139	166	193	237	271	256	273	298	301	271	240	185	142	115	95	52	3,533
Aquarium	13	1	1	0	0	2	81	127	214	310	351	384	339	361	315	306	247	192	127	109	72	46	41	30	3,669
Beachmont	54	6	1	0	0	1	9	20	21	38	40	48	76	80	105	115	130	133	122	122	94	74	73	79	1,439
Bowdoin	0	1	0	0	0	0	0	0	0	0	2	1	0	0	1	0	0	0	0	0	0	0	0	0	5
Maverick	192	35	0	0	0	4	66	101	88	120	142	229	250	291	308	439	559	477	504	387	301	274	390	436	5,592
Orient Heights	20	0	0	0	0	1	18	20	33	33	34	52	60	68	84	88	113	100	104	94	92	65	66	51	1,194
Revere Beach	13	2	0	0	0	1	5	13	10	20	21	29	31	60	47	50	59	49	47	37	38	34	22	22	610
Suffolk Downs	8	2	0	0	0	0	15	16	25	30	23	27	57	39	35	29	30	28	27	27	15	11	13	14	471
Wonderland	5	2	0	0	0	2	2	4	9	8	9	11	12	10	12	11	11	13	14	12	10	9	7	6	177
Wood Island	35	5	1	0	0	2	14	17	17	20	36	29	35	41	59	63	80	80	70	58	62	48	69	64	905
Line Total:	362	60	3	0	0	14	338	462	556	745	851	1,047	1,131	1,206	1,239	1,399	1,530	1,343	1,031	1,031	826	676	776	754	17,596

Line: Subway Green Line

Station	su avg 00:00	su avg 01:00	su avg 02:00	su avg 03:00	su avg 04:00	su avg 05:00	su avg 06:00	su avg 07:00	su avg 08:00	su avg 09:00	su avg 10:00	su avg 11:00	su avg 12:00	su avg 13:00	su avg 14:00	su avg 15:00	su avg 16:00	su avg 17:00	su avg 18:00	su avg 19:00	su avg 20:00	su avg 21:00	su avg 22:00	su avg 23:00	su avg
Arlington	21	7	3	1	1	7	45	76	140	227	396	287	297	306	341	350	291	243	210	153	114	95	78	41	3,734
Boylston	45	5	0	0	0	4	51	82	189	261	375	371	403	433	356	401	385	356	342	298	187	139	145	93	4,922
Copley Square	31	9	1	0	0	4	77	125	212	245	453	589	594	638	708	676	613	545	397	298	225	165	145	84	6,835
Government Cente	38	4	2	1	1	10	162	84	142	192	345	437	550	580	529	499	492	517	383	298	171	132	92	70	5,733
Hynes	53	1	0	0	0	8	42	61	112	169	221	305	313	333	318	350	362	345	315	278	202	178	141	103	4,212
Kenmore Square	63	5	0	0	0	4	94	96	145	212	328	731	1,053	939	515	390	317	313	407	322	249	217	199	114	6,712
Lechmere	1	0	0	0	0	1	1	2	1	4	7	5	7	5	5	7	11	7	9	9	2	1	1	1	89
Park Street	55	8	1	0	0	6	100	104	234	331	603	731	754	727	757	767	738	616	543	473	288	188	133	93	8,252
Prudential	17	0	0	0	0	4	24	44	57	96	148	171	201	257	200	253	239	231	168	124	98	76	53	31	2,491
Riverside	23	3	0	0	0	0	8	34	54	49	46	56	48	72	75	137	170	327	193	105	84	61	52	43	1,639
Science Park	3	2	0	0	0	3	12	11	24	61	80	93	112	97	93	84	54	49	30	32	13	12	5	7	874
Symphony	18	1	0	0	0	2	6	8	22	24	35	49	61	92	69	88	86	74	93	78	50	45	41	28	970
Line Total:	368	45	7	6	2	53	622	727	1,332	1,871	3,037	3,825	4,393	4,479	3,966	4,002	3,758	3,623	2,468	2,468	1,683	1,309	1,085	708	46,463

Line: Subway Orange Line

Station	su avg 00:00	su avg 01:00	su avg 02:00	su avg 03:00	su avg 04:00	su avg 05:00	su avg 06:00	su avg 07:00	su avg 08:00	su avg 09:00	su avg 10:00	su avg 11:00	su avg 12:00	su avg 13:00	su avg 14:00	su avg 15:00	su avg 16:00	su avg 17:00	su avg 18:00	su avg 19:00	su avg 20:00	su avg 21:00	su avg 22:00	su avg 23:00	su avg
Back Bay	13	3	1	0	0	1	107	160	243	257	347	385	360	368	405	362	306	262	205	151	112	88	94	45	4,275
Chinatown	10	4	0	1	1	2	72	112	146	279	340	324	295	286	246	208	219	237	228	179	113	67	63	26	3,455
Community Colleg	17	4	1	0	0	1	27	32	141	103	91	230	140	107	101	106	93	75	79	66	47	43	37	26	1,566
Downtown Crossi	22	7	0	0	0	4	68	107	189	294	411	457	482	515	515	533	455	404	276	197	117	77	71	43	5,243
Forest Hills	151	36	1	0	0	3	121	136	184	172	192	199	261	281	328	389	465	410	500	447	356	319	222	264	5,438
Green Street	30	6	1	0	0	0	7	19	22	43	46	45	72	86	85	113	133	136	111	117	79	77	60	61	1,349
Haymarket	62	8	2	0	0	7	53	79	105	157	186	254	300	335	391	359	409	408	421	370	250	173	166	157	4,652
Jackson Square	47	8	1	0	0	3	29	46	46	53	76	97	137	141	169	190	195	207	199	181	162	122	113	102	2,325

Exits Type and Time of Day Station Summary

Date Range: 09/01/2012 03:00:00 AM - 10/01/2012 02:59:59 AM
Station: All
Sorting: Line, Station

Line: All

Total Weekdays	Total Saturdays	Total Sundays	Total Holidays	Total Days
19	5	5	1	30

Line: Subway Orange Line

Station	su avg 00:00	su avg 01:00	su avg 02:00	su avg 03:00	su avg 04:00	su avg 05:00	su avg 06:00	su avg 07:00	su avg 08:00	su avg 09:00	su avg 10:00	su avg 11:00	su avg 12:00	su avg 13:00	su avg 14:00	su avg 15:00	su avg 16:00	su avg 17:00	su avg 18:00	su avg 19:00	su avg 20:00	su avg 21:00	su avg 22:00	su avg 23:00	su avg
Malden Center	47	7	1	1	1	2	37	41	67	71	106	109	156	171	198	225	252	322	279	288	224	121	110	113	2,949
Mass Ave	27	5	1	0	0	0	44	74	78	91	130	148	190	185	179	180	160	148	130	105	106	83	57	2,287	
North Station	18	7	2	0	0	3	70	116	172	215	266	305	237	296	245	253	320	470	415	348	178	110	112	83	4,244
Oak Grove	18	4	1	0	0	1	9	17	28	37	46	53	64	88	94	108	131	148	137	107	82	38	36	52	1,299
Roxbury Crossin	27	5	0	0	0	1	27	34	39	54	77	79	95	95	105	119	126	119	123	126	101	102	88	71	1,614
Ruggles	59	9	1	0	0	2	42	94	131	128	169	187	219	267	258	270	272	282	249	276	209	170	158	137	3,590
State Street	27	6	0	1	1	1	95	131	160	180	252	306	292	335	334	282	240	195	157	128	88	65	83	57	3,415
Stony Brook	48	7	1	0	0	1	6	15	19	30	41	55	79	96	100	133	122	127	120	137	91	91	74	61	1,452
Sullivan Square	211	42	2	0	0	4	90	136	143	168	168	213	260	319	342	427	503	530	520	446	374	489	517	485	6,389
Tufts Medical Cen	11	5	0	2	2	1	84	101	133	231	225	171	159	167	184	147	122	114	111	99	69	54	77	34	2,302
Wellington	19	5	0	0	0	1	25	28	51	66	106	101	116	133	172	178	196	235	202	148	118	58	44	81	2,083
Line Total:	864	178	16	1	5	38	1,013	1,478	2,097	2,629	3,275	3,734	3,872	4,276	4,457	4,581	4,739	4,841	3,941	3,941	2,875	2,370	2,208	1,955	59,927

Line: Subway Red Line

Station	su avg 00:00	su avg 01:00	su avg 02:00	su avg 03:00	su avg 04:00	su avg 05:00	su avg 06:00	su avg 07:00	su avg 08:00	su avg 09:00	su avg 10:00	su avg 11:00	su avg 12:00	su avg 13:00	su avg 14:00	su avg 15:00	su avg 16:00	su avg 17:00	su avg 18:00	su avg 19:00	su avg 20:00	su avg 21:00	su avg 22:00	su avg 23:00	su avg
Alewife	76	22	2	1	1	4	54	89	104	130	172	152	200	244	243	342	346	426	357	314	215	173	159	123	3,949
Andrew Square	6	1	0	0	0	0	17	14	23	34	53	49	57	61	69	60	69	59	46	38	29	23	25	15	750
Ashmont	12	2	1	0	0	4	8	7	17	13	14	13	17	18	26	22	20	26	24	24	19	12	12	11	323
Braintree	55	12	1	0	0	0	7	24	44	43	67	76	70	81	85	95	94	138	147	96	66	65	50	49	1,365
Broadway	26	11	2	0	0	2	48	62	85	110	121	160	167	184	169	142	156	143	152	126	100	93	69	53	2,181
Central Square	132	11	0	0	0	4	91	150	237	279	508	471	511	659	636	663	661	695	605	612	481	464	360	247	8,477
Charles MGH	31	2	1	0	0	1	141	116	128	163	201	235	290	296	324	306	280	261	238	172	165	126	114	59	3,650
Davis Square	153	18	1	0	0	1	35	73	93	155	238	273	347	395	389	487	500	600	560	484	405	344	316	239	6,106
Fields Corner	50	20	0	0	0	1	19	46	61	69	82	76	100	114	117	152	194	151	161	179	144	124	102	93	2,054
Harvard	126	16	3	0	0	1	134	187	292	459	774	934	931	1,192	1,152	1,040	1,137	1,038	991	859	609	490	411	289	13,065
JFK/U Mass	53	11	2	0	0	1	41	69	94	112	131	153	166	200	199	224	301	378	322	287	225	216	213	166	3,564
Kendall Square	40	6	1	0	0	3	47	76	131	168	271	319	443	541	557	583	484	409	324	259	213	167	159	100	5,301
North Quincy	18	2	0	0	0	0	14	25	40	62	49	64	62	66	60	86	97	91	76	62	49	31	53	23	1,031
Porter Square	90	13	1	0	0	2	27	73	105	147	214	231	237	309	267	324	374	411	383	364	280	231	184	155	4,423
Quincy Adams	13	2	0	0	0	1	4	11	13	18	22	31	32	30	38	50	52	85	61	61	42	32	17	21	637
Quincy Center	75	14	0	0	0	1	31	111	131	152	126	167	171	183	194	253	226	251	254	207	236	160	145	154	3,240
Savin Hill	33	9	0	0	0	2	10	25	18	25	40	34	56	66	67	73	87	88	102	85	74	65	57	58	1,073
Shawmut	12	3	0	0	0	0	3	6	15	10	24	22	20	32	29	35	50	45	51	56	42	27	26	26	535
South Station	44	12	5	0	0	1	154	166	247	321	455	454	417	387	390	352	387	352	306	240	190	141	140	71	5,234
Wollaston	51	4	0	0	0	0	16	20	40	48	69	58	68	92	103	95	133	155	158	118	125	82	136	82	1,655
Line Total:	1,096	191	20	1	1	29	901	1,350	1,918	2,518	3,631	3,972	4,362	5,150	5,114	5,384	5,648	5,802	4,643	4,643	3,709	3,066	2,748	2,034	68,614

Exits Type and Time of Day Station Summary

Date Range: 09/01/2012 03:00:00 AM - 10/01/2012 02:59:59 AM
Station: All
Sorting: Line, Station

Line: All

Total Weekdays	Total Saturdays	Total Sundays	Total Holidays	Total Days
19	5	5	1	30

Line: Silver Line

Station	Wd avg 00:00	Wd avg 01:00	Wd avg 02:00	Wd avg 03:00	Wd avg 04:00	Wd avg 05:00	Wd avg 06:00	Wd avg 07:00	Wd avg 08:00	Wd avg 09:00	Wd avg 10:00	Wd avg 11:00	Wd avg 12:00	Wd avg 13:00	Wd avg 14:00	Wd avg 15:00	Wd avg 16:00	Wd avg 17:00	Wd avg 18:00	Wd avg 19:00	Wd avg 20:00	Wd avg 21:00	Wd avg 22:00	Wd avg 23:00	Wd avg
Courthouse	2	1	2	1	1	12	54	126	344	238	85	37	29	30	30	37	45	45	28	20	8	5	4	3	1,187
World Trade Cente	5	1	1	2	2	28	90	280	557	248	69	59	54	69	63	60	68	80	62	37	22	26	22	10	1,915
Line Total:	7	2	3	3	3	40	144	406	901	486	154	96	83	99	93	97	113	125	57	57	30	31	26	13	19,645

Line: Subway Blue Line

Station	Wd avg 00:00	Wd avg 01:00	Wd avg 02:00	Wd avg 03:00	Wd avg 04:00	Wd avg 05:00	Wd avg 06:00	Wd avg 07:00	Wd avg 08:00	Wd avg 09:00	Wd avg 10:00	Wd avg 11:00	Wd avg 12:00	Wd avg 13:00	Wd avg 14:00	Wd avg 15:00	Wd avg 16:00	Wd avg 17:00	Wd avg 18:00	Wd avg 19:00	Wd avg 20:00	Wd avg 21:00	Wd avg 22:00	Wd avg 23:00	Wd avg
Airport	33	8	0	1	1	123	200	219	222	190	200	253	278	275	302	313	342	343	240	172	133	120	107	74	4,149
Aquarium	20	6	2	2	2	100	204	494	717	474	337	288	210	224	267	301	271	318	166	114	79	61	62	38	4,757
Beachmont	79	11	0	3	3	10	33	40	46	45	59	85	98	128	184	254	358	468	307	212	160	147	141	118	2,986
Bowdoin	0	1	0	0	0	56	171	307	393	194	90	65	59	72	75	61	51	48	14	0	0	0	0	0	1,659
Maverick	313	57	1	2	2	72	187	359	281	251	278	333	369	484	728	992	1,121	1,053	861	548	485	497	568	571	10,411
Orient Heights	57	1	0	1	1	21	51	76	77	54	65	72	91	110	177	243	327	380	243	158	129	113	116	109	2,670
Revere Beach	18	2	0	1	1	5	19	18	33	34	36	37	49	54	63	90	89	102	71	50	41	36	32	27	907
Suffolk Downs	11	2	0	1	1	3	13	8	8	12	12	33	55	46	40	46	47	40	33	33	25	25	19	17	530
Wonderland	6	3	1	3	3	8	15	23	23	22	16	16	18	14	16	14	14	18	15	11	9	10	9	7	291
Wood Island	51	7	1	1	1	15	38	63	34	27	34	37	53	59	96	153	189	215	136	98	87	92	99	102	1,687
Line Total:	588	98	5	5	15	413	931	1,607	1,834	1,303	1,127	1,219	1,280	1,466	1,948	2,467	2,809	2,985	1,396	1,396	1,148	1,101	1,153	1,063	190,297

Line: Subway Green Line

Station	Wd avg 00:00	Wd avg 01:00	Wd avg 02:00	Wd avg 03:00	Wd avg 04:00	Wd avg 05:00	Wd avg 06:00	Wd avg 07:00	Wd avg 08:00	Wd avg 09:00	Wd avg 10:00	Wd avg 11:00	Wd avg 12:00	Wd avg 13:00	Wd avg 14:00	Wd avg 15:00	Wd avg 16:00	Wd avg 17:00	Wd avg 18:00	Wd avg 19:00	Wd avg 20:00	Wd avg 21:00	Wd avg 22:00	Wd avg 23:00	Wd avg
Arlington	43	5	2	3	3	93	306	856	1,778	1,224	475	336	348	358	365	359	388	553	398	262	162	125	125	82	8,649
Boylston	91	9	1	2	2	67	207	540	966	853	482	466	392	428	396	452	437	549	451	346	235	219	224	159	7,974
Copley Square	60	9	1	3	3	93	244	735	1,237	971	584	581	614	657	730	863	920	1,074	896	562	332	257	215	116	11,754
Government Cente	72	6	2	4	4	113	345	1,038	2,268	1,294	613	557	545	539	517	557	528	634	498	360	251	223	235	164	11,364
Hynes	85	4	1	2	2	46	118	329	661	463	357	273	267	305	285	343	366	473	483	388	263	238	198	144	6,095
Kenmore Square	93	12	0	1	1	40	191	486	624	487	332	320	338	333	385	501	660	874	869	718	406	269	175	152	8,265
Lechmere	1	0	0	0	0	1	4	8	12	7	6	6	6	6	7	9	14	14	9	6	5	4	3	1	131
Park Street	86	36	2	3	3	79	260	913	2,247	1,566	878	803	767	845	739	833	854	922	759	542	348	260	253	162	14,161
Prudential	20	3	1	0	0	32	92	193	372	252	165	184	212	218	261	289	318	362	320	209	138	84	72	36	3,833
Riverside	71	9	0	0	0	5	64	145	215	150	81	74	71	78	77	121	173	230	241	150	98	89	138	203	2,484
Science Park	5	2	0	2	2	7	38	61	132	92	79	73	63	67	69	61	62	64	65	44	27	14	17	8	1,052
Symphony	25	2	0	0	0	7	17	40	70	63	62	68	84	93	100	121	141	181	155	123	76	66	57	38	1,590
Line Total:	652	97	10	16	20	583	1,886	5,344	10,582	7,422	4,114	3,741	3,707	3,927	3,931	4,509	4,861	5,930	3,710	3,710	2,341	1,848	1,712	1,265	489,900

Line: Subway Orange Line

Station	Wd avg 00:00	Wd avg 01:00	Wd avg 02:00	Wd avg 03:00	Wd avg 04:00	Wd avg 05:00	Wd avg 06:00	Wd avg 07:00	Wd avg 08:00	Wd avg 09:00	Wd avg 10:00	Wd avg 11:00	Wd avg 12:00	Wd avg 13:00	Wd avg 14:00	Wd avg 15:00	Wd avg 16:00	Wd avg 17:00	Wd avg 18:00	Wd avg 19:00	Wd avg 20:00	Wd avg 21:00	Wd avg 22:00	Wd avg 23:00	Wd avg
Back Bay	27	3	1	1	1	137	566	1,494	1,973	1,254	533	444	472	470	514	590	747	992	562	316	195	123	120	61	11,595
Chinatown	20	4	0	2	2	59	209	434	797	748	453	427	418	380	351	330	357	365	297	193	121	84	69	41	6,159
Community Colleg	20	5	0	0	0	46	287	461	949	642	394	513	384	364	468	400	317	619	320	140	104	72	68	39	6,612
Downtown Crossi	42	15	3	4	4	150	514	1,356	2,819	1,859	988	847	843	885	905	934	929	933	611	330	173	131	106	65	15,445
Forest Hills	216	44	3	6	6	85	441	633	462	355	347	426	491	626	938	1,364	1,724	2,130	1,583	965	709	601	466	391	15,009
Green Street	52	6	1	2	2	10	55	152	165	102	87	82	92	120	162	249	333	532	442	276	185	157	122	85	3,470
Haymarket	111	12	4	3	3	79	199	412	598	480	309	320	381	410	506	644	758	854	760	557	408	352	315	269	8,746
Jackson Square	77	9	1	2	2	22	81	184	220	183	161	190	236	273	418	541	590	649	458	304	236	236	208	146	5,426

Exits Type and Time of Day Station Summary

Date Range: 09/01/2012 03:00:00 AM - 10/01/2012 02:59:59 AM
Station: All
Sorting: Line, Station

Line: All

Total Weekdays	Total Saturdays	Total Sundays	Total Holidays	Total Days
19	5	5	1	30

Line: Subway Orange Line

Station	Wd avg 00:00	Wd avg 01:00	Wd avg 02:00	Wd avg 03:00	Wd avg 04:00	Wd avg 05:00	Wd avg 06:00	Wd avg 07:00	Wd avg 08:00	Wd avg 09:00	Wd avg 10:00	Wd avg 11:00	Wd avg 12:00	Wd avg 13:00	Wd avg 14:00	Wd avg 15:00	Wd avg 16:00	Wd avg 17:00	Wd avg 18:00	Wd avg 19:00	Wd avg 20:00	Wd avg 21:00	Wd avg 22:00	Wd avg 23:00	Wd avg
Malden Center	68	8	0	2	2	37	105	229	283	215	235	294	316	419	452	627	881	1,354	1,090	669	511	119	111	91	8,116
Mass Ave	43	8	1	2	2	52	169	374	576	414	276	252	263	289	303	329	351	460	366	234	163	140	119	73	5,255
North Station	36	9	7	8	8	147	568	1,059	1,362	877	470	380	446	432	510	742	1,673	2,118	994	548	361	246	234	129	13,365
Oak Grove	38	7	1	1	1	14	50	66	63	56	76	91	120	147	210	354	667	1,084	805	397	285	58	49	40	4,680
Roxbury Crossin	53	8	2	1	1	26	241	484	361	251	183	163	193	216	263	334	370	457	326	212	150	127	119	84	4,628
Ruggles	94	13	1	1	1	86	558	1,253	1,207	860	546	530	455	633	682	710	784	942	569	369	303	277	240	168	11,281
State Street	26	8	4	3	3	325	844	2,101	4,113	2,228	820	579	531	543	539	487	542	623	334	174	113	86	98	58	15,180
Stony Brook	65	9	1	2	2	5	22	46	85	108	100	122	145	166	208	271	355	545	423	274	189	190	139	97	3,565
Sullivan Square	329	53	1	3	3	109	391	706	550	344	243	297	320	366	483	670	881	1,167	865	577	543	1,001	918	781	11,602
Tufts Medical Cent	22	5	2	3	3	95	459	988	1,328	773	365	277	298	290	376	344	347	363	225	143	99	99	77	46	7,025
Wellington	52	9	0	2	2	70	131	216	274	187	155	199	238	310	384	543	483	747	693	532	336	83	67	67	5,777
Line Total:	1,391	235	33	33	48	1,554	5,890	12,648	18,185	11,936	6,741	6,433	6,642	7,339	8,672	10,463	13,089	16,934	7,210	7,210	5,184	4,182	3,645	2,731	1,031,923

Line: Subway Red Line

Station	Wd avg 00:00	Wd avg 01:00	Wd avg 02:00	Wd avg 03:00	Wd avg 04:00	Wd avg 05:00	Wd avg 06:00	Wd avg 07:00	Wd avg 08:00	Wd avg 09:00	Wd avg 10:00	Wd avg 11:00	Wd avg 12:00	Wd avg 13:00	Wd avg 14:00	Wd avg 15:00	Wd avg 16:00	Wd avg 17:00	Wd avg 18:00	Wd avg 19:00	Wd avg 20:00	Wd avg 21:00	Wd avg 22:00	Wd avg 23:00	Wd avg
Alewife	134	26	2	2	2	60	341	470	685	367	233	219	255	341	398	699	1,038	1,713	1,417	806	479	396	300	247	10,628
Andrew Square	9	2	0	1	1	36	77	78	65	67	61	63	69	72	81	100	88	88	71	54	36	31	25	18	1,195
Ashmont	11	3	2	1	1	7	28	28	31	29	22	23	20	28	38	45	53	70	63	43	31	20	19	15	635
Braintree	47	10	0	1	1	2	53	55	59	47	50	51	71	77	114	185	363	551	415	204	119	87	78	64	2,704
Broadway	40	8	1	2	2	68	276	430	440	290	167	158	170	190	275	335	399	578	444	299	184	176	145	88	5,163
Central Square	187	19	3	6	6	107	441	1,035	1,413	909	561	507	558	609	683	827	1,013	1,549	1,485	1,050	757	674	520	347	15,261
Charles MGH	44	4	1	1	1	193	1,232	1,623	1,899	1,056	599	441	442	482	524	507	486	613	533	332	232	223	198	104	11,770
Davis Square	235	41	2	2	2	23	101	257	380	352	284	290	338	386	457	664	911	1,656	1,672	1,147	771	702	527	413	11,612
Fields Corner	63	23	2	0	0	15	95	217	270	160	146	167	204	213	377	541	566	585	441	276	225	189	158	131	5,065
Harvard	197	21	1	1	1	149	553	1,319	2,183	1,582	1,067	992	1,007	1,020	1,076	1,273	1,546	2,103	1,907	1,293	848	718	574	409	21,839
JFK/U Mass	51	12	1	2	2	53	266	1,276	1,120	935	672	430	395	371	325	461	426	541	419	273	218	181	148	99	8,675
Kendall Square	60	8	1	2	2	137	591	1,381	2,876	2,077	896	573	559	527	510	517	606	778	705	413	292	255	211	129	14,106
North Quincy	75	1	1	5	5	25	141	422	398	262	172	171	210	230	294	406	668	1,097	937	505	330	276	238	171	7,037
Porter Square	140	23	2	3	3	18	95	240	345	269	215	210	231	278	325	492	869	1,428	1,315	803	517	438	328	242	8,829
Quincy Adams	31	5	0	1	1	3	43	51	44	41	37	38	44	51	65	88	157	250	245	123	85	55	54	57	1,571
Quincy Center	110	8	1	3	3	8	207	442	399	356	300	290	333	345	492	595	971	1,440	1,304	633	423	333	305	208	9,506
Savin Hill	43	11	1	2	2	12	50	195	66	54	55	60	79	85	144	217	256	346	283	186	140	130	96	77	2,589
Shawmut	17	5	2	1	1	4	12	40	43	30	29	33	47	49	91	113	144	190	162	96	75	60	43	38	1,323
South Station	36	9	5	4	4	154	458	1,012	1,958	1,222	613	467	484	501	506	715	1,114	1,278	661	388	223	177	156	93	12,240
Wollaston	79	1	0	1	1	4	47	78	89	89	111	103	128	153	232	316	515	858	680	350	245	221	209	165	4,673
Line Total:	1,609	240	28	26	41	1,078	5,107	10,649	14,763	10,194	6,290	5,286	5,644	6,008	7,007	9,096	12,189	17,712	9,274	9,274	6,230	5,342	4,332	3,115	990,660

Exits Type and Time of Day Station Summary

Date Range: 09/01/2012 03:00:00 AM - 10/01/2012 02:59:59 AM
Station: All
Sorting: Line, Station

Line: All

Total Weekdays	Total Saturdays	Total Sundays	Total Holidays	Total Days
19	5	5	1	30

Line: Silver Line

Station	sa avg 00:00	sa avg 01:00	sa avg 02:00	sa avg 03:00	sa avg 04:00	sa avg 05:00	sa avg 06:00	sa avg 07:00	sa avg 08:00	sa avg 09:00	sa avg 10:00	sa avg 11:00	sa avg 12:00	sa avg 13:00	sa avg 14:00	sa avg 15:00	sa avg 16:00	sa avg 17:00	sa avg 18:00	sa avg 19:00	sa avg 20:00	sa avg 21:00	sa avg 22:00	sa avg 23:00	sa avg
Courthouse	2	0	0	0	0	3	6	7	14	19	18	17	23	31	29	27	22	14	18	11	10	8	8	6	292
World Trade Cente	11	1	0	0	0	10	27	28	42	29	30	35	43	40	70	65	67	69	68	38	29	38	33	18	792
Line Total:	13	1	0	0	0	13	33	35	56	48	48	52	66	71	99	92	89	83	49	49	39	46	41	24	1,085

Line: Subway Blue Line

Station	sa avg 00:00	sa avg 01:00	sa avg 02:00	sa avg 03:00	sa avg 04:00	sa avg 05:00	sa avg 06:00	sa avg 07:00	sa avg 08:00	sa avg 09:00	sa avg 10:00	sa avg 11:00	sa avg 12:00	sa avg 13:00	sa avg 14:00	sa avg 15:00	sa avg 16:00	sa avg 17:00	sa avg 18:00	sa avg 19:00	sa avg 20:00	sa avg 21:00	sa avg 22:00	sa avg 23:00	sa avg
Airport	46	11	0	1	1	79	160	178	186	204	185	269	241	238	272	249	287	245	227	206	202	168	125	80	3,860
Aquarium	26	6	0	1	1	46	88	176	308	367	413	426	423	448	433	458	379	264	208	201	157	105	91	60	5,083
Beachmont	98	15	0	1	1	7	18	25	28	41	50	77	94	93	119	138	147	176	150	132	98	103	100	97	1,807
Bowdoin	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Maverick	503	91	0	1	1	53	70	110	140	178	220	301	378	397	444	559	636	614	529	388	390	309	367	537	7,215
Orient Heights	79	10	0	0	0	8	27	27	32	42	48	68	71	98	104	125	128	145	120	112	112	94	85	101	1,638
Revere Beach	24	6	0	0	0	3	6	17	22	28	33	36	51	49	54	54	58	57	51	51	40	29	22	28	720
Suffolk Downs	16	4	1	0	0	0	10	4	8	9	31	80	122	83	65	47	39	37	29	26	25	21	19	15	691
Wonderland	7	5	0	1	1	4	5	10	11	11	10	10	12	15	9	11	17	12	8	9	11	10	9	8	206
Wood Island	86	14	0	0	0	12	16	19	28	19	31	37	51	49	59	76	97	97	88	89	72	63	70	96	1,168
Line Total:	885	162	1	0	5	213	400	567	763	899	1,021	1,304	1,443	1,470	1,559	1,717	1,788	1,647	1,214	1,214	1,107	902	888	1,022	22,391

Line: Subway Green Line

Station	sa avg 00:00	sa avg 01:00	sa avg 02:00	sa avg 03:00	sa avg 04:00	sa avg 05:00	sa avg 06:00	sa avg 07:00	sa avg 08:00	sa avg 09:00	sa avg 10:00	sa avg 11:00	sa avg 12:00	sa avg 13:00	sa avg 14:00	sa avg 15:00	sa avg 16:00	sa avg 17:00	sa avg 18:00	sa avg 19:00	sa avg 20:00	sa avg 21:00	sa avg 22:00	sa avg 23:00	sa avg
Arlington	70	3	1	3	3	27	105	151	241	303	276	314	362	449	591	673	590	455	356	316	259	185	168	101	6,000
Boylston	259	7	0	1	1	23	89	120	236	342	417	431	487	559	620	607	560	562	558	551	366	351	378	287	7,809
Copley Square	117	13	0	1	1	47	105	181	349	470	559	700	804	914	953	1,051	996	783	679	640	496	326	347	190	10,721
Government Cente	172	7	1	1	1	37	92	151	198	340	394	586	698	785	886	854	756	799	694	715	536	398	415	365	9,880
Hynes	183	3	0	1	1	19	48	90	152	195	246	309	358	429	465	447	490	444	431	430	364	286	319	237	5,946
Kenmore Square	185	23	0	1	1	16	85	132	198	278	329	575	900	568	564	693	684	717	710	483	445	395	446	329	8,758
Lechmere	2	0	0	0	0	0	1	1	3	4	6	6	7	9	9	9	11	12	13	11	8	8	4	2	129
Park Street	187	56	4	0	0	26	72	120	285	495	652	827	1,015	1,252	1,316	1,335	1,139	961	851	678	474	434	382	260	12,824
Prudential	30	2	0	0	0	15	42	63	93	95	152	215	256	281	305	298	347	315	286	196	176	125	99	84	3,475
Riverside	83	36	0	1	1	1	22	33	38	51	40	44	74	67	84	121	151	159	319	276	237	167	141	116	2,262
Science Park	4	5	0	2	2	3	15	15	39	56	93	109	114	137	117	114	78	51	41	25	23	20	15	10	1,088
Symphony	35	0	0	0	0	3	10	23	29	43	49	73	91	108	122	90	134	119	139	106	76	81	72	54	1,455
Line Total:	1,327	155	6	10	11	217	686	1,080	1,861	2,672	3,213	4,189	5,166	5,558	6,032	6,292	5,936	5,377	4,427	4,427	3,460	2,776	2,786	2,035	70,346

Line: Subway Orange Line

Station	sa avg 00:00	sa avg 01:00	sa avg 02:00	sa avg 03:00	sa avg 04:00	sa avg 05:00	sa avg 06:00	sa avg 07:00	sa avg 08:00	sa avg 09:00	sa avg 10:00	sa avg 11:00	sa avg 12:00	sa avg 13:00	sa avg 14:00	sa avg 15:00	sa avg 16:00	sa avg 17:00	sa avg 18:00	sa avg 19:00	sa avg 20:00	sa avg 21:00	sa avg 22:00	sa avg 23:00	sa avg
Back Bay	39	7	0	0	0	47	174	281	368	374	434	458	504	494	586	563	463	399	335	303	224	175	165	89	6,482
Chinatown	35	5	0	0	0	34	109	136	216	313	342	352	389	370	320	328	308	302	309	272	173	111	92	71	4,589
Community Colleg	30	10	0	1	1	24	29	63	366	225	141	233	189	130	154	132	112	110	84	77	70	50	62	46	2,338
Downtown Crossi	63	21	1	1	1	31	93	163	287	467	562	668	729	859	865	950	743	628	491	358	238	160	155	120	8,652
Forest Hills	269	72	1	0	0	45	126	224	230	220	266	290	385	372	505	564	626	675	659	543	479	448	376	343	7,718
Green Street	71	17	1	0	0	2	9	31	39	60	74	85	104	101	106	142	150	135	149	115	108	122	99	96	1,817
Haymarket	145	21	0	1	1	37	80	171	220	279	373	486	582	625	670	748	814	776	681	635	472	342	280	257	8,693
Jackson Square	110	12	0	1	1	7	35	63	73	99	122	145	184	193	191	243	267	262	251	229	191	163	176	150	3,169

Exits Type and Time of Day Station Summary

Date Range: 09/01/2012 03:00:00 AM - 10/01/2012 02:59:59 AM
Station: All
Sorting: Line, Station

Line: All

Total Weekdays	Total Saturdays	Total Sundays	Total Holidays	Total Days
19	5	5	1	30

Line: Subway Orange Line

Station	sa avg 00:00	sa avg 01:00	sa avg 02:00	sa avg 03:00	sa avg 04:00	sa avg 05:00	sa avg 06:00	sa avg 07:00	sa avg 08:00	sa avg 09:00	sa avg 10:00	sa avg 11:00	sa avg 12:00	sa avg 13:00	sa avg 14:00	sa avg 15:00	sa avg 16:00	sa avg 17:00	sa avg 18:00	sa avg 19:00	sa avg 20:00	sa avg 21:00	sa avg 22:00	sa avg 23:00	sa avg
Malden Center	156	36	0	1	1	18	46	82	89	118	139	180	217	258	297	301	369	392	398	331	264	280	232	240	4,446
Mass Ave	57	12	0	2	2	27	68	106	129	163	158	204	236	281	260	275	248	226	204	191	147	140	143	117	3,395
North Station	46	12	0	0	0	32	79	175	264	309	318	348	250	303	307	339	374	427	289	376	285	223	270	162	5,188
Oak Grove	79	22	0	0	0	2	16	29	35	42	65	74	95	99	116	148	174	200	197	144	149	143	125	109	2,063
Roxbury Crossin	74	12	0	1	1	8	33	59	89	100	83	104	124	141	130	181	173	174	188	151	153	131	127	102	2,337
Ruggles	118	31	0	0	0	19	75	120	219	188	206	253	285	326	333	409	386	377	359	317	305	273	235	201	5,036
State Street	41	10	0	5	5	63	132	201	235	330	362	400	462	481	507	489	387	357	259	199	175	148	195	99	5,539
Stony Brook	94	14	1	0	0	4	9	20	33	108	165	211	227	211	184	161	176	157	167	129	130	115	119	95	2,528
Sullivan Square	338	64	2	1	1	56	127	217	245	237	285	286	373	429	430	583	648	675	626	503	528	457	452	414	7,975
Tufts Medical Cent	24	6	0	1	1	24	119	153	215	235	230	194	214	173	190	196	179	183	163	151	90	93	105	74	3,013
Wellington	69	21	0	0	0	22	42	72	74	76	111	120	178	179	228	231	232	259	233	212	205	127	119	112	2,921
Line Total:	1,858	405	6	4	15	502	1,401	2,366	3,426	3,943	4,436	5,091	5,727	6,025	6,379	6,983	6,829	6,714	5,236	5,236	4,386	3,701	3,527	2,897	87,899

Line: Subway Red Line

Station	sa avg 00:00	sa avg 01:00	sa avg 02:00	sa avg 03:00	sa avg 04:00	sa avg 05:00	sa avg 06:00	sa avg 07:00	sa avg 08:00	sa avg 09:00	sa avg 10:00	sa avg 11:00	sa avg 12:00	sa avg 13:00	sa avg 14:00	sa avg 15:00	sa avg 16:00	sa avg 17:00	sa avg 18:00	sa avg 19:00	sa avg 20:00	sa avg 21:00	sa avg 22:00	sa avg 23:00	sa avg
Alewife	172	43	2	2	2	19	103	126	133	140	191	197	252	248	290	396	457	529	587	480	405	337	321	231	5,661
Andrew Square	13	3	0	1	1	9	28	31	41	43	54	58	72	80	90	86	88	74	73	59	47	44	37	20	1,050
Ashmont	12	5	1	2	2	6	9	12	16	17	13	17	17	25	19	19	20	19	21	23	20	16	13	13	334
Braintree	63	45	0	1	1	1	27	27	41	64	72	79	95	118	101	123	153	171	237	163	179	157	133	103	2,152
Broadway	63	21	0	0	0	24	75	97	115	115	123	134	143	158	187	194	201	192	167	173	138	126	95	102	2,644
Central Square	327	54	0	5	5	31	124	209	292	353	430	460	573	626	645	679	742	761	742	750	689	653	671	493	10,309
Charles MGH	94	8	0	1	1	22	180	169	221	321	297	289	366	435	492	538	484	359	317	234	235	213	204	136	5,616
Davis Square	428	88	0	1	1	19	40	94	144	193	265	337	370	395	480	549	645	702	750	713	644	608	533	452	8,449
Fields Corner	82	30	0	0	0	8	31	72	90	91	112	122	136	158	177	225	235	221	215	185	183	149	125	123	2,771
Harvard	398	67	0	1	1	60	196	297	489	640	852	1,043	1,156	1,203	1,231	1,370	1,314	1,343	1,381	1,225	951	921	702	623	17,462
JFK/U Mass	172	26	1	1	1	36	77	195	226	175	267	267	254	253	302	332	410	492	430	411	387	314	275	271	5,571
Kendall Square	116	20	0	2	2	34	72	121	205	239	300	336	475	513	557	538	566	473	489	367	331	297	286	241	6,580
North Quincy	44	3	0	1	1	61	110	134	199	217	267	247	294	334	305	150	137	119	124	114	98	83	73	88	3,202
Porter Square	253	53	0	1	1	15	39	101	173	167	228	262	303	296	353	395	458	438	457	446	339	303	266	263	5,609
Quincy Adams	21	10	0	1	1	2	17	19	25	32	30	34	43	45	38	59	56	80	97	89	73	59	38	39	906
Quincy Center	128	55	0	1	1	6	85	169	204	175	212	227	241	225	283	285	317	295	326	296	234	228	187	188	4,366
Savin Hill	63	16	0	0	0	6	13	30	30	39	52	52	68	72	103	100	108	119	102	112	105	80	76	89	1,436
Shawmut	21	7	0	0	0	1	6	13	19	20	29	28	33	47	39	52	68	64	62	50	53	45	48	30	734
South Station	54	12	1	0	0	70	268	289	367	473	477	479	500	535	467	464	444	390	332	300	245	165	147	105	6,584
Wollaston	83	32	0	1	1	3	19	34	44	66	82	79	90	96	114	128	146	171	170	192	153	146	123	157	2,128
Line Total:	2,607	598	5	0	22	433	1,519	2,239	3,074	3,580	4,353	4,747	5,481	5,862	6,273	6,682	7,049	7,012	6,382	6,382	5,509	4,944	4,353	3,767	93,565

Exits Type and Time of Day Station Summary

Date Range: 09/01/2012 03:00:00 AM - 10/01/2012 02:59:59 AM
Station: All
Sorting: Line, Station

Line: All

Total Weekdays	Total Saturdays	Total Sundays	Total Holidays	Total Days
19	5	5	1	30

Line: Silver Line

Station	hd avg 00:00	hd avg 01:00	hd avg 02:00	hd avg 03:00	hd avg 04:00	hd avg 05:00	hd avg 06:00	hd avg 07:00	hd avg 08:00	hd avg 09:00	hd avg 10:00	hd avg 11:00	hd avg 12:00	hd avg 13:00	hd avg 14:00	hd avg 15:00	hd avg 16:00	hd avg 17:00	hd avg 18:00	hd avg 19:00	hd avg 20:00	hd avg 21:00	hd avg 22:00	hd avg 23:00	hd avg
Courthouse	3	0	0	1	1	0	2	2	5	19	22	11	21	22	21	27	16	6	4	7	4	3	4	2	202
World Trade Cente	0	1	0	0	0	1	10	21	23	25	20	28	42	31	34	22	34	126	199	14	20	12	23	6	692
Line Total:	3	1	0	0	1	1	12	23	28	44	42	39	63	53	55	49	50	132	21	21	24	15	27	8	894

Line: Subway Blue Line

Station	hd avg 00:00	hd avg 01:00	hd avg 02:00	hd avg 03:00	hd avg 04:00	hd avg 05:00	hd avg 06:00	hd avg 07:00	hd avg 08:00	hd avg 09:00	hd avg 10:00	hd avg 11:00	hd avg 12:00	hd avg 13:00	hd avg 14:00	hd avg 15:00	hd avg 16:00	hd avg 17:00	hd avg 18:00	hd avg 19:00	hd avg 20:00	hd avg 21:00	hd avg 22:00	hd avg 23:00	hd avg
Airport	16	3	0	0	0	4	188	146	203	203	237	256	232	286	342	349	299	278	216	229	178	119	120	59	3,963
Aquarium	18	3	3	0	0	0	101	186	251	316	437	437	418	368	395	380	295	192	150	107	69	57	49	38	4,270
Beachmont	50	6	0	0	0	2	20	28	10	38	31	56	99	119	114	140	161	139	178	147	129	61	78	70	1,676
Bowdoin	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Maverick	178	25	0	0	0	15	66	94	100	113	174	204	314	328	434	533	630	580	452	445	302	332	381	411	6,111
Orient Heights	32	11	0	0	0	0	31	33	29	29	35	59	53	75	123	89	104	107	130	104	79	76	64	57	1,320
Revere Beach	10	2	2	0	0	1	14	14	10	29	31	43	68	84	69	115	78	53	49	37	40	18	31	19	817
Suffolk Downs	9	1	0	0	0	0	11	4	2	8	18	67	130	62	56	43	40	23	26	17	25	14	14	13	583
Wonderland	7	12	3	0	0	2	8	7	9	11	22	19	17	15	16	14	11	15	10	8	12	10	12	4	244
Wood Island	28	8	1	0	0	3	26	13	20	22	24	23	37	46	69	60	94	109	82	77	46	51	68	73	980
Line Total:	348	74	10	0	0	27	465	525	634	769	1,009	1,164	1,368	1,383	1,618	1,723	1,712	1,496	1,171	1,171	880	738	817	744	19,968

Line: Subway Green Line

Station	hd avg 00:00	hd avg 01:00	hd avg 02:00	hd avg 03:00	hd avg 04:00	hd avg 05:00	hd avg 06:00	hd avg 07:00	hd avg 08:00	hd avg 09:00	hd avg 10:00	hd avg 11:00	hd avg 12:00	hd avg 13:00	hd avg 14:00	hd avg 15:00	hd avg 16:00	hd avg 17:00	hd avg 18:00	hd avg 19:00	hd avg 20:00	hd avg 21:00	hd avg 22:00	hd avg 23:00	hd avg
Arlington	41	5	1	0	0	6	70	104	158	151	223	266	303	262	368	372	274	275	292	213	214	94	96	31	3,819
Boylston	288	3	2	0	0	12	107	111	192	258	298	354	381	363	370	360	314	328	316	256	173	145	148	149	4,928
Copley Square	55	18	1	0	0	10	108	132	229	258	417	536	554	646	670	806	627	535	469	341	280	171	163	97	7,123
Government Cente	24	4	1	1	1	12	96	120	168	262	376	447	722	567	713	566	493	415	360	329	173	132	129	87	6,197
Hynes	63	0	0	0	0	14	50	63	95	150	188	234	299	282	303	347	324	277	283	248	199	195	152	91	3,857
Kenmore Square	63	6	1	0	0	2	82	81	121	212	266	257	388	545	357	476	440	422	415	759	355	232	201	152	5,833
Lechmere	2	0	0	0	0	0	0	0	4	4	5	9	8	6	13	9	10	11	13	4	10	5	3	0	116
Park Street	94	9	0	0	0	12	81	104	200	307	646	920	782	1,010	805	980	744	587	560	376	239	221	365	117	9,159
Prudential	16	1	1	0	0	5	34	56	73	101	130	186	188	250	210	267	344	254	198	128	172	65	59	39	2,777
Riverside	15	0	0	0	0	0	11	49	42	42	44	50	53	75	108	112	86	148	85	117	64	83	34	40	1,258
Science Park	0	1	0	0	0	2	12	19	32	45	114	115	99	55	148	82	61	36	35	22	20	15	12	2	927
Symphony	17	8	0	0	0	5	3	8	15	26	29	39	48	60	74	89	116	95	87	68	94	69	43	32	1,025
Line Total:	678	55	7	0	1	80	654	847	1,329	1,816	2,736	3,413	3,825	4,121	4,139	4,466	3,833	3,383	2,861	2,861	1,993	1,427	1,405	837	47,019

Line: Subway Orange Line

Station	hd avg 00:00	hd avg 01:00	hd avg 02:00	hd avg 03:00	hd avg 04:00	hd avg 05:00	hd avg 06:00	hd avg 07:00	hd avg 08:00	hd avg 09:00	hd avg 10:00	hd avg 11:00	hd avg 12:00	hd avg 13:00	hd avg 14:00	hd avg 15:00	hd avg 16:00	hd avg 17:00	hd avg 18:00	hd avg 19:00	hd avg 20:00	hd avg 21:00	hd avg 22:00	hd avg 23:00	hd avg
Back Bay	15	5	0	0	0	4	149	189	273	249	289	338	368	377	402	488	311	308	205	174	141	96	89	40	4,510
Chinatown	7	3	2	1	1	1	102	106	212	263	423	284	364	379	322	239	159	260	307	179	105	58	45	34	3,855
Community Colleg	16	4	0	0	0	1	22	22	52	42	68	81	76	92	94	97	126	102	74	77	58	48	49	22	1,223
Downtown Crossi	51	8	2	0	0	3	129	157	252	341	623	646	695	701	663	762	617	472	350	227	118	103	58	57	7,035
Forest Hills	134	37	0	0	0	6	109	198	191	149	188	204	284	340	411	474	536	490	548	503	441	341	281	260	6,125
Green Street	28	8	0	0	0	1	26	29	22	23	45	59	105	110	97	120	137	128	130	125	86	80	85	39	1,483
Haymarket	47	9	9	1	1	7	63	101	131	159	215	269	340	389	442	424	401	462	396	337	266	235	189	173	5,065
Jackson Square	55	3	0	0	0	1	37	51	49	68	82	118	109	167	191	158	269	244	223	191	148	162	119	104	2,549

Exits Type and Time of Day Station Summary

Date Range: 09/01/2012 03:00:00 AM - 10/01/2012 02:59:59 AM
Station: All
Sorting: Line, Station

Line: All

Total Weekdays	Total Saturdays	Total Sundays	Total Holidays	Total Days
19	5	5	1	30

Line: Subway Orange Line

Station	hd avg 00:00	hd avg 01:00	hd avg 02:00	hd avg 03:00	hd avg 04:00	hd avg 05:00	hd avg 06:00	hd avg 07:00	hd avg 08:00	hd avg 09:00	hd avg 10:00	hd avg 11:00	hd avg 12:00	hd avg 13:00	hd avg 14:00	hd avg 15:00	hd avg 16:00	hd avg 17:00	hd avg 18:00	hd avg 19:00	hd avg 20:00	hd avg 21:00	hd avg 22:00	hd avg 23:00	hd avg
Malden Center	97	10	0	0	0	2	54	77	83	94	105	166	207	200	290	317	379	440	413	392	368	251	338	189	4,472
Mass Ave	22	11	0	0	0	3	57	87	76	110	119	148	177	158	188	204	187	180	160	142	126	123	92	86	2,456
North Station	16	6	6	0	0	4	115	145	234	316	219	282	190	253	273	267	248	323	170	201	144	86	117	98	3,713
Oak Grove	30	3	0	0	0	2	21	16	31	40	53	77	60	120	136	145	192	191	183	128	133	80	122	48	1,811
Roxbury Crossin	39	6	0	0	0	1	24	29	39	53	48	59	77	106	105	100	158	151	144	132	145	109	106	60	1,691
Ruggles	57	9	2	0	0	2	57	107	135	160	202	184	243	275	322	291	370	315	344	319	264	190	176	133	4,157
State Street	22	8	0	0	0	3	140	133	203	256	355	342	351	416	445	359	305	236	152	130	87	58	67	39	4,107
Stony Brook	36	5	0	0	0	2	13	16	19	61	82	144	102	199	135	115	161	141	164	128	114	97	99	74	1,907
Sullivan Square	93	27	0	0	0	4	102	132	137	115	133	171	178	272	255	376	399	361	361	321	293	257	285	250	4,522
Tufts Medical Cent	15	11	12	0	0	1	121	98	101	147	175	135	106	114	131	161	109	149	94	94	51	64	66	29	1,984
Wellington	32	6	0	0	0	1	43	78	70	85	101	136	152	216	251	262	303	256	310	217	157	145	130	112	3,063
Line Total:	812	179	33	0	2	49	1,384	1,771	2,310	2,731	3,525	3,843	4,184	4,884	5,153	5,359	5,367	5,209	4,017	4,017	3,245	2,583	2,513	1,847	65,728

Line: Subway Red Line

Station	hd avg 00:00	hd avg 01:00	hd avg 02:00	hd avg 03:00	hd avg 04:00	hd avg 05:00	hd avg 06:00	hd avg 07:00	hd avg 08:00	hd avg 09:00	hd avg 10:00	hd avg 11:00	hd avg 12:00	hd avg 13:00	hd avg 14:00	hd avg 15:00	hd avg 16:00	hd avg 17:00	hd avg 18:00	hd avg 19:00	hd avg 20:00	hd avg 21:00	hd avg 22:00	hd avg 23:00	hd avg
Alewife	63	26	1	1	1	1	77	109	132	145	185	144	218	231	314	319	367	419	401	246	227	161	111	111	4,009
Andrew Square	5	4	0	0	0	1	36	25	30	42	85	94	74	77	104	116	115	103	68	46	36	31	34	10	1,136
Ashmont	10	5	4	1	1	6	6	9	8	14	22	14	18	16	20	21	20	15	17	19	23	14	15	8	305
Braintree	33	6	0	0	0	0	0	33	35	33	60	57	86	64	96	98	86	151	115	88	57	43	39	51	1,231
Broadway	22	4	3	0	0	4	53	69	80	99	99	75	100	114	133	189	149	154	149	134	101	79	96	66	1,972
Central Square	109	17	0	0	0	5	108	182	182	250	307	367	424	539	595	630	626	734	739	719	432	611	394	275	8,245
Charles MGH	46	7	0	0	0	2	231	109	135	163	237	235	296	323	340	326	308	284	254	204	160	139	112	49	3,960
Davis Square	100	6	0	0	0	1	48	69	104	121	189	247	283	326	373	479	569	781	595	580	380	403	331	190	6,175
Fields Corner	49	15	0	0	0	3	22	53	61	48	68	92	137	126	146	153	224	207	171	136	139	150	89	110	2,199
Harvard	101	15	0	0	0	2	174	233	293	484	651	734	954	1,053	1,221	1,261	1,035	1,140	1,072	879	600	579	428	263	13,172
JFK/U Mass	35	7	2	0	0	1	19	50	64	61	98	115	165	173	185	192	156	167	233	178	200	148	114	82	2,445
Kendall Square	45	7	0	0	0	2	76	77	132	218	329	363	404	453	434	460	491	431	312	311	242	221	194	107	5,309
North Quincy	60	0	0	0	0	0	14	58	62	85	86	89	98	106	134	156	199	255	210	197	172	150	174	87	2,392
Porter Square	68	8	0	0	0	4	30	67	121	96	143	155	169	233	308	354	315	434	351	386	256	221	202	132	4,053
Quincy Adams	8	0	1	0	0	1	4	17	14	18	26	30	41	24	31	62	71	68	77	60	36	21	34	21	665
Quincy Center	78	0	0	0	0	3	63	127	140	169	190	217	222	235	273	318	236	363	263	235	246	198	170	161	3,907
Savin Hill	26	8	0	0	0	6	18	22	21	23	34	33	55	60	96	90	81	104	110	67	79	84	57	60	1,134
Shawmut	25	4	0	0	0	2	3	9	10	12	14	20	28	39	45	37	55	66	55	50	50	47	17	18	606
South Station	35	14	7	0	0	2	190	225	223	364	473	476	473	476	442	403	408	345	297	223	223	132	142	72	5,645
Wollaston	50	0	0	0	0	1	26	32	44	65	83	91	69	110	134	153	180	207	165	143	136	121	155	89	2,054
Line Total:	968	153	18	0	2	47	1,198	1,575	1,891	2,510	3,379	3,648	4,314	4,778	5,424	5,817	5,691	6,428	4,901	4,901	3,795	3,553	2,908	1,962	70,614

Exits Type and Time of Day Station Summary

Date Range: 09/01/2012 03:00:00 AM - 10/01/2012 02:59:59 AM
Station: All
Sorting: Line, Station

Line: All

Total Weekdays	Total Saturdays	Total Sundays	Total Holidays	Total Days
19	5	5	1	30

Line: Silver Line

Station	total# 00:00	total# 01:00	total# 02:00	total# 03:00	total# 04:00	total# 05:00	total# 06:00	total# 07:00	total# 08:00	total# 09:00	total# 10:00	total# 11:00	total# 12:00	total# 13:00	total# 14:00	total# 15:00	total# 16:00	total# 17:00	total# 18:00	total# 19:00	total# 20:00	total# 21:00	total# 22:00	total# 23:00	total#
Courthouse	74	13	33	31	23	254	1,078	2,461	6,638	4,719	1,810	879	790	835	886	981	1,092	962	667	473	241	179	167	94	25,38
World Trade Cente	166	35	16	14	31	587	1,929	5,598	10,951	5,025	1,601	1,507	1,448	1,774	1,749	1,687	1,893	2,177	1,923	1,066	669	790	710	319	43,66
Line Total:	240	48	49	45	54	841	3,007	8,059	17,589	9,744	3,411	2,386	2,238	2,609	2,635	2,668	2,985	3,139	2,590	1,539	910	969	877	413	69,04

Line: Subway Blue Line

Station	total# 00:00	total# 01:00	total# 02:00	total# 03:00	total# 04:00	total# 05:00	total# 06:00	total# 07:00	total# 08:00	total# 09:00	total# 10:00	total# 11:00	total# 12:00	total# 13:00	total# 14:00	total# 15:00	total# 16:00	total# 17:00	total# 18:00	total# 19:00	total# 20:00	total# 21:00	total# 22:00	total# 23:00	total#
Airport	980	232	7	8	27	2,742	5,434	5,919	6,055	5,664	5,918	7,595	8,072	7,987	8,803	9,030	9,739	9,366	7,113	5,450	4,432	3,808	3,257	2,115	119,75
Aquarium	590	147	51	20	44	2,146	4,829	11,087	16,489	12,716	10,655	9,958	8,213	8,660	9,211	9,920	8,569	8,518	4,985	3,833	2,720	1,963	1,880	1,204	138,40
Beachmont	2,301	317	11	12	54	238	786	1,019	1,136	1,294	1,599	2,285	2,803	3,409	4,729	6,224	8,350	10,566	7,366	5,443	4,136	3,744	3,618	3,200	74,64
Bowdoin	0	22	10	5	1	1,076	3,247	5,838	7,467	3,693	1,717	1,245	1,127	1,372	1,422	1,165	968	913	268	5	7	0	0	0	31,56
Maverick	9,604	1,744	24	12	35	1,668	4,304	7,969	6,573	6,374	7,259	9,181	10,460	12,963	18,036	24,367	27,904	26,043	21,985	14,723	12,963	12,687	14,956	16,126	267,96
Orient Heights	1,605	72	0	2	13	440	1,235	1,714	1,816	1,428	1,673	2,023	2,435	3,004	4,434	5,774	7,521	8,543	5,872	4,135	3,554	3,019	3,019	2,882	66,21
Revere Beach	526	88	12	2	20	121	425	509	787	915	984	1,067	1,415	1,653	1,776	2,349	2,353	2,531	1,885	1,426	1,206	1,007	851	788	24,69
Suffolk Downs	334	69	6	17	20	67	382	254	317	424	521	1,229	2,073	1,543	1,318	1,307	1,272	1,111	940	908	701	647	530	477	16,46
Wonderland	175	95	18	15	55	176	338	514	546	515	425	437	477	412	430	381	424	480	396	323	288	296	262	206	7,68
Wood Island	1,607	230	16	1	16	345	903	1,392	891	730	999	1,055	1,474	1,613	2,495	3,669	4,577	5,074	3,460	2,680	2,371	2,355	2,648	2,803	43,40
Line Total:	17,722	3,016	155	94	285	9,019	21,883	36,215	42,077	33,753	31,750	36,075	38,549	42,616	52,654	64,186	71,677	73,145	54,270	38,926	32,378	29,526	31,021	29,801	790,79

Line: Subway Green Line

Station	total# 00:00	total# 01:00	total# 02:00	total# 03:00	total# 04:00	total# 05:00	total# 06:00	total# 07:00	total# 08:00	total# 09:00	total# 10:00	total# 11:00	total# 12:00	total# 13:00	total# 14:00	total# 15:00	total# 16:00	total# 17:00	total# 18:00	total# 19:00	total# 20:00	total# 21:00	total# 22:00	total# 23:00	total#
Arlington	1,313	146	54	123	68	1,948	6,629	17,505	35,846	26,051	12,614	9,650	10,220	10,847	11,963	12,317	12,043	14,280	10,673	7,531	5,144	3,863	3,702	2,294	216,82
Boylston	3,533	240	23	40	37	1,411	4,749	11,381	20,677	19,473	13,419	13,226	12,278	13,448	12,772	13,979	13,345	15,353	13,389	11,081	7,397	6,753	7,011	5,079	220,09
Copley Square	1,930	297	30	28	54	2,042	5,659	15,625	26,532	22,290	16,571	18,023	19,217	20,887	22,846	25,840	26,147	27,575	22,868	15,702	10,190	7,502	6,709	3,674	318,23
Government Cente	2,440	172	57	29	83	2,395	7,924	21,018	44,957	27,514	15,709	16,149	17,316	17,626	17,608	17,915	16,763	19,038	15,211	12,239	8,478	7,018	7,131	5,377	300,16
Hynes	2,858	88	17	27	40	1,023	2,735	7,075	13,973	10,773	9,305	8,498	8,739	9,895	9,631	10,858	11,549	13,201	13,198	11,161	8,025	7,044	6,212	4,536	170,46
Kenmore Square	3,068	370	11	13	16	853	4,608	10,458	13,680	11,916	9,864	12,879	16,567	14,396	13,066	15,412	17,981	22,185	22,508	18,424	11,545	8,397	6,741	5,249	240,20
Lechmere	44	7	3	1	3	32	80	163	248	188	190	183	196	188	210	256	394	367	291	226	165	136	83	39	3,69
Park Street	2,927	1,015	76	90	60	1,677	5,890	18,578	45,482	34,185	23,596	23,972	24,203	26,952	25,209	27,318	26,348	25,996	21,952	16,432	10,660	8,261	7,749	4,967	383,59
Prudential	623	77	12	28	4	711	2,103	4,258	7,890	5,841	4,764	5,603	6,501	7,076	7,694	8,507	9,315	9,854	8,547	5,701	4,170	2,673	2,192	1,294	105,43
Riverside	1,886	365	6	0	5	96	1,372	3,145	4,583	3,392	2,023	1,960	2,013	2,256	2,369	3,706	4,982	6,948	7,225	4,877	3,540	2,905	3,618	4,686	67,95
Science Park	126	71	3	15	53	170	860	1,312	2,850	2,370	2,485	2,510	2,419	2,501	2,506	2,226	1,899	1,753	1,632	1,150	701	450	444	229	30,73
Symphony	762	44	8	16	3	165	410	921	1,605	1,554	1,631	1,943	2,396	2,820	2,921	3,274	3,899	4,493	4,183	3,328	2,175	1,949	1,694	1,160	43,35
Line Total:	21,510	2,892	300	410	426	12,523	43,019	111,439	218,323	165,647	112,171	114,696	122,066	128,892	128,795	141,608	144,685	161,043	141,677	107,852	72,190	56,951	53,286	38,584	2,100,76

Line: Subway Orange Line

Station	total# 00:00	total# 01:00	total# 02:00	total# 03:00	total# 04:00	total# 05:00	total# 06:00	total# 07:00	total# 08:00	total# 09:00	total# 10:00	total# 11:00	total# 12:00	total# 13:00	total# 14:00	total# 15:00	total# 16:00	total# 17:00	total# 18:00	total# 19:00	total# 20:00	total# 21:00	total# 22:00	total# 23:00	total#
Back Bay	780	115	35	40	27	2,839	12,301	30,780	40,819	27,226	14,316	12,984	13,651	13,614	15,122	16,324	18,345	22,458	13,584	8,451	5,523	3,740	3,662	1,869	278,60
Chinatown	607	117	8	15	46	1,300	4,972	9,590	17,165	17,426	12,437	11,769	11,728	10,886	9,826	9,183	9,581	9,890	8,637	6,097	3,842	2,546	2,134	1,299	161,10
Community Colleg	628	166	9	3	12	1,001	5,759	9,258	20,616	13,883	8,710	12,152	9,016	8,189	10,257	8,883	7,177	12,781	6,964	3,450	2,622	1,881	1,831	1,124	146,37
Downtown Crossi	1,269	427	58	85	84	3,021	10,693	27,264	56,189	39,456	24,263	22,369	22,768	24,382	24,761	25,917	24,264	23,367	15,801	9,273	5,180	3,769	3,194	2,102	369,95
Forest Hills	6,330	1,408	75	53	118	1,869	9,721	14,028	11,033	8,850	9,065	10,740	12,845	15,491	22,395	31,164	38,749	46,388	36,421	23,794	18,091	15,603	12,124	10,723	357,07
Green Street	1,515	245	34	23	31	193	1,147	3,167	3,466	2,473	2,291	2,268	2,742	3,318	4,130	6,117	7,875	11,580	9,837	6,532	4,547	4,067	3,194	2,445	83,23
Haymarket	3,198	386	93	69	69	1,716	4,513	9,170	13,118	11,456	8,884	10,046	11,978	12,990	15,363	18,195	20,912	22,611	20,350	15,940	11,633	9,498	8,414	7,354	237,95
Jackson Square	2,311	278	27	12	48	471	1,902	4,090	4,836	4,311	4,127	4,928	6,204	7,019	9,930	12,597	13,798	14,915	11,176	8,018	6,391	6,074	5,514	4,135	133,11

Exits Type and Time of Day Station Summary

Date Range: 09/01/2012 03:00:00 AM - 10/01/2012 02:59:59 AM
Station: All
Sorting: Line, Station

Line: All

Total Weekdays	Total Saturdays	Total Sundays	Total Holidays	Total Days
19	5	5	1	30

Line: Subway Orange Line

Station	total# 00:00	total# 01:00	total# 02:00	total# 03:00	total# 04:00	total# 05:00	total# 06:00	total# 07:00	total# 08:00	total# 09:00	total# 10:00	total# 11:00	total# 12:00	total# 13:00	total# 14:00	total# 15:00	total# 16:00	total# 17:00	total# 18:00	total# 19:00	total# 20:00	total# 21:00	total# 22:00	total# 23:00	total#
Malden Center	2,412	382	8	1	38	813	2,465	5,043	6,240	5,131	5,789	7,194	8,076	10,314	11,350	14,854	20,223	29,739	24,516	16,192	12,514	4,521	4,149	3,683	195,64
Mass Ave	1,257	242	19	11	48	1,128	3,834	8,086	12,051	9,257	6,800	6,776	7,086	8,016	8,164	8,730	8,998	10,839	8,866	6,186	4,479	4,017	3,480	2,349	130,71
North Station	1,017	270	149	153	154	2,977	11,657	21,721	28,283	19,606	12,067	10,773	11,094	11,465	12,716	17,334	35,499	45,059	22,582	14,241	9,309	6,430	6,472	3,786	304,81
Oak Grove	1,233	258	19	13	11	292	1,099	1,511	1,550	1,507	2,057	2,436	3,131	3,844	5,181	8,144	14,390	22,523	17,137	8,933	6,699	2,094	1,867	1,614	107,54
Roxbury Crossin	1,547	237	30	27	32	532	4,897	9,697	7,535	5,596	4,333	4,073	4,847	5,388	6,277	7,953	8,685	10,299	7,902	5,554	4,271	3,699	3,447	2,514	109,37
Ruggles	2,721	453	23	23	26	1,739	11,237	24,984	24,811	18,071	12,451	12,457	11,406	15,265	16,243	17,174	18,564	21,507	14,202	10,289	8,585	7,664	6,708	5,020	261,62
State Street	860	239	80	33	79	6,507	17,310	41,703	80,312	45,134	19,006	14,884	14,221	14,803	14,894	13,463	13,733	14,833	8,577	5,075	3,549	2,751	3,325	1,917	337,28
Stony Brook	1,971	269	23	11	39	119	502	1,062	1,891	2,801	3,016	3,798	4,377	4,884	5,504	6,737	8,388	11,918	9,643	6,666	4,805	4,733	3,699	2,696	89,55
Sullivan Square	9,094	1,564	41	38	63	2,386	8,624	15,314	12,520	8,674	7,023	8,305	9,418	10,972	13,283	18,162	22,902	28,561	22,528	16,022	15,122	24,010	22,576	19,583	296,78
Tufts Medical Cent	607	165	44	38	79	1,930	9,862	20,132	27,060	17,165	9,389	7,229	7,624	7,319	9,148	8,402	8,204	8,524	5,744	4,061	2,727	2,676	2,444	1,451	162,02
Wellington	1,469	315	0	5	43	1,450	2,860	4,680	5,901	4,347	4,123	5,018	6,136	7,672	9,552	12,617	11,612	16,913	15,642	12,121	8,148	2,635	2,227	2,358	137,84
Line Total:	40,826	7,536	775	653	1,047	32,283	125,355	261,280	375,396	262,370	170,147	170,199	178,348	196,831	224,096	261,950	311,899	384,705	280,109	186,895	138,037	112,408	100,461	78,022	3,900,62

Line: Subway Red Line

Station	total# 00:00	total# 01:00	total# 02:00	total# 03:00	total# 04:00	total# 05:00	total# 06:00	total# 07:00	total# 08:00	total# 09:00	total# 10:00	total# 11:00	total# 12:00	total# 13:00	total# 14:00	total# 15:00	total# 16:00	total# 17:00	total# 18:00	total# 19:00	total# 20:00	total# 21:00	total# 22:00	total# 23:00	total#
Alewife	3,842	842	51	19	66	1,258	7,345	10,113	14,334	8,466	6,420	6,044	7,317	9,171	10,537	17,292	24,100	37,749	32,043	19,536	12,431	10,235	8,200	6,576	253,98
Andrew Square	270	55	10	54	28	724	1,721	1,723	1,594	1,704	1,784	1,835	2,029	2,151	2,438	2,739	2,576	2,441	2,011	1,548	1,099	959	813	537	32,84
Ashmont	346	106	48	54	33	190	626	647	773	720	580	606	564	754	972	1,081	1,232	1,572	1,430	1,067	803	535	505	409	15,65
Braintree	1,508	490	14	24	23	43	1,172	1,327	1,586	1,465	1,715	1,799	2,257	2,515	3,181	4,710	8,221	12,161	9,927	5,267	3,534	2,799	2,432	2,017	70,18
Broadway	1,230	312	32	16	38	1,426	5,911	9,040	9,432	6,734	4,492	4,545	4,883	5,433	7,133	8,239	9,508	12,806	10,171	7,319	4,778	4,517	3,675	2,521	124,19
Central Square	5,964	694	50	60	137	2,211	9,559	21,646	29,668	20,675	15,661	14,651	16,447	18,543	19,977	23,046	26,878	37,438	35,694	27,479	20,655	18,995	15,440	10,572	392,14
Charles MGH	1,506	138	22	16	15	3,787	25,236	32,367	37,952	22,653	14,114	11,239	11,967	13,142	14,368	14,187	13,360	15,040	13,153	8,549	6,567	6,073	5,468	2,998	273,91
Davis Square	7,475	1,311	39	31	40	542	2,340	5,783	8,508	8,547	8,108	8,806	10,282	11,604	13,406	18,280	23,597	38,751	38,916	28,357	20,281	18,497	14,588	11,500	299,58
Fields Corner	1,898	708	33	0	9	338	2,065	4,765	5,950	3,881	3,810	4,254	5,195	5,541	8,783	12,322	13,129	13,188	10,440	7,205	6,043	5,105	4,217	3,684	122,56
Harvard	6,462	822	44	23	27	3,130	12,337	27,715	45,665	36,033	29,045	29,458	30,525	32,405	33,581	37,500	42,653	53,003	49,168	35,868	24,502	21,269	16,903	12,602	580,74
JFK/U Mass	2,137	424	39	12	42	1,185	5,672	25,609	22,950	19,254	14,859	10,374	9,776	9,490	8,870	11,726	11,806	14,784	11,948	8,851	7,396	6,229	5,370	4,152	212,95
Kendall Square	1,963	287	22	25	52	2,788	11,894	27,306	56,461	41,720	20,204	14,522	15,606	15,746	15,702	15,892	17,263	19,626	17,773	11,282	8,516	7,388	6,421	4,268	332,72
North Quincy	1,787	50	17	9	100	776	3,316	8,872	8,825	6,463	4,946	4,886	5,879	6,484	7,535	9,051	14,066	22,146	19,014	10,670	7,173	5,969	5,324	3,895	157,25
Porter Square	4,442	784	45	22	53	436	2,161	5,505	8,074	6,788	6,448	6,611	7,263	8,530	9,583	13,292	20,984	31,817	29,531	19,702	13,176	11,213	8,682	6,821	221,96
Quincy Adams	771	162	9	18	19	64	923	1,134	1,045	1,057	992	1,079	1,250	1,365	1,651	2,281	3,594	5,646	5,531	3,152	2,226	1,522	1,333	1,397	38,22
Quincy Center	3,175	498	16	8	57	197	4,585	9,929	9,395	8,562	7,575	7,687	8,610	8,837	11,998	14,305	21,396	30,458	27,929	14,788	10,626	8,469	7,621	5,827	222,54
Savin Hill	1,315	342	17	9	42	277	1,083	4,007	1,520	1,376	1,531	1,613	2,179	2,371	3,690	5,066	5,928	7,721	6,513	4,579	3,638	3,272	2,539	2,251	62,87
Shawmut	517	147	31	1	15	91	281	864	996	725	823	889	1,186	1,358	2,121	2,611	3,378	4,228	3,700	2,394	1,938	1,550	1,213	1,025	32,08
South Station	1,215	303	126	111	81	3,282	11,010	21,735	40,498	27,559	16,781	14,008	14,255	14,604	14,341	18,064	25,728	28,342	16,054	10,285	6,639	5,013	4,532	2,721	297,28
Wollaston	2,212	212	7	3	20	91	1,088	1,779	2,150	2,329	2,951	2,738	3,301	3,947	5,620	7,275	11,357	18,139	14,717	8,341	6,184	5,463	5,417	4,420	109,76
Line Total:	50,035	8,687	672	515	897	22,836	110,325	221,866	307,376	226,711	162,839	147,644	160,771	173,991	195,487	236,959	300,754	407,056	355,663	236,239	168,206	145,072	120,693	90,193	3,853,48

END OF REPORT

Attachment:

End of Attachment List

Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

Data Collection

CTPS Growth Data – Vehicle Miles Traveled
Automatic Traffic Recorders
Turning Movement Counts

VMT Growth Between 2009 and 2035 in Selected City/Towns

AM Summary

City/Town	Freeway VMT				Arterials/Local VMT				Total VMT			
	2009	2035	Growth	Annual Growth	2009	2035	Growth	Annual Growth	2009	2035	Growth	Annual Growth
Taunton	103,540	121,610	17.5%	0.6%	119,290	141,350	18.5%	0.7%	222,830	262,960	18.0%	0.6%
Milford	103,390	110,450	6.8%	0.3%	61,370	69,150	12.7%	0.5%	164,760	179,600	9.0%	0.3%
Everett, Chelsea, and East Boston	110,320	119,550	8.4%	0.3%	111,900	111,950	0.0%	0.0%	222,220	231,500	4.2%	0.2%
Sub-total	**317,250**	**351,610**	**10.8%**	**0.4%**	**292,560**	**322,450**	**10.2%**	**0.4%**	**609,810**	**674,060**	**10.5%**	**0.4%**

MD Summary

City/Town	Freeway VMT				Arterials/Local VMT				Total VMT			
	2009	2035	Growth	Annual Growth	2009	2035	Growth	Annual Growth	2009	2035	Growth	Annual Growth
Taunton	175,340	201,340	14.8%	0.5%	227,180	256,290	12.8%	0.5%	402,520	457,630	13.7%	0.5%
Milford	157,750	168,480	6.8%	0.3%	92,050	103,320	12.2%	0.4%	249,800	271,800	8.8%	0.3%
Everett, Chelsea, and East Boston	176,880	196,410	11.0%	0.4%	213,600	219,040	2.5%	0.1%	390,480	415,450	6.4%	0.2%
Sub-total	**509,970**	**566,230**	**11.0%**	**0.4%**	**532,830**	**578,650**	**8.6%**	**0.3%**	**1,042,800**	**1,144,880**	**9.8%**	**0.4%**

PM Summary

City/Town	Freeway VMT				Arterials/Local VMT				Total VMT			
	2009	2035	Growth	Annual Growth	2009	2035	Growth	Annual Growth	2009	2035	Growth	Annual Growth
Taunton	126,610	146,100	15.4%	0.6%	150,620	177,170	17.6%	0.6%	277,230	323,270	16.6%	0.6%
Milford	112,080	120,740	7.7%	0.3%	68,590	77,200	12.6%	0.5%	180,670	197,940	9.6%	0.4%
Everett, Chelsea, and East Boston	125,350	138,920	10.8%	0.4%	139,100	140,060	0.7%	0.0%	264,450	278,980	5.5%	0.2%
Sub-total	**364,040**	**405,760**	**11.5%**	**0.4%**	**358,310**	**394,430**	**10.1%**	**0.4%**	**722,350**	**800,190**	**10.8%**	**0.4%**

NT Summary

City/Town	Freeway VMT				Arterials/Local VMT				Total VMT			
	2009	2035	Growth	Annual Growth	2009	2035	Growth	Annual Growth	2009	2035	Growth	Annual Growth
Taunton	131,470	158,740	20.7%	0.7%	181,730	207,820	14.4%	0.5%	313,200	366,560	17.0%	0.6%
Milford	125,460	137,320	9.5%	0.3%	73,510	83,450	13.5%	0.5%	198,970	220,770	11.0%	0.4%
Everett, Chelsea, and East Boston	157,030	176,080	12.1%	0.4%	180,570	188,040	4.1%	0.2%	337,600	364,120	7.9%	0.3%
Sub-total	**413,960**	**472,140**	**14.1%**	**0.5%**	**435,810**	**479,310**	**10.0%**	**0.4%**	**849,770**	**951,450**	**12.0%**	**0.4%**

Daily Summary

City/Town	Freeway VMT				Arterials/Local VMT				Total VMT			
	2009	2035	Growth	Annual Growth	2009	2035	Growth	Annual Growth	2009	2035	Growth	Annual Growth
Taunton	536,960	627,790	16.9%	0.6%	678,820	782,630	15.3%	0.5%	1,215,780	1,410,420	16.0%	0.6%
Milford	498,680	536,990	7.7%	0.3%	295,520	333,120	12.7%	0.5%	794,200	870,110	9.6%	0.4%
Everett, Chelsea, and East Boston	569,580	630,960	10.8%	0.4%	645,170	659,090	2.2%	0.1%	1,214,750	1,290,050	6.2%	0.2%
Sub-total	**1,605,220**	**1,795,740**	**11.9%**	**0.4%**	**1,619,510**	**1,774,840**	**9.6%**	**0.4%**	**3,224,730**	**3,570,580**	**10.7%**	**0.4%**

Notes:
1. VMT results were extracted from RTP model 2009 and 2035 Scenario
2. Results were rounded to the nearest 10.

Accurate Counts
978-664-2565

Location : Route 1A South of
Location : Furlong Drive
City/State: Revere, MA
Counter : 13940

10271001
Site Code: 10271001

Start	09-Jun-10	NB		Hour Totals		SB		Hour Totals		Combined Totals	
Time	Wed	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		172	417			95	438				
12:15		163	354			94	443				
12:30		149	398			76	427				
12:45		121	415	605	1584	65	432	330	1740	935	3324
01:00		85	427			74	417				
01:15		93	416			53	381				
01:30		81	433			53	409				
01:45		73	421	332	1697	54	439	234	1646	566	3343
02:00		67	502			37	428				
02:15		60	461			58	412				
02:30		71	501			44	448				
02:45		31	488	229	1952	43	424	182	1712	411	3664
03:00		59	471			55	431				
03:15		46	516			60	438				
03:30		81	529			107	440				
03:45		56	525	242	2041	114	436	336	1745	578	3786
04:00		49	508			135	448				
04:15		69	535			149	401				
04:30		104	521			213	495				
04:45		117	493	339	2057	238	403	735	1747	1074	3804
05:00		143	541			217	400				
05:15		156	556			225	379				
05:30		141	483			313	364				
05:45		209	523	649	2103	381	352	1136	1495	1785	3598
06:00		233	512			378	348				
06:15		226	519			520	305				
06:30		243	488			596	322				
06:45		280	476	982	1995	554	310	2048	1285	3030	3280
07:00		282	447			535	287				
07:15		271	463			610	290				
07:30		296	419			584	294				
07:45		298	355	1147	1684	531	266	2260	1137	3407	2821
08:00		302	399			567	285				
08:15		341	352			539	290				
08:30		295	396			552	230				
08:45		290	339	1228	1486	521	243	2179	1048	3407	2534
09:00		293	368			513	285				
09:15		324	350			468	248				
09:30		316	351			457	274				
09:45		338	341	1271	1410	431	261	1869	1068	3140	2478
10:00		344	372			409	220				
10:15		376	326			445	185				
10:30		370	327			394	182				
10:45		425	267	1515	1292	413	159	1661	746	3176	2038
11:00		386	237			387	131				
11:15		390	243			407	139				
11:30		423	202			392	136				
11:45		380	175	1579	857	427	121	1613	527	3192	1384
Total		10118	20158			14583	15896			24701	36054
Percent		33.4%	66.6%			47.8%	52.2%			40.7%	59.3%

Accurate Counts
978-664-2565

Location : Route 1A South of
Location : Furlong Drive
City/State: Revere, MA
Counter : 13940

10271001
Site Code: 10271001

Start	10-Jun-10	NB		Hour Totals		SB		Hour Totals		Combined Totals	
Time	Thu	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		170	396			81	371				
12:15		160	389			71	378				
12:30		118	381			65	416				
12:45		121	440	569	1606	48	420	265	1585	834	3191
01:00		79	414			79	454				
01:15		76	407			50	428				
01:30		82	422			56	429				
01:45		66	416	303	1659	60	420	245	1731	548	3390
02:00		64	446			42	403				
02:15		58	467			36	428				
02:30		59	487			42	444				
02:45		35	504	216	1904	53	451	173	1726	389	3630
03:00		49	491			43	455				
03:15		44	532			82	445				
03:30		61	508			69	454				
03:45		57	525	211	2056	115	429	309	1783	520	3839
04:00		63	526			104	439				
04:15		85	487			135	376				
04:30		73	548			178	383				
04:45		119	497	340	2058	199	402	616	1600	956	3658
05:00		148	549			192	423				
05:15		130	518			243	424				
05:30		172	508			323	342				
05:45		193	482	643	2057	326	336	1084	1525	1727	3582
06:00		202	500			364	354				
06:15		189	472			458	297				
06:30		291	469			582	331				
06:45		253	448	935	1889	558	322	1962	1304	2897	3193
07:00		279	488			511	291				
07:15		287	385			554	316				
07:30		283	383			575	295				
07:45		271	357	1120	1613	550	265	2190	1167	3310	2780
08:00		257	400			535	269				
08:15		262	358			557	279				
08:30		314	382			551	261				
08:45		252	168	1085	1308	509	263	2152	1072	3237	2380
09:00		280	214			522	261				
09:15		272	491			488	260				
09:30		328	370			455	251				
09:45		336	317	1216	1392	464	234	1929	1006	3145	2398
10:00		352	358			433	254				
10:15		323	397			445	199				
10:30		385	369			402	188				
10:45		374	337	1434	1461	435	173	1715	814	3149	2275
11:00		367	318			374	160				
11:15		366	258			389	97				
11:30		421	234			405	104				
11:45		365	204	1519	1014	386	138	1554	499	3073	1513
Total		9591	20017			14194	15812			23785	35829
Percent		32.4%	67.6%			47.3%	52.7%			39.9%	60.1%

Accurate Counts
978-664-2565

Location : Route 1A South of
Location : Furlong Drive
City/State: Revere, MA
Counter : 13940

10271001
Site Code: 10271001

Start Time	11-Jun-10 Fri	NB Morning	NB Afternoon	Hour Totals Morning	Hour Totals Afternoon	SB Morning	SB Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		252	442			147	464				
12:15		240	461			119	419				
12:30		212	454			100	432				
12:45		175	445	879	1802	87	431	453	1746	1332	3548
01:00		103	457			100	432				
01:15		98	483			63	470				
01:30		88	427			68	450				
01:45		98	500	387	1867	72	420	303	1772	690	3639
02:00		93	491			55	439				
02:15		75	502			61	450				
02:30		80	510			50	412				
02:45		50	507	298	2010	52	503	218	1804	516	3814
03:00		61	490			51	461				
03:15		54	519			83	425				
03:30		62	527			95	438				
03:45		70	517	247	2053	110	480	339	1804	586	3857
04:00		76	520			114	462				
04:15		96	492			155	415				
04:30		98	490			163	405				
04:45		107	512	377	2014	222	396	654	1678	1031	3692
05:00		141	539			193	435				
05:15		164	524			249	438				
05:30		176	500			303	359				
05:45		180	548	661	2111	311	388	1056	1620	1717	3731
06:00		199	508			355	377				
06:15		208	488			461	354				
06:30		247	476			590	382				
06:45		277	454	931	1926	534	367	1940	1480	2871	3406
07:00		325	421			512	380				
07:15		316	456			549	389				
07:30		334	414			557	352				
07:45		305	440	1280	1731	576	323	2194	1444	3474	3175
08:00		255	437			599	316				
08:15		268	391			571	310				
08:30		296	439			539	290				
08:45		295	376	1114	1643	519	309	2228	1225	3342	2868
09:00		352	395			428	322				
09:15		339	395			433	308				
09:30		380	428			439	308				
09:45		365	355	1436	1573	413	293	1713	1231	3149	2804
10:00		379	412			397	293				
10:15		405	378			442	305				
10:30		376	403			427	276				
10:45		427	346	1587	1539	426	221	1692	1095	3279	2634
11:00		421	323			399	220				
11:15		408	300			404	196				
11:30		409	272			441	186				
11:45		438	246	1676	1141	377	156	1621	758	3297	1899
Total		10873	21410			14411	17657			25284	39067
Percent		33.7%	66.3%			44.9%	55.1%			39.3%	60.7%

Accurate Counts
978-664-2565

Location : Route 1A South of
Location : Furlong Drive
City/State: Revere, MA
Counter : 13940

10271001
Site Code: 10271001

Start	12-Jun-10	NB		Hour Totals		SB		Hour Totals		Combined Totals	
Time	Sat	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		211	459			154	433				
12:15		208	435			116	449				
12:30		186	470			144	439				
12:45		161	436	766	1800	131	488	545	1809	1311	3609
01:00		148	459			170	407				
01:15		158	475			127	440				
01:30		104	462			107	472				
01:45		116	457	526	1853	81	404	485	1723	1011	3576
02:00		122	474			78	436				
02:15		125	422			63	411				
02:30		109	428			54	448				
02:45		107	432	463	1756	69	387	264	1682	727	3438
03:00		86	400			65	436				
03:15		93	383			91	427				
03:30		93	411			89	390				
03:45		77	417	349	1611	114	411	359	1664	708	3275
04:00		90	389			89	408				
04:15		97	432			132	419				
04:30		88	434			132	413				
04:45		107	432	382	1687	158	443	511	1683	893	3370
05:00		93	481			132	400				
05:15		128	461			153	350				
05:30		119	400			200	338				
05:45		120	411	460	1753	197	420	682	1508	1142	3261
06:00		168	401			209	344				
06:15		161	414			215	355				
06:30		148	377			292	356				
06:45		211	389	688	1581	269	360	985	1415	1673	2996
07:00		204	350			231	341				
07:15		246	375			252	308				
07:30		227	342			291	302				
07:45		240	318	917	1385	284	309	1058	1260	1975	2645
08:00		253	348			300	282				
08:15		270	322			310	250				
08:30		278	336			286	225				
08:45		322	319	1123	1325	345	259	1241	1016	2364	2341
09:00		311	281			337	280				
09:15		341	299			363	273				
09:30		375	318			400	259				
09:45		403	272	1430	1170	355	247	1455	1059	2885	2229
10:00		408	270			360	226				
10:15		369	260			393	202				
10:30		401	289			380	221				
10:45		382	274	1560	1093	434	210	1567	859	3127	1952
11:00		431	167			407	202				
11:15		411	179			432	195				
11:30		460	120			434	176				
11:45		405	221	1707	687	406	155	1679	728	3386	1415
Total		10371	17701			10831	16406			21202	34107
Percent		36.9%	63.1%			39.8%	60.2%			38.3%	61.7%

Accurate Counts
978-664-2565

Location : Route 1A South of
Location : Furlong Drive
City/State: Revere, MA
Counter : 13940

10271001
Site Code: 10271001

Start	13-Jun-10	NB		Hour Totals		SB		Hour Totals		Combined Totals	
Time	Sun	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		223	387			144	378				
12:15		184	395			127	411				
12:30		165	438			119	362				
12:45		166	398	738	1618	124	429	514	1580	1252	3198
01:00		157	435			123	348				
01:15		113	401			100	390				
01:30		99	463			100	438				
01:45		126	430	495	1729	73	405	396	1581	891	3310
02:00		109	447			61	405				
02:15		135	466			75	414				
02:30		131	453			50	345				
02:45		126	466	501	1832	61	381	247	1545	748	3377
03:00		104	420			66	425				
03:15		81	437			58	379				
03:30		77	472			65	420				
03:45		71	432	333	1761	81	431	270	1655	603	3416
04:00		60	401			79	416				
04:15		69	457			104	399				
04:30		72	469			123	398				
04:45		80	459	281	1786	118	416	424	1629	705	3415
05:00		95	429			116	364				
05:15		100	425			115	382				
05:30		94	454			142	382				
05:45		105	387	394	1695	124	389	497	1517	891	3212
06:00		103	402			144	404				
06:15		128	380			158	417				
06:30		120	393			172	354				
06:45		114	367	465	1542	191	358	665	1533	1130	3075
07:00		167	393			162	342				
07:15		156	328			160	344				
07:30		144	384			158	322				
07:45		167	338	634	1443	200	274	680	1282	1314	2725
08:00		133	319			182	284				
08:15		166	332			221	249				
08:30		190	305			237	224				
08:45		181	296	670	1252	254	249	894	1006	1564	2258
09:00		230	311			245	226				
09:15		224	301			232	262				
09:30		219	273			299	223				
09:45		279	256	952	1141	315	221	1091	932	2043	2073
10:00		250	265			347	204				
10:15		294	260			286	193				
10:30		306	221			307	143				
10:45		286	206	1136	952	313	128	1253	668	2389	1620
11:00		347	302			353	193				
11:15		354	275			346	145				
11:30		379	264			382	120				
11:45		334	180	1414	1021	362	116	1443	574	2857	1595
Total		8013	17772			8374	15502			16387	33274
Percent		31.1%	68.9%			35.1%	64.9%			33.0%	67.0%

Accurate Counts
978-664-2565

Location : Route 1A South of
Location : Furlong Drive
City/State: Revere, MA
Counter : 13940

10271001
Site Code: 10271001

Start Time	14-Jun-10 Mon	NB Morning	NB Afternoon	Hour Totals Morning	Hour Totals Afternoon	SB Morning	SB Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		186	390			123	394				
12:15		126	368			93	423				
12:30		124	430			72	431				
12:45		103	394	539	1582	76	442	364	1690	903	3272
01:00		89	449			77	400				
01:15		74	408			70	420				
01:30		89	478			55	466				
01:45		93	459	345	1794	65	421	267	1707	612	3501
02:00		90	488			52	393				
02:15		79	469			61	409				
02:30		71	466			64	429				
02:45		67	449	307	1872	50	472	227	1703	534	3575
03:00		69	498			36	435				
03:15		52	512			58	394				
03:30		71	512			83	409				
03:45		61	532	253	2054	111	429	288	1667	541	3721
04:00		75	487			113	430				
04:15		87	473			171	417				
04:30		102	513			234	431				
04:45		107	508	371	1981	231	379	749	1657	1120	3638
05:00		148	530			250	363				
05:15		168	516			257	386				
05:30		178	477			317	391				
05:45		183	519	677	2042	359	368	1183	1508	1860	3550
06:00		219	519			390	351				
06:15		261	497			537	324				
06:30		295	458			614	372				
06:45		260	457	1035	1931	580	308	2121	1355	3156	3286
07:00		303	412			529	342				
07:15		312	402			582	312				
07:30		308	399			591	296				
07:45		267	373	1190	1586	593	318	2295	1268	3485	2854
08:00		273	359			529	274				
08:15		286	372			542	277				
08:30		257	367			590	223				
08:45		258	344	1074	1442	530	268	2191	1042	3265	2484
09:00		298	321			515	267				
09:15		334	339			521	230				
09:30		331	327			465	222				
09:45		361	268	1324	1255	443	236	1944	955	3268	2210
10:00		352	317			395	224				
10:15		364	289			392	196				
10:30		366	278			366	160				
10:45		354	242	1436	1126	353	167	1506	747	2942	1873
11:00		348	262			340	141				
11:15		392	193			371	128				
11:30		426	181			390	99				
11:45		372	146	1538	782	456	125	1557	493	3095	1275
Total		10089	19447			14692	15792			24781	35239
Percent		34.2%	65.8%			48.2%	51.8%			41.3%	58.7%

Accurate Counts
978-664-2565

Location : Route 1A South of
Location : Furlong Drive
City/State: Revere, MA
Counter : 13940

10271001
Site Code: 10271001

Start Time	15-Jun-10 Tue	NB Morning	NB Afternoon	Hour Totals Morning	Hour Totals Afternoon	SB Morning	SB Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		163	443			124	372				
12:15		144	436			67	433				
12:30		128	393			69	428				
12:45		99	426	534	1698	51	416	311	1649	845	3347
01:00		76	413			55	405				
01:15		67	418			46	406				
01:30		44	428			38	451				
01:45		50	465	237	1724	40	423	179	1685	416	3409
02:00		63	439			52	396				
02:15		55	450			50	440				
02:30		64	454			47	463				
02:45		40	442	222	1785	58	384	207	1683	429	3468
03:00		62	503			60	405				
03:15		43	491			85	437				
03:30		66	510			86	399				
03:45		60	538	231	2042	103	484	334	1725	565	3767
04:00		59	527			110	385				
04:15		78	492			142	388				
04:30		92	506			206	456				
04:45		139	500	368	2025	251	395	709	1624	1077	3649
05:00		149	556			257	427				
05:15		145	532			250	413				
05:30		157	540			339	424				
05:45		207	493	658	2121	375	355	1221	1619	1879	3740
06:00		230	522			368	379				
06:15		224	490			533	390				
06:30		288	435			569	352				
06:45		283	408	1025	1855	568	301	2038	1422	3063	3277
07:00		261	415			569	322				
07:15		271	370			582	299				
07:30		282	383			556	271				
07:45		280	370	1094	1538	550	314	2257	1206	3351	2744
08:00		300	411			541	279				
08:15		294	399			542	301				
08:30		297	402			549	282				
08:45		301	383	1192	1595	532	284	2164	1146	3356	2741
09:00		283	403			536	287				
09:15		329	350			475	260				
09:30		391	335			501	233				
09:45		340	281	1343	1369	405	253	1917	1033	3260	2402
10:00		393	306			383	220				
10:15		346	340			430	210				
10:30		370	329			386	183				
10:45		385	311	1494	1286	379	162	1578	775	3072	2061
11:00		383	302			413	156				
11:15		405	230			378	141				
11:30		357	215			419	153				
11:45		384	201	1529	948	419	127	1629	577	3158	1525
Total		9927	19986			14544	16144			24471	36130
Percent		33.2%	66.8%			47.4%	52.6%			40.4%	59.6%
Grand Total		68982	136491			91629	113209			160611	249700
Percent		33.6%	66.4%			44.7%	55.3%			39.1%	60.9%

ADT ADT 58,616 AADT 58,616

Accurate Counts
978-664-2565

Location : Route 1A North of
Location : Route 145 Ramps
City/State: Revere, MA
Counter : 10110

10271002
Site Code: 10271002

Start	09-Jun-10	NB		Hour Totals		SB		Hour Totals		Combined Totals	
Time	Wed	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		143	322			71	308				
12:15		133	260			60	311				
12:30		123	296			54	311				
12:45		107	299	506	1177	49	311	234	1241	740	2418
01:00		71	320			57	298				
01:15		65	336			38	265				
01:30		70	319			34	311				
01:45		55	338	261	1313	42	312	171	1186	432	2499
02:00		52	394			32	275				
02:15		45	368			39	281				
02:30		55	398			35	314				
02:45		24	364	176	1524	35	282	141	1152	317	2676
03:00		48	356			39	305				
03:15		32	402			51	291				
03:30		60	409			93	309				
03:45		50	385	190	1552	83	305	266	1210	456	2762
04:00		55	367			78	325				
04:15		16	430			98	288				
04:30		59	400			119	356				
04:45		93	390	223	1587	184	287	479	1256	702	2843
05:00		116	391			174	266				
05:15		125	431			183	277				
05:30		124	394			279	255				
05:45		162	407	527	1623	299	249	935	1047	1462	2670
06:00		182	381			316	256				
06:15		185	404			407	214				
06:30		190	385			456	225				
06:45		237	366	794	1536	438	209	1617	904	2411	2440
07:00		237	393			415	209				
07:15		238	369			462	203				
07:30		251	347			428	207				
07:45		232	290	958	1399	410	182	1715	801	2673	2200
08:00		232	327			427	208				
08:15		275	285			380	197				
08:30		258	333			384	166				
08:45		218	265	983	1210	367	168	1558	739	2541	1949
09:00		247	290			394	203				
09:15		262	298			367	184				
09:30		252	270			335	217				
09:45		250	257	1011	1115	337	184	1433	788	2444	1903
10:00		285	322			308	173				
10:15		291	275			328	144				
10:30		286	285			285	122				
10:45		336	221	1198	1103	293	113	1214	552	2412	1655
11:00		311	190			272	100				
11:15		297	199			302	109				
11:30		319	161			282	100				
11:45		278	128	1205	678	307	95	1163	404	2368	1082
Total		8032	15817			10926	11280			18958	27097
Percent		33.7%	66.3%			49.2%	50.8%			41.2%	58.8%

Accurate Counts
978-664-2565

Location : Route 1A North of
Location : Route 145 Ramps
City/State: Revere, MA
Counter : 10110

10271002
Site Code: 10271002

Start	10-Jun-10	NB		Hour Totals		SB		Hour Totals		Combined Totals	
Time	Thu	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		137	310			57	276				
12:15		136	301			48	282				
12:30		97	320			54	310				
12:45		81	342	451	1273	31	287	190	1155	641	2428
01:00		76	326			66	312				
01:15		58	307			32	291				
01:30		66	319			42	288				
01:45		62	305	262	1257	48	273	188	1164	450	2421
02:00		38	358			34	280				
02:15		48	387			30	316				
02:30		48	369			35	302				
02:45		28	385	162	1499	42	326	141	1224	303	2723
03:00		36	390			34	318				
03:15		33	432			62	332				
03:30		53	409			53	328				
03:45		42	401	164	1632	76	292	225	1270	389	2902
04:00		53	416			83	313				
04:15		64	383			108	276				
04:30		64	426			136	261				
04:45		86	404	267	1629	155	301	482	1151	749	2780
05:00		119	407			151	302				
05:15		118	414			205	286				
05:30		156	399			253	245				
05:45		156	375	549	1595	269	249	878	1082	1427	2677
06:00		162	390			289	268				
06:15		158	380			354	224				
06:30		225	382			430	234				
06:45		215	376	760	1528	415	246	1488	972	2248	2500
07:00		221	385			373	211				
07:15		220	329			427	240				
07:30		229	306			423	208				
07:45		223	293	893	1313	383	194	1606	853	2499	2166
08:00		194	320			372	194				
08:15		207	292			398	208				
08:30		257	304			398	197				
08:45		203	172	861	1088	379	199	1547	798	2408	1886
09:00		221	194			428	197				
09:15		198	419			356	175				
09:30		267	313			341	169				
09:45		251	258	937	1184	356	179	1481	720	2418	1904
10:00		285	289			325	203				
10:15		270	324			339	159				
10:30		291	324			302	139				
10:45		289	273	1135	1210	322	123	1288	624	2423	1834
11:00		294	261			277	121				
11:15		295	220			279	78				
11:30		344	195			298	88				
11:45		289	163	1222	839	293	96	1147	383	2369	1222
Total		7663	16047			10661	11396			18324	27443
Percent		32.3%	67.7%			48.3%	51.7%			40.0%	60.0%

Accurate Counts
978-664-2565

Location : Route 1A North of
Location : Route 145 Ramps
City/State: Revere, MA
Counter : 10110

10271002
Site Code: 10271002

Start	11-Jun-10	NB		Hour Totals		SB		Hour Totals		Combined Totals	
Time	Fri	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		214	343			122	314				
12:15		188	349			79	283				
12:30		196	359			74	304				
12:45		143	345	741	1396	57	279	332	1180	1073	2576
01:00		77	343			77	308				
01:15		86	353			49	322				
01:30		72	337			48	331				
01:45		75	407	310	1440	43	285	217	1246	527	2686
02:00		77	383			40	313				
02:15		63	393			41	324				
02:30		64	411			29	295				
02:45		33	362	237	1549	43	345	153	1277	390	2826
03:00		50	383			36	332				
03:15		39	369			51	306				
03:30		48	376			80	291				
03:45		48	374	185	1502	88	338	255	1267	440	2769
04:00		65	387			81	330				
04:15		66	390			118	278				
04:30		83	388			130	280				
04:45		73	407	287	1572	167	289	496	1177	783	2749
05:00		113	387			148	282				
05:15		147	368			199	329				
05:30		148	375			249	266				
05:45		134	392	542	1522	240	284	836	1161	1378	2683
06:00		158	381			285	291				
06:15		163	373			368	243				
06:30		198	382			451	286				
06:45		215	363	734	1499	413	278	1517	1098	2251	2597
07:00		258	325			408	262				
07:15		256	389			408	290				
07:30		271	335			404	249				
07:45		249	359	1034	1408	427	241	1647	1042	2681	2450
08:00		217	347			435	238				
08:15		209	315			430	230				
08:30		233	362			409	213				
08:45		231	287	890	1311	360	222	1634	903	2524	2214
09:00		270	308			324	229				
09:15		260	326			309	230				
09:30		300	332			330	237				
09:45		302	305	1132	1271	313	215	1276	911	2408	2182
10:00		293	320			297	207				
10:15		325	308			324	213				
10:30		289	345			311	194				
10:45		341	274	1248	1247	291	160	1223	774	2471	2021
11:00		302	278			273	170				
11:15		309	257			292	134				
11:30		305	217			313	140				
11:45		348	201	1264	953	262	127	1140	571	2404	1524
Total		8604	16670			10726	12607			19330	29277
Percent		34.0%	66.0%			46.0%	54.0%			39.8%	60.2%

Accurate Counts
978-664-2565

Location : Route 1A North of
Location : Route 145 Ramps
City/State: Revere, MA
Counter : 10110

10271002
Site Code: 10271002

Start	12-Jun-10	NB		Hour Totals		SB		Hour Totals		Combined Totals	
Time	Sat	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		164	361			114	289				
12:15		166	346			86	315				
12:30		162	378			114	305				
12:45		133	321	625	1406	104	300	418	1209	1043	2615
01:00		130	340			131	281				
01:15		127	368			97	310				
01:30		96	368			81	338				
01:45		92	362	445	1438	67	266	376	1195	821	2633
02:00		95	388			58	315				
02:15		105	343			40	300				
02:30		92	328			43	349				
02:45		77	355	369	1414	61	261	202	1225	571	2639
03:00		77	337			52	326				
03:15		72	324			67	322				
03:30		73	328			65	300				
03:45		57	344	279	1333	89	311	273	1259	552	2592
04:00		78	327			73	280				
04:15		89	356			101	318				
04:30		71	331			109	315				
04:45		86	368	324	1382	136	306	419	1219	743	2601
05:00		77	375			108	301				
05:15		104	373			116	256				
05:30		91	362			150	268				
05:45		103	343	375	1453	152	302	526	1127	901	2580
06:00		122	346			164	249				
06:15		122	341			160	255				
06:30		123	314			216	272				
06:45		156	328	523	1329	202	260	742	1036	1265	2365
07:00		168	291			187	257				
07:15		201	290			174	237				
07:30		185	293			214	233				
07:45		190	250	744	1124	210	222	785	949	1529	2073
08:00		190	264			205	211				
08:15		216	279			240	174				
08:30		225	267			212	171				
08:45		245	255	876	1065	232	184	889	740	1765	1805
09:00		258	224			244	204				
09:15		268	247			266	212				
09:30		285	244			289	185				
09:45		314	237	1125	952	259	206	1058	807	2183	1759
10:00		319	226			258	179				
10:15		293	218			287	146				
10:30		300	235			278	174				
10:45		293	234	1205	913	291	164	1114	663	2319	1576
11:00		316	156			259	167				
11:15		304	140			329	147				
11:30		302	103			299	152				
11:45		317	187	1239	586	272	125	1159	591	2398	1177
Total		8129	14395			7961	12020			16090	26415
Percent		36.1%	63.9%			39.8%	60.2%			37.9%	62.1%

Accurate Counts
978-664-2565

Location : Route 1A North of
Location : Route 145 Ramps
City/State: Revere, MA
Counter : 10110

10271002
Site Code: 10271002

Start	13-Jun-10	NB		Hour Totals		SB		Hour Totals		Combined Totals	
Time	Sun	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		181	326			114	292				
12:15		156	318			106	296				
12:30		138	352			98	272				
12:45		141	321	616	1317	95	299	413	1159	1029	2476
01:00		121	367			96	277				
01:15		96	312			70	275				
01:30		72	373			85	323				
01:45		103	377	392	1429	52	284	303	1159	695	2588
02:00		95	376			46	305				
02:15		108	374			57	297				
02:30		111	363			36	248				
02:45		112	378	426	1491	50	284	189	1134	615	2625
03:00		84	327			51	330				
03:15		63	357			45	298				
03:30		64	387			51	321				
03:45		51	345	262	1416	63	329	210	1278	472	2694
04:00		46	341			58	323				
04:15		53	385			67	295				
04:30		58	399			98	300				
04:45		59	377	216	1502	97	326	320	1244	536	2746
05:00		72	334			82	274				
05:15		91	355			88	301				
05:30		81	369			130	287				
05:45		76	310	320	1368	101	297	401	1159	721	2527
06:00		84	337			100	298				
06:15		104	315			121	314				
06:30		86	319			134	261				
06:45		89	292	363	1263	152	256	507	1129	870	2392
07:00		135	311			125	246				
07:15		126	272			118	262				
07:30		117	298			110	227				
07:45		137	283	515	1164	144	203	497	938	1012	2102
08:00		98	251			156	221				
08:15		128	274			168	188				
08:30		156	257			193	163				
08:45		139	239	521	1021	192	188	709	760	1230	1781
09:00		175	244			171	155				
09:15		178	243			175	190				
09:30		179	222			220	168				
09:45		213	211	745	920	226	170	792	683	1537	1603
10:00		198	220			264	144				
10:15		222	206			213	144				
10:30		251	190			224	110				
10:45		224	153	895	769	241	82	942	480	1837	1249
11:00		268	230			258	130				
11:15		279	224			251	113				
11:30		309	217			272	85				
11:45		268	148	1124	819	254	85	1035	413	2159	1232
Total		6395	14479			6318	11536			12713	26015
Percent		30.6%	69.4%			35.4%	64.6%			32.8%	67.2%

Accurate Counts
978-664-2565

Location : Route 1A North of
Location : Route 145 Ramps
City/State: Revere, MA
Counter : 10110

10271002
Site Code: 10271002

Start Time	14-Jun-10 Mon	NB Morning	NB Afternoon	Hour Totals Morning	Hour Totals Afternoon	SB Morning	SB Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		147	291			84	288				
12:15		106	279			63	290				
12:30		96	319			55	308				
12:45		89	310	438	1199	52	327	254	1213	692	2412
01:00		70	339			56	298				
01:15		59	327			49	313				
01:30		71	366			45	315				
01:45		81	332	281	1364	45	285	195	1211	476	2575
02:00		73	404			34	282				
02:15		61	355			43	278				
02:30		55	375			47	312				
02:45		53	352	242	1486	35	320	159	1192	401	2678
03:00		58	373			28	315				
03:15		46	405			44	275				
03:30		52	378			63	298				
03:45		40	435	196	1591	96	301	231	1189	427	2780
04:00		58	364			79	297				
04:15		73	396			122	291				
04:30		87	412			193	306				
04:45		90	418	308	1590	200	276	594	1170	902	2760
05:00		129	423			207	286				
05:15		134	396			217	250				
05:30		149	394			262	274				
05:45		146	406	558	1619	312	270	998	1080	1556	2699
06:00		169	384			314	269				
06:15		193	392			407	221				
06:30		251	388			441	283				
06:45		211	375	824	1539	458	227	1620	1000	2444	2539
07:00		253	332			427	240				
07:15		254	332			422	236				
07:30		240	327			409	208				
07:45		215	284	962	1275	431	225	1689	909	2651	2184
08:00		214	300			414	189				
08:15		228	272			404	208				
08:30		200	292			420	158				
08:45		228	278	870	1142	415	187	1653	742	2523	1884
09:00		250	252			395	193				
09:15		263	272			383	159				
09:30		271	283			344	171				
09:45		293	197	1077	1004	349	166	1471	689	2548	1693
10:00		295	261			283	157				
10:15		275	214			301	146				
10:30		301	233			283	103				
10:45		286	205	1157	913	266	108	1133	514	2290	1427
11:00		264	220			270	110				
11:15		284	145			267	93				
11:30		326	145			289	80				
11:45		284	121	1158	631	326	93	1152	376	2310	1007
Total		8071	15353			11149	11285			19220	26638
Percent		34.5%	65.5%			49.7%	50.3%			41.9%	58.1%

Accurate Counts
978-664-2565

Location : Route 1A North of
Location : Route 145 Ramps
City/State: Revere, MA
Counter : 10110

10271002
Site Code: 10271002

Start	15-Jun-10	NB		Hour Totals		SB		Hour Totals		Combined Totals	
Time	Tue	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		129	334			93	281				
12:15		126	346			52	277				
12:30		99	304			47	322				
12:45		88	322	442	1306	31	314	223	1194	665	2500
01:00		58	301			39	286				
01:15		59	320			28	265				
01:30		37	322			26	322				
01:45		39	373	193	1316	30	303	123	1176	316	2492
02:00		46	340			42	295				
02:15		41	342			39	323				
02:30		44	357			37	326				
02:45		36	348	167	1387	44	272	162	1216	329	2603
03:00		42	383			41	280				
03:15		45	396			74	323				
03:30		57	418			74	291				
03:45		53	409	197	1606	82	337	271	1231	468	2837
04:00		54	408			96	282				
04:15		51	371			122	267				
04:30		86	390			166	345				
04:45		110	392	301	1561	203	277	587	1171	888	2732
05:00		130	427			203	304				
05:15		133	391			196	296				
05:30		122	409			299	286				
05:45		156	396	541	1623	297	285	995	1171	1536	2794
06:00		200	428			306	267				
06:15		172	384			413	293				
06:30		227	358			431	263				
06:45		233	328	832	1498	446	224	1596	1047	2428	2545
07:00		221	342			441	226				
07:15		227	310			445	215				
07:30		232	338			428	181				
07:45		234	295	914	1285	400	223	1714	845	2628	2130
08:00		235	324			394	186				
08:15		246	334			397	228				
08:30		231	314			388	197				
08:45		264	306	976	1278	400	191	1579	802	2555	2080
09:00		215	322			400	212				
09:15		261	295			354	179				
09:30		294	254			377	175				
09:45		290	226	1060	1097	313	160	1444	726	2504	1823
10:00		301	241			283	172				
10:15		284	270			312	160				
10:30		272	271			309	136				
10:45		300	268	1157	1050	287	108	1191	576	2348	1626
11:00		299	248			317	99				
11:15		341	188			255	88				
11:30		273	163			305	95				
11:45		272	169	1185	768	299	106	1176	388	2361	1156
Total		7965	15775			11061	11543			19026	27318
Percent		33.6%	66.4%			48.9%	51.1%			41.1%	58.9%
Grand Total		54859	108536			68802	81667			123661	190203
Percent		33.6%	66.4%			45.7%	54.3%			39.4%	60.6%

ADT ADT 44,838 AADT 44,838

Accurate Counts
978-664-2565

Location : Route 60 North of
Location : Bell Circle
City/State: Revere, MA
Counter : 124

10271003
Site Code: 10271003

Start Time	09-Jun-10 Wed	NB Morning	NB Afternoon	Hour Totals Morning	Hour Totals Afternoon	SB Morning	SB Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		113	270			60	317				
12:15		86	254			61	268				
12:30		90	264			48	265				
12:45		75	258	364	1046	47	256	216	1106	580	2152
01:00		52	290			41	277				
01:15		58	300			30	272				
01:30		39	267			30	259				
01:45		36	285	185	1142	32	281	133	1089	318	2231
02:00		32	291			16	275				
02:15		28	302			40	300				
02:30		13	330			23	249				
02:45		22	307	95	1230	22	304	101	1128	196	2358
03:00		25	364			27	276				
03:15		16	302			36	266				
03:30		35	327			74	276				
03:45		33	358	109	1351	55	297	192	1115	301	2466
04:00		39	358			62	292				
04:15		35	342			38	302				
04:30		66	375			118	307				
04:45		67	378	207	1453	135	257	353	1158	560	2611
05:00		81	350			128	280				
05:15		113	346			168	263				
05:30		99	363			219	244				
05:45		103	352	396	1411	232	267	747	1054	1143	2465
06:00		137	355			238	268				
06:15		142	328			332	230				
06:30		167	324			320	203				
06:45		181	341	627	1348	298	202	1188	903	1815	2251
07:00		198	300			341	175				
07:15		194	284			336	216				
07:30		213	276			329	216				
07:45		184	237	789	1097	323	190	1329	797	2118	1894
08:00		191	253			339	180				
08:15		190	222			305	171				
08:30		207	224			301	180				
08:45		184	193	772	892	258	177	1203	708	1975	1600
09:00		202	222			281	193				
09:15		222	204			310	178				
09:30		216	198			229	196				
09:45		211	213	851	837	301	171	1121	738	1972	1575
10:00		252	212			273	131				
10:15		220	180			255	91				
10:30		248	217			263	129				
10:45		297	171	1017	780	229	84	1020	435	2037	1215
11:00		274	135			249	104				
11:15		284	137			265	80				
11:30		245	121			260	78				
11:45		260	97	1063	490	257	71	1031	333	2094	823
Total		6475	13077			8634	10564			15109	23641
Percent		33.1%	66.9%			45.0%	55.0%			39.0%	61.0%

Accurate Counts
978-664-2565

Location : Route 60 North of
Location : Bell Circle
City/State: Revere, MA
Counter : 124

10271003
Site Code: 10271003

Start	10-Jun-10	NB		Hour Totals		SB		Hour Totals		Combined Totals	
Time	Thu	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		106	263			65	287				
12:15		98	274			49	312				
12:30		70	275			43	291				
12:45		83	267	357	1079	28	275	185	1165	542	2244
01:00		54	298			35	302				
01:15		41	291			26	312				
01:30		49	290			29	312				
01:45		36	317	180	1196	42	282	132	1208	312	2404
02:00		25	315			14	301				
02:15		28	351			30	295				
02:30		30	306			20	312				
02:45		14	309	97	1281	36	302	100	1210	197	2491
03:00		19	309			30	334				
03:15		22	320			26	286				
03:30		33	368			51	301				
03:45		30	356	104	1353	43	312	150	1233	254	2586
04:00		30	352			65	278				
04:15		54	307			89	269				
04:30		47	338			91	273				
04:45		67	352	198	1349	115	284	360	1104	558	2453
05:00		83	360			123	263				
05:15		83	330			137	283				
05:30		121	358			195	304				
05:45		113	366	400	1414	203	276	658	1126	1058	2540
06:00		120	361			214	254				
06:15		122	331			321	243				
06:30		188	347			305	275				
06:45		188	322	618	1361	312	251	1152	1023	1770	2384
07:00		185	283			286	263				
07:15		194	260			298	257				
07:30		206	248			332	249				
07:45		168	231	753	1022	301	256	1217	1025	1970	2047
08:00		154	253			329	224				
08:15		177	219			311	210				
08:30		200	221			321	178				
08:45		182	153	713	846	251	189	1212	801	1925	1647
09:00		209	194			243	231				
09:15		172	279			267	221				
09:30		215	234			273	209				
09:45		221	161	817	868	269	187	1052	848	1869	1716
10:00		214	177			283	189				
10:15		216	218			274	201				
10:30		272	236			271	167				
10:45		249	160	951	791	270	123	1098	680	2049	1471
11:00		287	174			257	119				
11:15		243	140			279	118				
11:30		311	137			288	121				
11:45		268	150	1109	601	284	98	1108	456	2217	1057
Total		6297	13161			8424	11879			14721	25040
Percent		32.4%	67.6%			41.5%	58.5%			37.0%	63.0%

Accurate Counts
978-664-2565

Location : Route 60 North of
Location : Bell Circle
City/State: Revere, MA
Counter : 124

10271003
Site Code: 10271003

Start Time	11-Jun-10 Fri	NB Morning	NB Afternoon	Hour Totals Morning	Hour Totals Afternoon	SB Morning	SB Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		163	344			60	312				
12:15		130	303			61	285				
12:30		132	302			48	280				
12:45		113	304	538	1253	47	289	216	1166	754	2419
01:00		64	301			41	295				
01:15		64	326			30	319				
01:30		46	271			30	290				
01:45		58	329	232	1227	32	282	133	1186	365	2413
02:00		53	292			16	318				
02:15		44	355			40	288				
02:30		42	318			23	302				
02:45		21	351	160	1316	22	280	101	1188	261	2504
03:00		34	294			27	316				
03:15		26	314			36	276				
03:30		36	347			74	322				
03:45		26	348	122	1303	55	291	192	1205	314	2508
04:00		43	370			62	302				
04:15		41	370			93	283				
04:30		58	326			92	264				
04:45		54	327	196	1393	121	276	368	1125	564	2518
05:00		76	354			119	270				
05:15		114	322			142	306				
05:30		111	349			191	279				
05:45		104	321	405	1346	201	256	653	1111	1058	2457
06:00		109	353			213	269				
06:15		151	379			293	249				
06:30		139	311			331	280				
06:45		176	294	575	1337	307	251	1144	1049	1719	2386
07:00		213	268			272	247				
07:15		231	304			328	262				
07:30		252	280			307	267				
07:45		229	273	925	1125	276	249	1183	1025	2108	2150
08:00		175	284			332	234				
08:15		192	266			318	201				
08:30		180	272			309	214				
08:45		203	243	750	1065	242	213	1201	862	1951	1927
09:00		251	245			257	211				
09:15		250	253			277	237				
09:30		256	261			268	224				
09:45		308	222	1065	981	262	211	1064	883	2129	1864
10:00		286	243			276	195				
10:15		246	237			260	190				
10:30		261	246			284	151				
10:45		299	188	1092	914	268	137	1088	673	2180	1587
11:00		272	207			260	125				
11:15		270	183			279	128				
11:30		272	175			283	139				
11:45		293	143	1107	708	224	102	1046	494	2153	1202
Total		7167	13968			8389	11967			15556	25935
Percent		33.9%	66.1%			41.2%	58.8%			37.5%	62.5%

Accurate Counts
978-664-2565

Location : Route 60 North of
Location : Bell Circle
City/State: Revere, MA
Counter : 124

10271003
Site Code: 10271003

Start	12-Jun-10	NB		Hour Totals		SB		Hour Totals		Combined Totals	
Time	Sat	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		104	294			97	279				
12:15		126	316			79	308				
12:30		136	308			78	291				
12:45		90	296	456	1214	67	271	321	1149	777	2363
01:00		104	294			71	263				
01:15		82	270			61	331				
01:30		71	312			60	285				
01:45		68	278	325	1154	50	252	242	1131	567	2285
02:00		66	323			43	257				
02:15		67	302			25	275				
02:30		56	297			34	332				
02:45		49	289	238	1211	49	249	151	1113	389	2324
03:00		39	310			46	258				
03:15		46	302			47	302				
03:30		47	265			57	319				
03:45		37	302	169	1179	54	287	204	1166	373	2345
04:00		45	264			55	258				
04:15		55	280			77	242				
04:30		48	278			90	267				
04:45		53	286	201	1108	84	274	306	1041	507	2149
05:00		60	345			71	288				
05:15		79	287			89	244				
05:30		62	307			117	280				
05:45		76	274	277	1213	124	246	401	1058	678	2271
06:00		99	286			109	235				
06:15		104	299			102	239				
06:30		115	283			150	261				
06:45		108	257	426	1125	146	228	507	963	933	2088
07:00		141	270			164	230				
07:15		165	232			139	197				
07:30		160	269			164	230				
07:45		150	196	616	967	189	210	656	867	1272	1834
08:00		177	207			153	198				
08:15		184	217			177	160				
08:30		190	208			168	161				
08:45		206	198	757	830	175	172	673	691	1430	1521
09:00		215	182			220	203				
09:15		224	197			225	183				
09:30		265	186			257	182				
09:45		262	169	966	734	254	152	956	720	1922	1454
10:00		268	158			261	154				
10:15		282	151			274	155				
10:30		258	180			268	156				
10:45		259	164	1067	653	276	123	1079	588	2146	1241
11:00		259	111			211	142				
11:15		281	125			300	123				
11:30		271	85			267	130				
11:45		309	150	1120	471	255	88	1033	483	2153	954
Total		6618	11859			6529	10970			13147	22829
Percent		35.8%	64.2%			37.3%	62.7%			36.5%	63.5%

Accurate Counts
978-664-2565

Location : Route 60 North of
Location : Bell Circle
City/State: Revere, MA
Counter : 124

10271003
Site Code: 10271003

Start Time	13-Jun-10 Sun	NB Morning	NB Afternoon	Hour Totals Morning	Hour Totals Afternoon	SB Morning	SB Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		111	276			100	235				
12:15		100	269			93	264				
12:30		111	289			80	267				
12:45		87	280	409	1114	82	264	355	1030	764	2144
01:00		100	298			76	218				
01:15		66	289			65	299				
01:30		44	299			59	265				
01:45		71	325	281	1211	48	262	248	1044	529	2255
02:00		65	313			37	294				
02:15		76	323			47	277				
02:30		64	304			32	241				
02:45		64	297	269	1237	50	308	166	1120	435	2357
03:00		49	256			45	292				
03:15		42	313			38	256				
03:30		40	315			50	296				
03:45		28	281	159	1165	53	301	186	1145	345	2310
04:00		43	290			42	258				
04:15		37	321			58	331				
04:30		40	339			70	284				
04:45		56	304	176	1254	85	280	255	1153	431	2407
05:00		60	280			64	264				
05:15		73	274			76	276				
05:30		60	306			96	271				
05:45		61	256	254	1116	91	270	327	1081	581	2197
06:00		69	275			74	256				
06:15		72	242			100	282				
06:30		76	245			117	253				
06:45		82	222	299	984	132	236	423	1027	722	2011
07:00		107	243			109	251				
07:15		103	222			95	222				
07:30		104	196			98	214				
07:45		88	181	402	842	112	205	414	892	816	1734
08:00		91	166			121	202				
08:15		106	181			117	155				
08:30		122	178			149	141				
08:45		107	165	426	690	175	159	562	657	988	1347
09:00		138	188			158	142				
09:15		152	130			139	134				
09:30		161	153			181	155				
09:45		170	151	621	622	206	124	684	555	1305	1177
10:00		156	163			234	103				
10:15		185	131			177	118				
10:30		202	116			202	80				
10:45		202	129	745	539	206	78	819	379	1564	918
11:00		213	174			224	113				
11:15		225	162			222	116				
11:30		244	162			262	85				
11:45		231	82	913	580	246	80	954	394	1867	974
Total		4954	11354			5393	10477			10347	21831
Percent		30.4%	69.6%			34.0%	66.0%			32.2%	67.8%

Accurate Counts
978-664-2565

Location : Route 60 North of
Location : Bell Circle
City/State: Revere, MA
Counter : 124

10271003
Site Code: 10271003

Start Time	14-Jun-10 Mon	NB Morning	NB Afternoon	Hour Totals Morning	Hour Totals Afternoon	SB Morning	SB Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		96	257			68	278				
12:15		69	254			46	271				
12:30		77	301			44	272				
12:45		60	311	302	1123	40	272	198	1093	500	2216
01:00		50	300			43	290				
01:15		43	319			31	307				
01:30		56	309			32	304				
01:45		46	332	195	1260	30	264	136	1165	331	2425
02:00		40	358			32	262				
02:15		41	320			31	275				
02:30		31	300			38	332				
02:45		22	302	134	1280	28	259	129	1128	263	2408
03:00		45	347			15	301				
03:15		25	337			35	283				
03:30		30	360			55	287				
03:45		39	339	139	1383	67	298	172	1169	311	2552
04:00		20	329			49	285				
04:15		48	307			108	306				
04:30		69	319			119	287				
04:45		72	352	209	1307	171	307	447	1185	656	2492
05:00		106	333			145	260				
05:15		105	315			172	277				
05:30		124	357			215	278				
05:45		103	340	438	1345	244	241	776	1056	1214	2401
06:00		145	311			236	270				
06:15		178	330			303	219				
06:30		172	337			358	271				
06:45		168	285	663	1263	327	219	1224	979	1887	2242
07:00		196	268			267	241				
07:15		231	262			333	238				
07:30		194	262			318	211				
07:45		167	230	788	1022	302	196	1220	886	2008	1908
08:00		173	204			296	212				
08:15		190	237			270	178				
08:30		164	199			341	171				
08:45		177	181	704	821	323	182	1230	743	1934	1564
09:00		203	205			312	189				
09:15		232	246			288	154				
09:30		226	173			277	160				
09:45		269	160	930	784	287	147	1164	650	2094	1434
10:00		269	175			255	162				
10:15		259	154			262	113				
10:30		265	175			251	95				
10:45		237	155	1030	659	220	87	988	457	2018	1116
11:00		242	141			252	80				
11:15		257	121			264	88				
11:30		298	124			244	80				
11:45		270	91	1067	477	295	85	1055	333	2122	810
Total		6599	12724			8739	10844			15338	23568
Percent		34.2%	65.8%			44.6%	55.4%			39.4%	60.6%

Accurate Counts
978-664-2565

Location : Route 60 North of
Location : Bell Circle
City/State: Revere, MA
Counter : 124

10271003
Site Code: 10271003

Start Time	15-Jun-10 Tue	NB Morning	NB Afternoon	Hour Totals Morning	Hour Totals Afternoon	SB Morning	SB Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		106	297			60	278				
12:15		85	290			38	301				
12:30		59	287			42	270				
12:45		56	294	306	1168	31	317	171	1166	477	2334
01:00		47	256			32	281				
01:15		45	308			23	286				
01:30		29	290			24	282				
01:45		34	316	155	1170	19	260	98	1109	253	2279
02:00		29	347			24	285				
02:15		25	301			31	313				
02:30		37	331			25	290				
02:45		30	326	121	1305	32	243	112	1131	233	2436
03:00		27	329			40	250				
03:15		25	342			44	311				
03:30		30	292			49	264				
03:45		31	330	113	1293	50	324	183	1149	296	2442
04:00		35	347			66	304				
04:15		55	349			100	284				
04:30		53	320			121	334				
04:45		84	297	227	1313	144	274	431	1196	658	2509
05:00		117	346			154	276				
05:15		100	340			163	290				
05:30		94	330			244	278				
05:45		124	299	435	1315	205	302	766	1146	1201	2461
06:00		161	349			219	278				
06:15		126	359			316	247				
06:30		182	298			347	244				
06:45		183	263	652	1269	299	229	1181	998	1833	2267
07:00		193	267			324	232				
07:15		204	230			296	220				
07:30		203	257			315	215				
07:45		211	267	811	1021	334	217	1269	884	2080	1905
08:00		202	239			345	176				
08:15		194	255			294	229				
08:30		191	240			310	181				
08:45		202	208	789	942	313	186	1262	772	2051	1714
09:00		210	256			277	211				
09:15		222	194			304	166				
09:30		262	185			288	183				
09:45		258	148	952	783	285	162	1154	722	2106	1505
10:00		257	173			245	145				
10:15		233	202			248	128				
10:30		234	195			259	110				
10:45		259	186	983	756	281	102	1033	485	2016	1241
11:00		244	189			262	95				
11:15		296	128			253	80				
11:30		218	144			265	85				
11:45		219	108	977	569	287	102	1067	362	2044	931
Total		6521	12904			8727	11120			15248	24024
Percent		33.6%	66.4%			44.0%	56.0%			38.8%	61.2%
Grand Total		44631	89047			54835	77821			99466	166868
Percent		33.4%	66.6%			41.3%	58.7%			37.3%	62.7%

ADT ADT 38,048 AADT 38,048

Accurate Counts
978-664-2565

Location : Route 16 West of
Location : Route 145
City/State: Revere, MA
Counter : 5846

10271004
Site Code: 10271004

Start Time	09-Jun-10 Wed	EB Morning	EB Afternoon	Hour Totals Morning	Hour Totals Afternoon	WB Morning	WB Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		142	366			69	282				
12:15		108	339			63	307				
12:30		65	355			46	323				
12:45		71	375	386	1435	39	297	217	1209	603	2644
01:00		57	365			37	341				
01:15		55	349			36	338				
01:30		47	358			45	322				
01:45		55	357	214	1429	41	356	159	1357	373	2786
02:00		45	333			35	371				
02:15		25	405			40	339				
02:30		26	397			36	353				
02:45		34	420	130	1555	37	381	148	1444	278	2999
03:00		31	427			26	376				
03:15		34	455			37	358				
03:30		35	455			66	398				
03:45		32	444	132	1781	54	309	183	1441	315	3222
04:00		38	485			61	321				
04:15		46	508			69	317				
04:30		53	487			81	344				
04:45		64	452	201	1932	96	372	307	1354	508	3286
05:00		54	507			92	356				
05:15		60	500			149	331				
05:30		82	459			209	320				
05:45		102	428	298	1894	208	322	658	1329	956	3223
06:00		111	394			250	287				
06:15		175	381			330	248				
06:30		208	370			342	278				
06:45		238	357	732	1502	347	250	1269	1063	2001	2565
07:00		238	346			365	221				
07:15		265	315			319	230				
07:30		252	317			399	228				
07:45		330	287	1085	1265	389	229	1472	908	2557	2173
08:00		372	264			354	214				
08:15		348	260			386	182				
08:30		301	249			352	166				
08:45		318	270	1339	1043	332	160	1424	722	2763	1765
09:00		272	231			271	165				
09:15		268	222			253	177				
09:30		245	217			281	166				
09:45		285	222	1070	892	279	162	1084	670	2154	1562
10:00		298	208			288	142				
10:15		246	150			302	125				
10:30		314	165			323	127				
10:45		302	162	1160	685	281	122	1194	516	2354	1201
11:00		313	136			274	101				
11:15		309	152			291	76				
11:30		334	114			305	78				
11:45		364	106	1320	508	287	83	1157	338	2477	846
Total		8067	15921			9272	12351			17339	28272
Percent		33.6%	66.4%			42.9%	57.1%			38.0%	62.0%

Accurate Counts
978-664-2565

Location : Route 16 West of
Location : Route 145
City/State: Revere, MA
Counter : 5846

10271004
Site Code: 10271004

Start	10-Jun-10	EB		Hour Totals		WB		Hour Totals		Combined Totals	
Time	Thu	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		104	331			81	291				
12:15		77	314			51	308				
12:30		62	345			41	328				
12:45		67	350	310	1340	45	297	218	1224	528	2564
01:00		57	384			41	282				
01:15		66	339			23	315				
01:30		43	340			35	306				
01:45		43	372	209	1435	28	311	127	1214	336	2649
02:00		23	357			42	324				
02:15		27	381			23	351				
02:30		32	407			43	311				
02:45		34	388	116	1533	35	346	143	1332	259	2865
03:00		30	380			37	345				
03:15		31	404			27	350				
03:30		28	431			44	313				
03:45		31	461	120	1676	42	319	150	1327	270	3003
04:00		36	407			73	308				
04:15		30	518			51	331				
04:30		42	486			79	327				
04:45		45	500	153	1911	77	334	280	1300	433	3211
05:00		43	515			88	312				
05:15		62	585			154	286				
05:30		78	550			203	333				
05:45		94	445	277	2095	201	357	646	1288	923	3383
06:00		127	496			219	288				
06:15		129	472			281	246				
06:30		202	457			344	272				
06:45		218	412	676	1837	343	246	1187	1052	1863	2889
07:00		202	313			350	257				
07:15		260	296			317	193				
07:30		264	299			371	209				
07:45		287	253	1013	1161	377	198	1415	857	2428	2018
08:00		304	269			352	202				
08:15		291	286			342	198				
08:30		255	226			371	164				
08:45		281	245	1131	1026	351	174	1416	738	2547	1764
09:00		240	232			302	144				
09:15		262	267			267	162				
09:30		249	215			296	140				
09:45		285	182	1036	896	247	155	1112	601	2148	1497
10:00		259	180			271	141				
10:15		264	176			275	149				
10:30		289	151			310	140				
10:45		271	150	1083	657	289	120	1145	550	2228	1207
11:00		274	112			285	107				
11:15		304	104			279	75				
11:30		302	107			294	72				
11:45		301	111	1181	434	248	98	1106	352	2287	786
Total		7305	16001			8945	11835			16250	27836
Percent		31.3%	68.7%			43.0%	57.0%			36.9%	63.1%

Accurate Counts
978-664-2565

Location : Route 16 West of
Location : Route 145
City/State: Revere, MA
Counter : 5846

10271004
Site Code: 10271004

Start Time	11-Jun-10 Fri	EB Morning	EB Afternoon	Hour Totals Morning	Hour Totals Afternoon	WB Morning	WB Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		153	381			96	302				
12:15		145	389			88	307				
12:30		99	330			52	329				
12:45		103	367	500	1467	41	316	277	1254	777	2721
01:00		83	376			45	363				
01:15		72	395			46	308				
01:30		47	404			45	322				
01:45		49	411	251	1586	38	330	174	1323	425	2909
02:00		49	355			29	348				
02:15		43	428			25	332				
02:30		35	458			25	347				
02:45		37	422	164	1663	35	393	114	1420	278	3083
03:00		41	407			33	353				
03:15		44	457			43	381				
03:30		33	450			50	418				
03:45		30	483	148	1797	45	354	171	1506	319	3303
04:00		48	469			69	337				
04:15		34	460			87	365				
04:30		49	492			70	317				
04:45		53	528	184	1949	85	307	311	1326	495	3275
05:00		53	525			99	315				
05:15		70	529			142	321				
05:30		82	506			189	294				
05:45		100	576	305	2136	228	305	658	1235	963	3371
06:00		128	413			251	314				
06:15		162	379			271	283				
06:30		200	366			328	254				
06:45		197	356	687	1514	305	267	1155	1118	1842	2632
07:00		243	330			340	282				
07:15		275	285			351	258				
07:30		287	346			380	270				
07:45		278	298	1083	1259	382	246	1453	1056	2536	2315
08:00		351	298			357	257				
08:15		303	322			325	231				
08:30		273	310			335	219				
08:45		263	313	1190	1243	316	209	1333	916	2523	2159
09:00		277	316			286	208				
09:15		266	314			264	223				
09:30		260	276			320	224				
09:45		290	261	1093	1167	286	206	1156	861	2249	2028
10:00		257	266			276	198				
10:15		299	251			318	200				
10:30		314	216			282	182				
10:45		317	197	1187	930	304	163	1180	743	2367	1673
11:00		291	202			277	147				
11:15		315	184			275	149				
11:30		321	151			278	132				
11:45		328	129	1255	666	310	120	1140	548	2395	1214
Total		8047	17377			9122	13306			17169	30683
Percent		31.7%	68.3%			40.7%	59.3%			35.9%	64.1%

Accurate Counts
978-664-2565

Location : Route 16 West of
Location : Route 145
City/State: Revere, MA
Counter : 5846

10271004
Site Code: 10271004

Start Time	12-Jun-10 Sat	EB Morning	EB Afternoon	Hour Totals Morning	Hour Totals Afternoon	WB Morning	WB Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		156	445			133	322				
12:15		121	352			89	362				
12:30		102	417			77	371				
12:45		98	425	477	1639	90	361	389	1416	866	3055
01:00		94	390			92	347				
01:15		104	373			62	345				
01:30		82	383			60	322				
01:45		61	381	341	1527	58	339	272	1353	613	2880
02:00		84	347			63	325				
02:15		81	330			49	295				
02:30		86	400			51	300				
02:45		67	334	318	1411	43	273	206	1193	524	2604
03:00		67	297			51	277				
03:15		63	343			42	265				
03:30		36	380			58	320				
03:45		45	338	211	1358	40	298	191	1160	402	2518
04:00		40	341			63	281				
04:15		48	322			66	261				
04:30		38	317			62	322				
04:45		54	307	180	1287	55	283	246	1147	426	2434
05:00		45	311			47	314				
05:15		54	356			87	255				
05:30		64	308			99	292				
05:45		67	332	230	1307	116	274	349	1135	579	2442
06:00		72	343			130	254				
06:15		81	299			149	245				
06:30		102	296			183	254				
06:45		135	322	390	1260	141	212	603	965	993	2225
07:00		121	297			177	223				
07:15		157	261			194	211				
07:30		177	275			191	216				
07:45		166	257	621	1090	185	196	747	846	1368	1936
08:00		211	233			202	187				
08:15		218	267			219	200				
08:30		210	201			235	188				
08:45		278	210	917	911	235	181	891	756	1808	1667
09:00		220	204			239	192				
09:15		289	193			246	177				
09:30		282	211			341	182				
09:45		317	192	1108	800	313	148	1139	699	2247	1499
10:00		281	188			312	160				
10:15		305	190			275	140				
10:30		314	188			310	152				
10:45		346	169	1246	735	319	137	1216	589	2462	1324
11:00		373	141			326	116				
11:15		374	161			329	113				
11:30		415	133			374	109				
11:45		387	130	1549	565	311	101	1340	439	2889	1004
Total		7588	13890			7589	11698			15177	25588
Percent		35.3%	64.7%			39.3%	60.7%			37.2%	62.8%

Accurate Counts
978-664-2565

Location : Route 16 West of
Location : Route 145
City/State: Revere, MA
Counter : 5846

10271004
Site Code: 10271004

Start Time	13-Jun-10 Sun	EB Morning	EB Afternoon	Hour Totals Morning	Hour Totals Afternoon	WB Morning	WB Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		131	299			98	312				
12:15		112	306			72	270				
12:30		84	343			70	285				
12:45		94	337	421	1285	77	301	317	1168	738	2453
01:00		116	383			108	305				
01:15		95	340			74	281				
01:30		75	325			63	300				
01:45		66	349	352	1397	54	309	299	1195	651	2592
02:00		76	341			51	302				
02:15		80	344			40	285				
02:30		70	339			41	293				
02:45		63	338	289	1362	34	239	166	1119	455	2481
03:00		45	322			54	301				
03:15		35	333			27	281				
03:30		43	341			46	280				
03:45		38	347	161	1343	37	234	164	1096	325	2439
04:00		38	316			45	249				
04:15		35	305			32	268				
04:30		28	331			47	303				
04:45		20	309	121	1261	33	264	157	1084	278	2345
05:00		38	332			41	279				
05:15		22	312			41	270				
05:30		25	306			69	271				
05:45		34	287	119	1237	77	270	228	1090	347	2327
06:00		43	342			56	242				
06:15		52	327			71	242				
06:30		72	260			111	235				
06:45		78	262	245	1191	76	230	314	949	559	2140
07:00		75	269			78	186				
07:15		68	240			94	227				
07:30		85	230			118	219				
07:45		99	227	327	966	101	228	391	860	718	1826
08:00		81	213			108	195				
08:15		119	201			120	195				
08:30		120	171			150	159				
08:45		119	179	439	764	183	132	561	681	1000	1445
09:00		144	176			151	166				
09:15		154	176			181	144				
09:30		158	156			192	145				
09:45		169	136	625	644	210	103	734	558	1359	1202
10:00		187	134			211	107				
10:15		219	136			230	119				
10:30		249	109			220	106				
10:45		219	124	874	503	262	114	923	446	1797	949
11:00		257	149			241	142				
11:15		257	171			283	126				
11:30		342	132			281	94				
11:45		331	126	1187	578	307	72	1112	434	2299	1012
Total		5160	12531			5366	10680			10526	23211
Percent		29.2%	70.8%			33.4%	66.6%			31.2%	68.8%

Accurate Counts
978-664-2565

Location : Route 16 West of
Location : Route 145
City/State: Revere, MA
Counter : 5846

10271004
Site Code: 10271004

Start Time	14-Jun-10 Mon	EB Morning	EB Afternoon	Hour Totals Morning	Hour Totals Afternoon	WB Morning	WB Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		81	343			65	284				
12:15		78	344			56	280				
12:30		65	372			44	314				
12:45		63	389	287	1448	42	290	207	1168	494	2616
01:00		52	354			41	299				
01:15		35	333			48	343				
01:30		68	376			40	344				
01:45		38	323	193	1386	28	332	157	1318	350	2704
02:00		40	345			34	322				
02:15		38	403			32	326				
02:30		36	425			38	310				
02:45		36	430	150	1603	27	309	131	1267	281	2870
03:00		32	380			30	347				
03:15		28	422			32	316				
03:30		33	406			46	381				
03:45		31	432	124	1640	53	297	161	1341	285	2981
04:00		32	419			64	303				
04:15		40	481			76	323				
04:30		39	479			69	332				
04:45		62	451	173	1830	81	341	290	1299	463	3129
05:00		60	526			108	362				
05:15		55	501			147	339				
05:30		86	479			209	305				
05:45		101	431	302	1937	234	304	698	1310	1000	3247
06:00		121	381			248	297				
06:15		159	352			288	297				
06:30		219	341			354	262				
06:45		214	335	713	1409	329	249	1219	1105	1932	2514
07:00		244	362			347	271				
07:15		261	281			352	243				
07:30		308	257			386	222				
07:45		313	280	1126	1180	349	187	1434	923	2560	2103
08:00		321	234			326	204				
08:15		299	271			377	205				
08:30		265	271			330	172				
08:45		272	252	1157	1028	293	179	1326	760	2483	1788
09:00		268	257			276	153				
09:15		274	221			293	167				
09:30		272	229			286	163				
09:45		268	195	1082	902	257	154	1112	637	2194	1539
10:00		262	167			272	187				
10:15		290	160			290	123				
10:30		293	153			291	126				
10:45		300	142	1145	622	259	111	1112	547	2257	1169
11:00		286	143			243	98				
11:15		296	140			294	82				
11:30		308	112			288	74				
11:45		328	143	1218	538	267	75	1092	329	2310	867
Total		7670	15523			8939	12004			16609	27527
Percent		33.1%	66.9%			42.7%	57.3%			37.6%	62.4%

Accurate Counts
978-664-2565

Location : Route 16 West of
Location : Route 145
City/State: Revere, MA
Counter : 5846

10271004
Site Code: 10271004

Start Time	15-Jun-10 Tue	EB Morning	EB Afternoon	Hour Totals Morning	Hour Totals Afternoon	WB Morning	WB Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		94	316			79	261				
12:15		68	431			50	326				
12:30		69	359			46	297				
12:45		47	391	278	1497	39	293	214	1177	492	2674
01:00		51	374			22	318				
01:15		42	367			25	337				
01:30		37	344			32	323				
01:45		35	367	165	1452	22	343	101	1321	266	2773
02:00		43	335			45	368				
02:15		37	388			34	351				
02:30		32	459			33	307				
02:45		41	418	153	1600	23	378	135	1404	288	3004
03:00		25	375			28	371				
03:15		28	460			36	346				
03:30		27	426			49	432				
03:45		23	459	103	1720	45	338	158	1487	261	3207
04:00		29	424			54	344				
04:15		47	452			70	378				
04:30		51	496			66	373				
04:45		61	460	188	1832	84	358	274	1453	462	3285
05:00		46	537			107	355				
05:15		64	503			167	361				
05:30		89	477			240	331				
05:45		123	393	322	1910	222	329	736	1376	1058	3286
06:00		142	361			274	309				
06:15		158	413			299	275				
06:30		238	362			366	265				
06:45		212	365	750	1501	339	262	1278	1111	2028	2612
07:00		247	301			361	227				
07:15		255	321			325	251				
07:30		309	302			369	242				
07:45		285	302	1096	1226	359	250	1414	970	2510	2196
08:00		304	308			319	264				
08:15		277	276			371	249				
08:30		255	293			344	220				
08:45		264	285	1100	1162	340	228	1374	961	2474	2123
09:00		257	298			312	198				
09:15		289	256			271	188				
09:30		266	222			276	151				
09:45		282	222	1094	998	262	126	1121	663	2215	1661
10:00		322	171			259	146				
10:15		287	149			260	135				
10:30		291	161			307	117				
10:45		307	147	1207	628	271	96	1097	494	2304	1122
11:00		322	173			277	110				
11:15		325	183			275	109				
11:30		306	142			272	88				
11:45		355	114	1308	612	286	95	1110	402	2418	1014
Total		7764	16138			9012	12819			16776	28957
Percent		32.5%	67.5%			41.3%	58.7%			36.7%	63.3%
Grand Total		51601	107381			58245	84693			109846	192074
Percent		32.5%	67.5%			40.7%	59.3%			36.4%	63.6%

ADT ADT 43,131 AADT 43,131

Lee Burbank Highway (Route 1A)
south of Furlong Drive
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133300 A Volume
Site Code: 10271.01

Start	NB				SB				Combined				06-Apr-13
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Sat
12:00	210		444		125		426		335		870		
12:15	162		448		108		436		270		884		
12:30	148		433		100		458		248		891		
12:45	104	624	420	1745	78	411	415	1735	182	1035	835	3480	
01:00	112		410		107		439		219		849		
01:15	94		405		85		450		179		855		
01:30	114		472		74		388		188		860		
01:45	121	441	452	1739	66	332	418	1695	187	773	870	3434	
02:00	120		464		48		456		168		920		
02:15	112		433		72		392		184		825		
02:30	122		486		57		434		179		920		
02:45	110	464	468	1851	54	231	396	1678	164	695	864	3529	
03:00	73		501		56		427		129		928		
03:15	74		469		78		442		152		911		
03:30	74		489		90		408		164		897		
03:45	84	305	468	1927	114	338	431	1708	198	643	899	3635	
04:00	94		425		93		360		187		785		
04:15	72		472		135		436		207		908		
04:30	112		482		128		431		240		913		
04:45	98	376	500	1879	166	522	403	1630	264	898	903	3509	
05:00	106		436		146		412		252		848		
05:15	118		409		188		425		306		834		
05:30	112		440		232		432		344		872		
05:45	117	453	428	1713	198	764	354	1623	315	1217	782	3336	
06:00	150		382		211		386		361		768		
06:15	172		380		253		321		425		701		
06:30	164		378		266		351		430		729		
06:45	174	660	378	1518	256	986	324	1382	430	1646	702	2900	
07:00	200		385		270		339		470		724		
07:15	216		354		250		348		466		702		
07:30	200		371		286		339		486		710		
07:45	245	861	350	1460	282	1088	301	1327	527	1949	651	2787	
08:00	252		284		293		306		545		590		
08:15	264		326		300		310		564		636		
08:30	274		360		322		284		596		644		
08:45	277	1067	360	1330	366	1281	303	1203	643	2348	663	2533	
09:00	314		299		334		281		648		580		
09:15	312		314		338		260		650		574		
09:30	333		295		356		294		689		589		
09:45	345	1304	318	1226	394	1422	286	1121	739	2726	604	2347	
10:00	355		274		358		208		713		482		
10:15	366		253		374		240		740		493		
10:30	378		258		370		243		748		501		
10:45	389	1488	255	1040	371	1473	214	905	760	2961	469	1945	
11:00	417		274		376		202		793		476		
11:15	422		262		356		166		778		428		
11:30	422		227		434		190		856		417		
11:45	422	1683	226	989	481	1647	142	700	903	3330	368	1689	
Total	9726		18417		10495		16707		20221		35124		
Percent	48.1%		52.4%		51.9%		47.6%						
Day Total		28143				27202				55345			
Peak	11:00		02:45		11:00		00:30		11:00		03:00		
Vol.	1683		1927		1647		1762		3330		3635		
P.H.F.	0.997		0.962		0.856		0.962		0.922		0.979		

Lee Burbank Highway (Route 1A)
south of Furlong Drive
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133300 A Volume
Site Code: 10271.01

Start	NB				SB				Combined				07-Apr-13
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Sun
12:00	220		418		158		404		378		822		
12:15	184		392		128		377		312		769		
12:30	160		430		123		442		283		872		
12:45	166	730	442	1682	96	505	432	1655	262	1235	874	3337	
01:00	125		372		165		403		290		775		
01:15	106		430		116		431		222		861		
01:30	117		390		85		390		202		780		
01:45	136	484	393	1585	59	425	384	1608	195	909	777	3193	
02:00	125		468		52		420		177		888		
02:15	112		437		72		389		184		826		
02:30	121		446		52		400		173		846		
02:45	100	458	426	1777	50	226	403	1612	150	684	829	3389	
03:00	111		490		68		411		179		901		
03:15	101		466		85		386		186		852		
03:30	89		488		76		404		165		892		
03:45	94	395	476	1920	84	313	402	1603	178	708	878	3523	
04:00	78		480		96		416		174		896		
04:15	86		454		80		388		166		842		
04:30	80		410		122		361		202		771		
04:45	90	334	452	1796	99	397	414	1579	189	731	866	3375	
05:00	80		420		95		424		175		844		
05:15	76		402		111		386		187		788		
05:30	80		374		143		378		223		752		
05:45	80	316	381	1577	134	483	366	1554	214	799	747	3131	
06:00	106		370		142		358		248		728		
06:15	116		398		139		364		255		762		
06:30	130		390		199		369		329		759		
06:45	139	491	406	1564	174	654	318	1409	313	1145	724	2973	
07:00	172		362		168		331		340		693		
07:15	150		376		170		258		320		634		
07:30	140		378		204		286		344		664		
07:45	159	621	354	1470	200	742	289	1164	359	1363	643	2634	
08:00	216		311		182		272		398		583		
08:15	198		382		263		205		461		587		
08:30	214		308		246		226		460		534		
08:45	232	860	318	1319	276	967	230	933	508	1827	548	2252	
09:00	204		302		268		214		472		516		
09:15	217		268		273		219		490		487		
09:30	256		256		240		156		496		412		
09:45	274	951	200	1026	308	1089	202	791	582	2040	402	1817	
10:00	296		207		327		179		623		386		
10:15	336		207		331		164		667		371		
10:30	286		251		324		162		610		413		
10:45	360	1278	214	879	353	1335	154	659	713	2613	368	1538	
11:00	344		213		346		135		690		348		
11:15	380		226		387		121		767		347		
11:30	425		172		418		88		843		260		
11:45	420	1569	158	769	395	1546	88	432	815	3115	246	1201	
Total	8487		17364		8682		14999		17169		32363		
Percent	49.4%		53.7%		50.6%		46.3%						
Day Total		25851				23681				49532			
Peak	11:00		03:00		11:00		00:30		11:00		03:00		
Vol.	1569		1920		1546		1708		3115		3523		
P.H.F.	0.923		0.980		0.925		0.966		0.924		0.978		

Lee Burbank Highway (Route 1A)
south of Furlong Drive
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133300 A Volume
Site Code: 10271.01

Start Time	NB A.M.		NB P.M.		SB A.M.		SB P.M.		Combined A.M.		Combined P.M.		08-Apr-13 Mon
12:00	138		368		78		384		216		752		
12:15	134		382		74		370		208		752		
12:30	104		376		58		419		162		795		
12:45	94	470	390	1516	74	284	406	1579	168	754	796	3095	
01:00	88		406		75		398		163		804		
01:15	83		388		62		392		145		780		
01:30	81		422		44		412		125		834		
01:45	74	326	394	1610	40	221	414	1616	114	547	808	3226	
02:00	86		452		40		358		126		810		
02:15	52		434		50		428		102		862		
02:30	44		440		26		448		70		888		
02:45	45	227	455	1781	59	175	405	1639	104	402	860	3420	
03:00	46		527		69		428		115		955		
03:15	61		534		64		376		125		910		
03:30	51		539		110		412		161		951		
03:45	64	222	558	2158	119	362	390	1606	183	584	948	3764	
04:00	68		511		114		418		182		929		
04:15	98		504		172		420		270		924		
04:30	100		561		174		416		274		977		
04:45	131	397	546	2122	212	672	404	1658	343	1069	950	3780	
05:00	138		574		210		384		348		958		
05:15	144		500		289		404		433		904		
05:30	178		508		286		365		464		873		
05:45	196	656	538	2120	380	1165	310	1463	576	1821	848	3583	
06:00	244		544		508		374		752		918		
06:15	254		524		582		330		836		854		
06:30	266		516		611		316		877		832		
06:45	286	1050	498	2082	554	2255	300	1320	840	3305	798	3402	
07:00	320		403		582		293		902		696		
07:15	286		443		606		274		892		717		
07:30	308		394		552		242		860		636		
07:45	289	1203	360	1600	514	2254	298	1107	803	3457	658	2707	
08:00	284		376		536		232		820		608		
08:15	278		318		548		252		826		570		
08:30	280		301		540		236		820		537		
08:45	286	1128	356	1351	540	2164	244	964	826	3292	600	2315	
09:00	304		292		524		214		828		506		
09:15	336		268		450		204		786		472		
09:30	317		265		501		192		818		457		
09:45	346	1303	264	1089	436	1911	196	806	782	3214	460	1895	
10:00	302		264		402		147		704		411		
10:15	308		266		362		152		670		418		
10:30	324		308		394		178		718		486		
10:45	394	1328	234	1072	374	1532	132	609	768	2860	366	1681	
11:00	356		252		392		127		748		379		
11:15	337		216		410		120		747		336		
11:30	396		162		418		92		814		254		
11:45	350	1439	153	783	346	1566	88	427	696	3005	241	1210	
Total	9749		19284		14561		14794		24310		34078		
Percent	40.1%		56.6%		59.9%		43.4%						
Day Total			29033				29355				58388		
Peak	10:45		04:15		06:30		02:15		06:30		04:15		
Vol.	1483		2185		2353		1709		3511		3809		
P.H.F.	0.936		0.952		0.963		0.954		0.973		0.975		

Lee Burbank Highway (Route 1A)
south of Furlong Drive
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
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Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133300 A Volume
Site Code: 10271.01

Start	NB				SB				Combined				09-Apr-13
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Tue
12:00	140		383		85		350		225		733		
12:15	119		368		73		362		192		730		
12:30	126		408		64		370		190		778		
12:45	77	462	346	1505	55	277	414	1496	132	739	760	3001	
01:00	56		426		58		392		114		818		
01:15	62		384		28		374		90		758		
01:30	59		416		32		382		91		798		
01:45	49	226	373	1599	34	152	402	1550	83	378	775	3149	
02:00	42		415		30		390		72		805		
02:15	54		448		36		402		90		850		
02:30	37		490		52		464		89		954		
02:45	50	183	486	1839	36	154	414	1670	86	337	900	3509	
03:00	30		510		64		426		94		936		
03:15	52		502		75		423		127		925		
03:30	51		570		93		424		144		994		
03:45	62	195	546	2128	110	342	426	1699	172	537	972	3827	
04:00	55		572		128		416		183		988		
04:15	83		547		137		424		220		971		
04:30	100		550		192		390		292		940		
04:45	128	366	554	2223	216	673	420	1650	344	1039	974	3873	
05:00	134		585		211		410		345		995		
05:15	127		566		284		388		411		954		
05:30	166		544		338		378		504		922		
05:45	174	601	514	2209	400	1233	360	1536	574	1834	874	3745	
06:00	212		536		494		348		706		884		
06:15	239		544		645		323		884		867		
06:30	292		542		590		314		882		856		
06:45	276	1019	508	2130	586	2315	294	1279	862	3334	802	3409	
07:00	304		494		578		280		882		774		
07:15	286		453		500		304		786		757		
07:30	304		426		506		292		810		718		
07:45	278	1172	368	1741	548	2132	295	1171	826	3304	663	2912	
08:00	298		312		508		292		806		604		
08:15	288		366		532		279		820		645		
08:30	305		382		512		248		817		630		
08:45	264	1155	346	1406	516	2068	269	1088	780	3223	615	2494	
09:00	268		322		520		265		788		587		
09:15	298		368		570		222		868		590		
09:30	326		306		578		216		904		522		
09:45	376	1268	262	1258	445	2113	195	898	821	3381	457	2156	
10:00	325		286		394		169		719		455		
10:15	315		269		398		172		713		441		
10:30	337		292		392		164		729		456		
10:45	322	1299	254	1101	420	1604	128	633	742	2903	382	1734	
11:00	363		302		384		122		747		424		
11:15	364		264		388		111		752		375		
11:30	388		213		374		96		762		309		
11:45	393	1508	172	951	375	1521	80	409	768	3029	252	1360	
Total	9454		20090		14584		15079		24038		35169		
Percent	39.3%		57.1%		60.7%		42.9%						
Day Total		29544				29663				59207			
Peak	11:00		04:30		06:15		02:30		06:15		03:30		
Vol.	1508		2255		2399		1727		3510		3925		
P.H.F.	0.959		0.964		0.930		0.930		0.993		0.987		

Lee Burbank Highway (Route 1A)
south of Furlong Drive
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133300 A Volume
Site Code: 10271.01

Start Time	NB A.M.		NB P.M.		SB A.M.		SB P.M.		Combined A.M.		Combined P.M.		10-Apr-13 Wed
12:00	140		410		100		380		240		790		
12:15	137		378		59		379		196		757		
12:30	116		388		64		392		180		780		
12:45	93	486	370	1546	56	279	383	1534	149	765	753	3080	
01:00	74		406		31		374		105		780		
01:15	82		445		54		415		136		860		
01:30	92		421		46		394		138		815		
01:45	60	308	416	1688	40	171	348	1531	100	479	764	3219	
02:00	54		442		44		422		98		864		
02:15	48		490		24		398		72		888		
02:30	46		499		58		444		104		943		
02:45	55	203	478	1909	44	170	424	1688	99	373	902	3597	
03:00	46		503		56		419		102		922		
03:15	50		531		89		436		139		967		
03:30	56		512		124		416		180		928		
03:45	82	234	523	2069	134	403	424	1695	216	637	947	3764	
04:00	52		490		138		432		190		922		
04:15	140		516		174		428		314		944		
04:30	92		555		192		439		284		994		
04:45	130	414	538	2099	208	712	439	1738	338	1126	977	3837	
05:00	98		526		200		404		298		930		
05:15	132		588		267		371		399		959		
05:30	156		550		338		402		494		952		
05:45	184	570	508	2172	360	1165	388	1565	544	1735	896	3737	
06:00	202		516		463		356		665		872		
06:15	252		540		622		310		874		850		
06:30	261		493		587		329		848		822		
06:45	256	971	496	2045	538	2210	296	1291	794	3181	792	3336	
07:00	310		408		588		303		898		711		
07:15	298		418		531		318		829		736		
07:30	288		408		506		302		794		710		
07:45	284	1180	390	1624	513	2138	261	1184	797	3318	651	2808	
08:00	272		368		530		262		802		630		
08:15	314		347		554		234		868		581		
08:30	286		341		530		240		816		581		
08:45	257	1129	281	1337	531	2145	231	967	788	3274	512	2304	
09:00	326		308		559		196		885		504		
09:15	304		322		532		204		836		526		
09:30	367		297		496		196		863		493		
09:45	310	1307	252	1179	420	2007	202	798	730	3314	454	1977	
10:00	378		283		406		144		784		427		
10:15	324		286		390		160		714		446		
10:30	365		316		398		150		763		466		
10:45	360	1427	274	1159	352	1546	176	630	712	2973	450	1789	
11:00	338		304		334		142		672		446		
11:15	378		290		411		108		789		398		
11:30	400		221		382		116		782		337		
11:45	390	1506	164	979	408	1535	98	464	798	3041	262	1443	
Total	9735		19806		14481		15085		24216		34891		
Percent	40.2%		56.8%		59.8%		43.2%						
Day Total		29541				29566				59107			
Peak	11:00		04:30		06:15		04:00		06:15		04:30		
Vol.	1506		2207		2335		1738		3414		3860		
P.H.F.	0.941		0.938		0.939		0.990		0.950		0.971		

Lee Burbank Highway (Route 1A)
south of Furlong Drive
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133300 A Volume
Site Code: 10271.01

Start	NB				SB				Combined				11-Apr-13
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Thu
12:00	130		404		72		394		202		798		
12:15	117		364		82		406		199		770		
12:30	152		405		72		442		224		847		
12:45	138	537	340	1513	62	288	400	1642	200	825	740	3155	
01:00	140		409		58		388		198		797		
01:15	120		407		55		400		175		807		
01:30	98		431		38		381		136		812		
01:45	87	445	422	1669	56	207	407	1576	143	652	829	3245	
02:00	76		458		36		391		112		849		
02:15	74		452		34		406		108		858		
02:30	57		462		38		424		95		886		
02:45	64	271	444	1816	50	158	440	1661	114	429	884	3477	
03:00	64		514		56		474		120		988		
03:15	71		508		78		446		149		954		
03:30	58		574		107		437		165		1011		
03:45	86	279	526	2122	132	373	450	1807	218	652	976	3929	
04:00	93		548		136		402		229		950		
04:15	88		529		150		434		238		963		
04:30	110		580		198		403		308		983		
04:45	132	423	572	2229	212	696	441	1680	344	1119	1013	3909	
05:00	163		614		199		400		362		1014		
05:15	156		550		284		400		440		950		
05:30	153		564		330		408		483		972		
05:45	168	640	552	2280	366	1179	379	1587	534	1819	931	3867	
06:00	202		582		448		330		650		912		
06:15	256		510		625		374		881		884		
06:30	252		532		542		320		794		852		
06:45	271	981	521	2145	570	2185	277	1301	841	3166	798	3446	
07:00	278		456		556		279		834		735		
07:15	300		480		532		313		832		793		
07:30	321		429		497		245		818		674		
07:45	298	1197	384	1749	522	2107	270	1107	820	3304	654	2856	
08:00	287		374		554		272		841		646		
08:15	307		364		534		244		841		608		
08:30	298		345		516		239		814		584		
08:45	268	1160	308	1391	559	2163	224	979	827	3323	532	2370	
09:00	316		370		530		254		846		624		
09:15	308		304		480		196		788		500		
09:30	327		346		463		218		790		564		
09:45	323	1274	300	1320	456	1929	210	878	779	3203	510	2198	
10:00	330		320		441		202		771		522		
10:15	344		332		407		183		751		515		
10:30	368		360		406		184		774		544		
10:45	366	1408	277	1289	392	1646	131	700	758	3054	408	1989	
11:00	382		283		413		129		795		412		
11:15	368		310		388		126		756		436		
11:30	404		246		415		132		819		378		
11:45	412	1566	213	1052	416	1632	98	485	828	3198	311	1537	
Total	10181		20575		14563		15403		24744		35978		
Percent	41.1%		57.2%		58.9%		42.8%						
Day Total		30756				29966				60722			
Peak	11:00		04:30		06:15		03:00		06:15		04:15		
Vol.	1566		2316		2293		1807		3350		3973		
P.H.F.	0.950		0.943		0.917		0.953		0.951		0.980		

Lee Burbank Highway (Route 1A)
south of Furlong Drive
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133300 A Volume
Site Code: 10271.01

Start	NB				SB				Combined				12-Apr-13
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Fri
12:00	160		401		96		432		256		833		
12:15	138		410		70		409		208		819		
12:30	120		434		50		380		170		814		
12:45	108	526	426	1671	74	290	394	1615	182	816	820	3286	
01:00	110		470		62		408		172		878		
01:15	110		395		46		403		156		798		
01:30	98		458		52		406		150		864		
01:45	72	390	433	1756	40	200	424	1641	112	590	857	3397	
02:00	82		482		48		415		130		897		
02:15	86		464		28		433		114		897		
02:30	74		492		56		390		130		882		
02:45	52	294	486	1924	51	183	441	1679	103	477	927	3603	
03:00	54		494		70		490		124		984		
03:15	63		490		85		400		148		890		
03:30	69		488		114		496		183		984		
03:45	82	268	514	1986	130	399	465	1851	212	667	979	3837	
04:00	74		520		134		432		208		952		
04:15	89		530		187		436		276		966		
04:30	90		506		201		451		291		957		
04:45	131	384	519	2075	216	738	460	1779	347	1122	979	3854	
05:00	144		536		192		399		336		935		
05:15	152		531		254		400		406		931		
05:30	183		446		300		387		483		833		
05:45	178	657	504	2017	383	1129	380	1566	561	1786	884	3583	
06:00	232		490		433		352		665		842		
06:15	253		498		596		354		849		852		
06:30	302		512		595		354		897		866		
06:45	292	1079	460	1960	562	2186	349	1409	854	3265	809	3369	
07:00	341		442		568		291		909		733		
07:15	306		404		562		293		868		697		
07:30	320		439		538		344		858		783		
07:45	311	1278	396	1681	540	2208	284	1212	851	3486	680	2893	
08:00	293		338		533		286		826		624		
08:15	327		364		510		246		837		610		
08:30	332		378		550		224		882		602		
08:45	267	1219	327	1407	552	2145	276	1032	819	3364	603	2439	
09:00	332		380		427		288		759		668		
09:15	310		348		480		276		790		624		
09:30	386		322		451		222		837		544		
09:45	338	1366	332	1382	448	1806	232	1018	786	3172	564	2400	
10:00	350		311		359		214		709		525		
10:15	341		338		436		247		777		585		
10:30	354		338		406		202		760		540		
10:45	357	1402	247	1234	370	1571	222	885	727	2973	469	2119	
11:00	353		308		359		176		712		484		
11:15	378		299		403		156		781		455		
11:30	366		260		445		140		811		400		
11:45	400	1497	225	1092	430	1637	149	621	830	3134	374	1713	
Total	10360		20185		14492		16308		24852		36493		
Percent	41.7%		55.3%		58.3%		44.7%						
Day Total		30545				30800				61345			
Peak	11:00		04:30		06:15		03:00		06:30		03:30		
Vol.	1497		2092		2321		1851		3528		3881		
P.H.F.	0.936		0.976		0.974		0.933		0.970		0.986		

Lee Burbank Highway (Route 1A)
north of Route 145 Ramps
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
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133300 B Volume
Site Code: 10271.01

Start	NB				SB				Combined				06-Apr-13
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Sat
12:00	166		336		90		318		256		654		
12:15	137		338		68		310		205		648		
12:30	111		329		72		354		183		683		
12:45	82	496	332	1335	56	286	317	1299	138	782	649	2634	
01:00	88		323		85		331		173		654		
01:15	78		311		52		338		130		649		
01:30	86		380		45		300		131		680		
01:45	96	348	368	1382	50	232	308	1277	146	580	676	2659	
02:00	92		345		32		350		124		695		
02:15	83		356		45		278		128		634		
02:30	100		376		45		324		145		700		
02:45	84	359	364	1441	36	158	305	1257	120	517	669	2698	
03:00	54		364		44		291		98		655		
03:15	58		376		57		322		115		698		
03:30	56		382		72		280		128		662		
03:45	63	231	368	1490	88	261	314	1207	151	492	682	2697	
04:00	72		335		74		274		146		609		
04:15	62		372		114		312		176		684		
04:30	88		386		102		316		190		702		
04:45	76	298	374	1467	138	428	292	1194	214	726	666	2661	
05:00	94		344		122		274		216		618		
05:15	87		315		150		306		237		621		
05:30	90		342		176		302		266		644		
05:45	87	358	345	1346	170	618	260	1142	257	976	605	2488	
06:00	112		302		167		294		279		596		
06:15	144		320		195		226		339		546		
06:30	144		290		198		250		342		540		
06:45	140	540	310	1222	213	773	246	1016	353	1313	556	2238	
07:00	146		278		206		244		352		522		
07:15	167		309		184		254		351		563		
07:30	156		284		214		253		370		537		
07:45	198	667	272	1143	208	812	216	967	406	1479	488	2110	
08:00	202		230		236		230		438		460		
08:15	222		272		212		228		434		500		
08:30	209		278		247		210		456		488		
08:45	212	845	272	1052	271	966	223	891	483	1811	495	1943	
09:00	241		238		249		214		490		452		
09:15	230		244		252		186		482		430		
09:30	258		232		258		219		516		451		
09:45	272	1001	267	981	272	1031	204	823	544	2032	471	1804	
10:00	271		222		265		160		536		382		
10:15	293		202		267		166		560		368		
10:30	296		199		286		186		582		385		
10:45	308	1168	199	822	288	1106	155	667	596	2274	354	1489	
11:00	316		231		276		147		592		378		
11:15	326		212		254		118		580		330		
11:30	312		182		332		148		644		330		
11:45	321	1275	192	817	362	1224	112	525	683	2499	304	1342	
Total	7586		14498		7895		12265		15481		26763		
Percent	49.0%		54.2%		51.0%		45.8%						
Day Total			22084				20160				42244		
Peak	11:00		03:00		11:00		00:30		11:00		02:30		
Vol.	1275		1490		1224		1340		2499		2722		
P.H.F.	0.978		0.975		0.845		0.946		0.915		0.972		

Lee Burbank Highway (Route 1A)
north of Route 145 Ramps
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
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133300 B Volume
Site Code: 10271.01

Start	NB				SB				Combined				07-Apr-13
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Sun
12:00	182		316		126		294		308		610		
12:15	138		300		100		288		238		588		
12:30	126		324		86		313		212		637		
12:45	130	576	348	1288	79	391	314	1209	209	967	662	2497	
01:00	102		283		110		302		212		585		
01:15	84		350		84		328		168		678		
01:30	92		293		65		282		157		575		
01:45	106	384	288	1214	45	304	293	1205	151	688	581	2419	
02:00	88		352		35		306		123		658		
02:15	84		354		48		274		132		628		
02:30	100		345		38		291		138		636		
02:45	76	348	319	1370	40	161	300	1171	116	509	619	2541	
03:00	88		400		53		298		141		698		
03:15	63		360		58		278		121		638		
03:30	62		406		48		308		110		714		
03:45	68	281	380	1546	64	223	301	1185	132	504	681	2731	
04:00	63		363		68		298		131		661		
04:15	53		356		61		288		114		644		
04:30	64		336		88		254		152		590		
04:45	72	252	354	1409	76	293	306	1146	148	545	660	2555	
05:00	63		320		72		304		135		624		
05:15	57		318		90		296		147		614		
05:30	56		304		114		292		170		596		
05:45	60	236	294	1236	102	378	279	1171	162	614	573	2407	
06:00	82		278		110		262		192		540		
06:15	92		320		112		253		204		573		
06:30	99		296		153		278		252		574		
06:45	110	383	326	1220	136	511	210	1003	246	894	536	2223	
07:00	132		281		124		253		256		534		
07:15	118		300		138		182		256		482		
07:30	114		294		150		197		264		491		
07:45	118	482	274	1149	145	557	195	827	263	1039	469	1976	
08:00	165		248		132		192		297		440		
08:15	139		304		196		150		335		454		
08:30	162		237		184		172		346		409		
08:45	176	642	258	1047	200	712	157	671	376	1354	415	1718	
09:00	142		253		200		156		342		409		
09:15	166		216		203		164		369		380		
09:30	217		198		169		120		386		318		
09:45	210	735	158	825	211	783	139	579	421	1518	297	1404	
10:00	243		160		240		128		483		288		
10:15	250		158		246		130		496		288		
10:30	227		205		242		119		469		324		
10:45	264	984	166	689	252	980	112	489	516	1964	278	1178	
11:00	272		169		258		97		530		266		
11:15	298		170		296		74		594		244		
11:30	312		134		296		62		608		196		
11:45	314	1196	126	599	298	1148	68	301	612	2344	194	900	
Total	6499		13592		6441		10957		12940		24549		
Percent	50.2%		55.4%		49.8%		44.6%						
Day Total			20091				17398				37489		
Peak	11:00		03:00		11:00		00:30		11:00		03:00		
Vol.	1196		1546		1148		1257		2344		2731		
P.H.F.	0.952		0.952		0.963		0.958		0.958		0.956		

Lee Burbank Highway (Route 1A)
north of Route 145 Ramps
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133300 B Volume
Site Code: 10271.01

Start Time	NB A.M.		NB P.M.		SB A.M.		SB P.M.		Combined A.M.		Combined P.M.		08-Apr-13 Mon
12:00	106		268		56		274		162		542		
12:15	104		284		53		265		157		549		
12:30	88		292		42		310		130		602		
12:45	70	368	293	1137	48	199	272	1121	118	567	565	2258	
01:00	66		306		56		278		122		584		
01:15	62		274		42		286		104		560		
01:30	71		317		32		290		103		607		
01:45	64	263	312	1209	32	162	308	1162	96	425	620	2371	
02:00	68		330		26		242		94		572		
02:15	34		325		31		298		65		623		
02:30	34		324		21		312		55		636		
02:45	34	170	339	1318	47	125	266	1118	81	295	605	2436	
03:00	34		394		52		314		86		708		
03:15	50		407		53		281		103		688		
03:30	34		422		86		318		120		740		
03:45	57	175	395	1618	94	285	267	1180	151	460	662	2798	
04:00	50		390		93		316		143		706		
04:15	74		400		125		292		199		692		
04:30	80		408		144		307		224		715		
04:45	105	309	416	1614	184	546	288	1203	289	855	704	2817	
05:00	111		446		164		266		275		712		
05:15	119		382		248		274		367		656		
05:30	143		392		232		236		375		628		
05:45	156	529	414	1634	315	959	232	1008	471	1488	646	2642	
06:00	185		422		386		258		571		680		
06:15	200		395		455		249		655		644		
06:30	222		408		476		230		698		638		
06:45	232	839	375	1600	434	1751	218	955	666	2590	593	2555	
07:00	252		320		440		213		692		533		
07:15	228		341		438		200		666		541		
07:30	255		313		442		178		697		491		
07:45	217	952	263	1237	362	1682	208	799	579	2634	471	2036	
08:00	218		295		374		157		592		452		
08:15	224		252		385		192		609		444		
08:30	224		238		393		174		617		412		
08:45	218	884	279	1064	424	1576	177	700	642	2460	456	1764	
09:00	243		235		398		150		641		385		
09:15	241		214		322		150		563		364		
09:30	230		210		387		138		617		348		
09:45	257	971	207	866	348	1455	142	580	605	2426	349	1446	
10:00	235		220		306		110		541		330		
10:15	250		210		262		106		512		316		
10:30	242		250		304		130		546		380		
10:45	283	1010	190	870	279	1151	96	442	562	2161	286	1312	
11:00	245		180		282		86		527		266		
11:15	264		182		303		84		567		266		
11:30	287		126		288		58		575		184		
11:45	269	1065	120	608	260	1133	72	300	529	2198	192	908	
Total	7535		14775		11024		10568		18559		25343		
Percent	40.6%		58.3%		59.4%		41.7%						
Day Total			22310				21592				43902		
Peak	10:45		04:15		06:15		04:00		06:30		04:15		
Vol.	1079		1670		1805		1203		2722		2823		
P.H.F.	0.940		0.936		0.948		0.952		0.975		0.987		

Lee Burbank Highway (Route 1A)
north of Route 145 Ramps
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133300 B Volume
Site Code: 10271.01

Start	NB				SB				Combined				09-Apr-13
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Tue
12:00	102		248		57		238		159		486		
12:15	95		266		48		271		143		537		
12:30	108		296		41		236		149		532		
12:45	64	369	254	1064	48	194	276	1021	112	563	530	2085	
01:00	40		290		36		280		76		570		
01:15	41		290		18		248		59		538		
01:30	48		319		26		275		74		594		
01:45	34	163	288	1187	24	104	272	1075	58	267	560	2262	
02:00	38		328		22		274		60		602		
02:15	44		326		28		269		72		595		
02:30	22		362		32		304		54		666		
02:45	36	140	354	1370	22	104	302	1149	58	244	656	2519	
03:00	24		369		52		298		76		667		
03:15	42		374		56		303		98		677		
03:30	36		442		76		302		112		744		
03:45	52	154	418	1603	88	272	306	1209	140	426	724	2812	
04:00	45		412		98		283		143		695		
04:15	68		388		120		303		188		691		
04:30	84		414		152		274		236		688		
04:45	96	293	411	1625	181	551	290	1150	277	844	701	2775	
05:00	114		403		182		278		296		681		
05:15	104		430		230		291		334		721		
05:30	127		423		266		288		393		711		
05:45	134	479	385	1641	322	1000	259	1116	456	1479	644	2757	
06:00	160		426		374		256		534		682		
06:15	174		422		472		236		646		658		
06:30	240		406		432		217		672		623		
06:45	236	810	386	1640	450	1728	209	918	686	2538	595	2558	
07:00	254		394		432		198		686		592		
07:15	226		337		358		219		584		556		
07:30	253		334		336		208		589		542		
07:45	218	951	286	1351	384	1510	202	827	602	2461	488	2178	
08:00	232		236		334		222		566		458		
08:15	222		308		361		201		583		509		
08:30	243		302		344		180		587		482		
08:45	222	919	275	1121	343	1382	198	801	565	2301	473	1922	
09:00	203		254		424		205		627		459		
09:15	228		282		446		167		674		449		
09:30	252		232		434		144		686		376		
09:45	284	967	208	976	352	1656	131	647	636	2623	339	1623	
10:00	238		217		298		122		536		339		
10:15	230		234		294		129		524		363		
10:30	258		229		294		124		552		353		
10:45	224	950	208	888	290	1176	86	461	514	2126	294	1349	
11:00	268		244		292		94		560		338		
11:15	263		208		276		74		539		282		
11:30	292		177		266		65		558		242		
11:45	300	1123	147	776	246	1080	54	287	546	2203	201	1063	
Total	7318		15242		10757		10661		18075		25903		
Percent	40.5%		58.8%		59.5%		41.2%						
Day Total		22560				21418				43978			
Peak	11:00		04:45		06:15		03:00		06:15		03:30		
Vol.	1123		1667		1786		1209		2690		2854		
P.H.F.	0.936		0.969		0.946		0.988		0.980		0.959		

Lee Burbank Highway (Route 1A)
north of Route 145 Ramps
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133300 B Volume
Site Code: 10271.01

Start	NB				SB				Combined				10-Apr-13
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Wed
12:00	112		292		72		282		184		574		
12:15	120		274		44		294		164		568		
12:30	96		274		44		270		140		544		
12:45	68	396	288	1128	48	208	268	1114	116	604	556	2242	
01:00	63		300		28		258		91		558		
01:15	58		350		45		302		103		652		
01:30	70		296		33		266		103		562		
01:45	48	239	321	1267	34	140	265	1091	82	379	586	2358	
02:00	38		322		28		310		66		632		
02:15	43		368		22		279		65		647		
02:30	32		376		38		306		70		682		
02:45	44	157	370	1436	30	118	304	1199	74	275	674	2635	
03:00	32		390		42		293		74		683		
03:15	42		394		68		318		110		712		
03:30	48		382		106		310		154		692		
03:45	50	172	389	1555	100	316	300	1221	150	488	689	2776	
04:00	42		356		108		292		150		648		
04:15	114		404		143		304		257		708		
04:30	78		434		166		304		244		738		
04:45	101	335	418	1612	174	591	316	1216	275	926	734	2828	
05:00	78		421		148		275		226		696		
05:15	104		474		220		286		324		760		
05:30	112		418		268		274		380		692		
05:45	140	434	381	1694	301	937	298	1133	441	1371	679	2827	
06:00	152		388		354		264		506		652		
06:15	201		442		492		226		693		668		
06:30	222		390		448		234		670		624		
06:45	206	781	382	1602	426	1720	204	928	632	2501	586	2530	
07:00	244		320		456		232		700		552		
07:15	246		317		362		232		608		549		
07:30	236		309		338		217		574		526		
07:45	215	941	295	1241	340	1496	186	867	555	2437	481	2108	
08:00	223		302		337		191		560		493		
08:15	233		292		380		179		613		471		
08:30	234		262		358		171		592		433		
08:45	212	902	224	1080	398	1473	161	702	610	2375	385	1782	
09:00	245		230		467		141		712		371		
09:15	239		246		429		148		668		394		
09:30	267		244		356		150		623		394		
09:45	252	1003	210	930	306	1558	153	592	558	2561	363	1522	
10:00	258		220		304		108		562		328		
10:15	258		224		288		118		546		342		
10:30	269		242		294		116		563		358		
10:45	286	1071	226	912	274	1160	134	476	560	2231	360	1388	
11:00	266		244		249		91		515		335		
11:15	288		234		300		84		588		318		
11:30	300		180		273		88		573		268		
11:45	292	1146	128	786	278	1100	78	341	570	2246	206	1127	
Total	7577		15243		10817		10880		18394		26123		
Percent	41.2%		58.4%		58.8%		41.6%						
Day Total		22820				21697				44517			
Peak	11:00		04:30		06:15		02:45		06:15		04:30		
Vol.	1146		1747		1822		1225		2695		2928		
P.H.F.	0.955		0.921		0.926		0.963		0.963		0.963		

Lee Burbank Highway (Route 1A)
north of Route 145 Ramps
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133300 B Volume
Site Code: 10271.01

Start	NB				SB				Combined				11-Apr-13
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Thu
12:00	102		308		56		278		158		586		
12:15	100		254		70		290		170		544		
12:30	138		302		53		317		191		619		
12:45	114	454	267	1131	49	228	282	1167	163	682	549	2298	
01:00	118		308		38		264		156		572		
01:15	96		294		36		287		132		581		
01:30	80		328		32		254		112		582		
01:45	62	356	311	1241	38	144	280	1085	100	500	591	2326	
02:00	70		356		28		266		98		622		
02:15	62		346		34		283		96		629		
02:30	44		344		26		296		70		640		
02:45	50	226	336	1382	30	118	302	1147	80	344	638	2529	
03:00	46		390		40		326		86		716		
03:15	54		346		54		309		108		655		
03:30	42		436		94		320		136		756		
03:45	66	208	400	1572	102	290	316	1271	168	498	716	2843	
04:00	76		418		107		292		183		710		
04:15	69		402		122		306		191		708		
04:30	97		450		176		278		273		728		
04:45	96	338	407	1677	160	565	324	1200	256	903	731	2877	
05:00	134		434		153		276		287		710		
05:15	131		420		230		294		361		714		
05:30	117		420		248		302		365		722		
05:45	132	514	399	1673	313	944	280	1152	445	1458	679	2825	
06:00	142		432		343		244		485		676		
06:15	195		405		504		274		699		679		
06:30	202		436		400		231		602		667		
06:45	220	759	400	1673	450	1697	196	945	670	2456	596	2618	
07:00	218		380		392		192		610		572		
07:15	255		376		390		225		645		601		
07:30	275		324		336		166		611		490		
07:45	238	986	302	1382	351	1469	188	771	589	2455	490	2153	
08:00	222		294		382		199		604		493		
08:15	227		271		344		168		571		439		
08:30	244		265		344		164		588		429		
08:45	203	896	263	1093	401	1471	156	687	604	2367	419	1780	
09:00	238		282		442		188		680		470		
09:15	250		242		369		131		619		373		
09:30	260		270		352		153		612		423		
09:45	240	988	252	1046	338	1501	146	618	578	2489	398	1664	
10:00	259		255		328		142		587		397		
10:15	264		268		300		142		564		410		
10:30	254		288		270		127		524		415		
10:45	268	1045	244	1055	276	1174	104	515	544	2219	348	1570	
11:00	280		230		310		91		590		321		
11:15	286		246		273		88		559		334		
11:30	312		203		290		100		602		303		
11:45	292	1170	168	847	298	1171	68	347	590	2341	236	1194	
Total	7940		15772		10772		10905		18712		26677		
Percent	42.4%		59.1%		57.6%		40.9%						
Day Total		23712				21677				45389			
Peak	11:00		04:30		06:15		03:00		06:15		03:30		
Vol.	1170		1711		1746		1271		2581		2890		
P.H.F.	0.938		0.951		0.866		0.975		0.923		0.956		

Lee Burbank Highway (Route 1A)
north of Route 145 Ramps
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133300 B Volume
Site Code: 10271.01

Start	NB				SB				Combined				12-Apr-13
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Fri
12:00	122		289		74		284		196		573		
12:15	115		297		48		296		163		593		
12:30	102		310		41		254		143		564		
12:45	92	431	314	1210	57	220	278	1112	149	651	592	2322	
01:00	94		346		43		284		137		630		
01:15	86		292		34		304		120		596		
01:30	86		340		38		286		124		626		
01:45	59	325	310	1288	32	147	294	1168	91	472	604	2456	
02:00	64		354		38		286		102		640		
02:15	62		368		24		308		86		676		
02:30	56		374		43		280		99		654		
02:45	38	220	359	1455	34	139	308	1182	72	359	667	2637	
03:00	42		372		41		346		83		718		
03:15	50		385		59		269		109		654		
03:30	58		372		97		353		155		725		
03:45	50	200	380	1509	104	301	347	1315	154	501	727	2824	
04:00	56		410		112		308		168		718		
04:15	69		423		153		316		222		739		
04:30	66		386		153		324		219		710		
04:45	112	303	402	1621	170	588	319	1267	282	891	721	2888	
05:00	115		402		156		273		271		675		
05:15	128		378		198		304		326		682		
05:30	132		365		236		270		368		635		
05:45	132	507	403	1548	322	912	295	1142	454	1419	698	2690	
06:00	182		386		314		254		496		640		
06:15	194		383		458		248		652		631		
06:30	245		408		434		274		679		682		
06:45	233	854	363	1540	454	1660	241	1017	687	2514	604	2557	
07:00	262		354		438		212		700		566		
07:15	249		309		388		208		637		517		
07:30	248		358		368		230		616		588		
07:45	250	1009	308	1329	354	1548	207	857	604	2557	515	2186	
08:00	222		260		380		201		602		461		
08:15	252		278		332		164		584		442		
08:30	260		304		368		171		628		475		
08:45	208	942	246	1088	408	1488	194	730	616	2430	440	1818	
09:00	266		300		326		212		592		512		
09:15	234		274		358		189		592		463		
09:30	294		253		350		168		644		421		
09:45	256	1050	260	1087	332	1366	165	734	588	2416	425	1821	
10:00	242		249		255		156		497		405		
10:15	260		272		308		166		568		438		
10:30	278		266		310		140		588		406		
10:45	272	1052	208	995	272	1145	174	636	544	2197	382	1631	
11:00	268		262		250		130		518		392		
11:15	296		236		296		104		592		340		
11:30	274		213		332		109		606		322		
11:45	288	1126	166	877	297	1175	110	453	585	2301	276	1330	
Total	8019		15547		10689		11613		18708		27160		
Percent	42.9%		57.2%		57.1%		42.8%						
Day Total		23566				22302				45868			
Peak	11:00		04:00		06:15		03:30		06:15		03:30		
Vol.	1126		1621		1784		1324		2718		2909		
P.H.F.	0.951		0.958		0.974		0.938		0.971		0.984		

Route 60
north of Bell Circle
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133300 C Volume
Site Code: 10271.01

Start	NB				SB				Combined				06-Apr-13
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Sat
12:00	118		282		88		268		206		550		
12:15	108		318		61		310		169		628		
12:30	91		268		62		292		153		560		
12:45	74	391	308	1176	50	261	286	1156	124	652	594	2332	
01:00	102		280		65		312		167		592		
01:15	72		285		46		331		118		616		
01:30	71		298		45		276		116		574		
01:45	71	316	316	1179	50	206	280	1199	121	522	596	2378	
02:00	74		289		29		310		103		599		
02:15	60		294		40		270		100		564		
02:30	64		334		40		274		104		608		
02:45	50	248	286	1203	32	141	278	1132	82	389	564	2335	
03:00	45		301		42		292		87		593		
03:15	45		318		44		289		89		607		
03:30	44		314		62		270		106		584		
03:45	38	172	343	1276	68	216	258	1109	106	388	601	2385	
04:00	46		304		65		264		111		568		
04:15	42		294		82		267		124		561		
04:30	48		285		85		299		133		584		
04:45	60	196	300	1183	116	348	274	1104	176	544	574	2287	
05:00	73		313		102		242		175		555		
05:15	68		280		108		269		176		549		
05:30	65		277		126		279		191		556		
05:45	73	279	294	1164	120	456	236	1026	193	735	530	2190	
06:00	84		234		136		246		220		480		
06:15	107		251		141		214		248		465		
06:30	136		248		148		220		284		468		
06:45	126	453	271	1004	185	610	226	906	311	1063	497	1910	
07:00	97		226		138		235		235		461		
07:15	128		261		138		222		266		483		
07:30	109		238		160		248		269		486		
07:45	145	479	251	976	168	604	199	904	313	1083	450	1880	
08:00	162		184		185		232		347		416		
08:15	198		193		192		210		390		403		
08:30	204		228		182		197		386		425		
08:45	180	744	239	844	190	749	190	829	370	1493	429	1673	
09:00	195		192		220		190		415		382		
09:15	199		207		204		190		403		397		
09:30	228		181		204		220		432		401		
09:45	254	876	175	755	249	877	164	764	503	1753	339	1519	
10:00	246		174		236		159		482		333		
10:15	253		153		230		139		483		292		
10:30	250		162		238		166		488		328		
10:45	261	1010	146	635	250	954	122	586	511	1964	268	1221	
11:00	285		142		226		129		511		271		
11:15	278		166		250		102		528		268		
11:30	291		118		292		136		583		254		
11:45	286	1140	144	570	298	1066	92	459	584	2206	236	1029	
Total	6304		11965		6488		11174		12792		23139		
Percent	49.3%		51.7%		50.7%		48.3%						
Day Total		18269				17662				35931			
Peak	11:00		03:15		11:00		00:30		11:00		01:15		
Vol.	1140		1279		1066		1221		2206		2385		
P.H.F.	0.979		0.932		0.894		0.922		0.944		0.968		

Route 60
north of Bell Circle
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
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133300 C Volume
Site Code: 10271.01

Start Time	NB A.M.		NB P.M.		SB A.M.		SB P.M.		Combined A.M.		Combined P.M.		07-Apr-13 Sun
12:00	128		294		106		260		234		554		
12:15	110		254		72		258		182		512		
12:30	87		268		62		266		149		534		
12:45	84	409	282	1098	72	312	276	1060	156	721	558	2158	
01:00	98		266		63		288		161		554		
01:15	62		277		56		262		118		539		
01:30	76		258		47		267		123		525		
01:45	56	292	264	1065	40	206	286	1103	96	498	550	2168	
02:00	68		278		32		309		100		587		
02:15	48		272		40		242		88		514		
02:30	67		314		36		272		103		586		
02:45	52	235	270	1134	33	141	278	1101	85	376	548	2235	
03:00	50		348		54		303		104		651		
03:15	48		287		36		242		84		529		
03:30	36		319		48		258		84		577		
03:45	40	174	290	1244	52	190	268	1071	92	364	558	2315	
04:00	38		284		54		279		92		563		
04:15	36		296		58		263		94		559		
04:30	46		272		71		224		117		496		
04:45	64	184	292	1144	63	246	256	1022	127	430	548	2166	
05:00	40		278		67		282		107		560		
05:15	48		254		72		258		120		512		
05:30	38		236		85		260		123		496		
05:45	41	167	266	1034	72	296	260	1060	113	463	526	2094	
06:00	65		211		79		243		144		454		
06:15	84		284		92		241		176		525		
06:30	80		240		116		250		196		490		
06:45	91	320	236	971	100	387	208	942	191	707	444	1913	
07:00	90		218		103		200		193		418		
07:15	104		236		98		193		202		429		
07:30	86		228		121		177		207		405		
07:45	84	364	216	898	118	440	182	752	202	804	398	1650	
08:00	140		192		104		185		244		377		
08:15	104		229		168		158		272		387		
08:30	123		190		136		144		259		334		
08:45	140	507	182	793	158	566	152	639	298	1073	334	1432	
09:00	128		189		160		154		288		343		
09:15	150		144		160		135		310		279		
09:30	170		144		155		108		325		252		
09:45	194	642	147	624	188	663	122	519	382	1305	269	1143	
10:00	181		112		213		130		394		242		
10:15	218		118		198		94		416		212		
10:30	190		132		228		84		418		216		
10:45	211	800	98	460	210	849	85	393	421	1649	183	853	
11:00	228		146		234		88		462		234		
11:15	252		121		246		75		498		196		
11:30	252		104		240		54		492		158		
11:45	245	977	95	466	248	968	64	281	493	1945	159	747	
Total	5071		10931		5264		9943		10335		20874		
Percent	49.1%		52.4%		50.9%		47.6%						
Day Total			16002				15207				31209		
Peak	11:00		03:00		11:00		01:15		11:00		03:00		
Vol.	977		1244		968		1124		1945		2315		
P.H.F.	0.969		0.894		0.976		0.909		0.976		0.889		

Route 60
north of Bell Circle
City, State: Revere, MA
Client: VHB/ E. Guidoboni

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133300 C Volume
Site Code: 10271.01

Start Time	NB A.M.		NB P.M.		SB A.M.		SB P.M.		Combined A.M.		Combined P.M.		08-Apr-13 Mon
12:00	87		243		56		288		143		531		
12:15	79		264		37		228		116		492		
12:30	64		262		40		238		104		500		
12:45	51	281	244	1013	32	165	244	998	83	446	488	2011	
01:00	40		255		28		234		68		489		
01:15	42		248		31		240		73		488		
01:30	48		292		26		288		74		580		
01:45	50	180	262	1057	20	105	241	1003	70	285	503	2060	
02:00	42		264		22		198		64		462		
02:15	20		302		24		264		44		566		
02:30	24		306		16		299		40		605		
02:45	21	107	294	1166	38	100	298	1059	59	207	592	2225	
03:00	28		302		36		264		64		566		
03:15	26		314		38		291		64		605		
03:30	26		288		74		262		100		550		
03:45	39	119	324	1228	73	221	286	1103	112	340	610	2331	
04:00	30		331		74		278		104		609		
04:15	44		286		107		292		151		578		
04:30	58		340		116		274		174		614		
04:45	73	205	288	1245	140	437	273	1117	213	642	561	2362	
05:00	88		309		122		260		210		569		
05:15	80		285		188		264		268		549		
05:30	101		296		179		250		280		546		
05:45	102	371	342	1232	218	707	236	1010	320	1078	578	2242	
06:00	112		340		268		192		380		532		
06:15	144		332		342		249		486		581		
06:30	182		304		338		218		520		522		
06:45	176	614	300	1276	292	1240	205	864	468	1854	505	2140	
07:00	168		258		360		209		528		467		
07:15	184		268		308		204		492		472		
07:30	204		246		297		159		501		405		
07:45	222	778	202	974	310	1275	204	776	532	2053	406	1750	
08:00	166		245		299		186		465		431		
08:15	169		192		328		184		497		376		
08:30	183		190		296		149		479		339		
08:45	184	702	240	867	280	1203	161	680	464	1905	401	1547	
09:00	186		190		279		148		465		338		
09:15	214		178		250		158		464		336		
09:30	205		170		304		136		509		306		
09:45	216	821	156	694	257	1090	132	574	473	1911	288	1268	
10:00	225		144		274		114		499		258		
10:15	225		154		231		114		456		268		
10:30	226		180		262		116		488		296		
10:45	226	902	138	616	250	1017	88	432	476	1919	226	1048	
11:00	248		129		230		74		478		203		
11:15	236		132		270		90		506		222		
11:30	256		107		238		60		494		167		
11:45	226	966	58	426	214	952	78	302	440	1918	136	728	
Total	6046		11794		8512		9918		14558		21712		
Percent	41.5%		54.3%		58.5%		45.7%						
Day Total		17840				18430				36270			
Peak	10:45		05:45		06:15		02:30		07:00		03:45		
Vol.	966		1318		1332		1152		2053		2411		
P.H.F.	0.943		0.963		0.925		0.963		0.965		0.982		

Route 60
north of Bell Circle
City, State: Revere, MA
Client: VHB/ E. Guidoboni

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133300 C Volume
Site Code: 10271.01

Start Time	NB A.M.		NB P.M.		SB A.M.		SB P.M.		Combined A.M.		Combined P.M.		09-Apr-13 Tue
12:00	91		277		62		221		153		498		
12:15	92		244		34		212		126		456		
12:30	86		250		42		234		128		484		
12:45	51	320	259	1030	40	178	246	913	91	498	505	1943	
01:00	39		242		26		228		65		470		
01:15	34		260		21		236		55		496		
01:30	41		254		18		268		59		522		
01:45	31	145	258	1014	22	87	163	895	53	232	421	1909	
02:00	34		280		12		0		46		280		
02:15	26		302		24		0		50		302		
02:30	20		329		28		0		48		329		
02:45	28	108	266	1177	17	81	0	0	45	189	266	1177	
03:00	20		322		53		0		73		322		
03:15	28		323		34		0		62		323		
03:30	20		312		60		0		80		312		
03:45	42	110	295	1252	66	213	0	0	108	323	295	1252	
04:00	28		274		76		0		104		274		
04:15	44		306		104		0		148		306		
04:30	63		312		123		0		186		312		
04:45	85	220	330	1222	132	435	0	0	217	655	330	1222	
05:00	71		288		142		0		213		288		
05:15	91		359		166		0		257		359		
05:30	92		312		201		0		293		312		
05:45	102	356	345	1304	214	723	0	0	316	1079	345	1304	
06:00	118		294		278		0		396		294		
06:15	145		328		326		0		471		328		
06:30	176		322		341		0		517		322		
06:45	166	605	303	1247	305	1250	0	0	471	1855	303	1247	
07:00	218		282		319		0		537		282		
07:15	206		302		334		0		540		302		
07:30	215		272		260		0		475		272		
07:45	206	845	250	1106	244	1157	0	0	450	2002	250	1106	
08:00	191		219		248		0		439		219		
08:15	150		226		215		0		365		226		
08:30	188		216		200		0		388		216		
08:45	186	715	192	853	208	871	0	0	394	1586	192	853	
09:00	158		220		266		0		424		220		
09:15	212		210		308		0		520		210		
09:30	209		176		317		0		526		176		
09:45	275	854	154	760	271	1162	0	0	546	2016	154	760	
10:00	218		144		246		0		464		144		
10:15	228		175		256		0		484		175		
10:30	212		165		228		0		440		165		
10:45	210	868	168	652	250	980	0	0	460	1848	168	652	
11:00	251		164		268		0		519		164		
11:15	226		162		218		0		444		162		
11:30	242		128		226		0		468		128		
11:45	261	980	97	551	220	932	0	0	481	1912	97	551	
Total	6126		12168		8069		1808		14195		13976		
Percent	43.2%		87.1%		56.8%		12.9%						
Day Total		18294				9877				28171			
Peak	11:00		05:15		06:30		00:45		06:30		00:45		
Vol.	980		1310		1299		978		2065		1993		
P.H.F.	0.939		0.912		0.952		0.912		0.956		0.955		

Route 60
north of Bell Circle
City, State: Revere, MA
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133300 C Volume
Site Code: 10271.01

Start Time	NB A.M.		NB P.M.		SB A.M.		SB P.M.		Combined A.M.		Combined P.M.		10-Apr-13 Wed
12:00	92		282		0		0		92		282		
12:15	88		228		0		0		88		228		
12:30	68		242		0		0		68		242		
12:45	65	313	240	992	0	0	0	0	65	313	240	992	
01:00	62		260		0		0		62		260		
01:15	46		284		0		0		46		284		
01:30	55		272		0		0		55		272		
01:45	30	193	284	1100	0	0	0	0	30	193	284	1100	
02:00	38		273		0		0		38		273		
02:15	28		304		0		0		28		304		
02:30	22		301		0		0		22		301		
02:45	25	113	307	1185	0	0	0	0	25	113	307	1185	
03:00	26		337		0		0		26		337		
03:15	28		312		0		0		28		312		
03:30	34		308		0		0		34		308		
03:45	32	120	279	1236	0	0	0	0	32	120	279	1236	
04:00	24		321		0		0		24		321		
04:15	67		296		0		0		67		296		
04:30	62		289		0		0		62		289		
04:45	76	229	327	1233	0	0	0	0	76	229	327	1233	
05:00	72		312		0		0		72		312		
05:15	76		290		0		0		76		290		
05:30	86		308		0		0		86		308		
05:45	87	321	341	1251	0	0	0	0	87	321	341	1251	
06:00	132		350		0		0		132		350		
06:15	122		348		0		0		122		348		
06:30	156		290		0		0		156		290		
06:45	182	592	342	1330	0	0	0	0	182	592	342	1330	
07:00	196		252		0		0		196		252		
07:15	204		240		0		0		204		240		
07:30	226		210		0		0		226		210		
07:45	220	846	250	952	0	0	0	0	220	846	250	952	
08:00	182		224		0		0		182		224		
08:15	180		210		0		0		180		210		
08:30	194		190		0		0		194		190		
08:45	200	756	153	777	0	0	0	0	200	756	153	777	
09:00	180		158		0		0		180		158		
09:15	218		176		0		0		218		176		
09:30	213		170		0		0		213		170		
09:45	220	831	160	664	0	0	0	0	220	831	160	664	
10:00	220		149		0		0		220		149		
10:15	215		154		0		0		215		154		
10:30	236		161		0		0		236		161		
10:45	218	889	161	625	0	0	0	0	218	889	161	625	
11:00	256		176		0		0		256		176		
11:15	240		160		0		0		240		160		
11:30	260		118		0		0		260		118		
11:45	267	1023	90	544	0	0	0	0	267	1023	90	544	
Total	6226		11889		0		0		6226		11889		
Percent	100.0%		100.0%		0.0%		0.0%						
Day Total		18115				0				18115			
Peak	11:00		05:30						11:00		05:30		
Vol.	1023		1347						1023		1347		
P.H.F.	0.958		0.962						0.958		0.962		

Route 60
north of Bell Circle
City, State: Revere, MA
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Start Time	NB A.M.		NB P.M.		SB A.M.		SB P.M.		Combined A.M.		Combined P.M.		11-Apr-13 Thu
12:00	76		254		0		0		76		254		
12:15	78		260		0		0		78		260		
12:30	104		274		0		0		104		274		
12:45	83	341	242	1030	0	0	0	0	83	341	242	1030	
01:00	83		242		0		0		83		242		
01:15	80		259		0		0		80		259		
01:30	56		259		0		0		56		259		
01:45	46	265	254	1014	0	0	0	0	46	265	254	1014	
02:00	50		296		0		0		50		296		
02:15	40		319		0		0		40		319		
02:30	38		288		0		0		38		288		
02:45	24	152	298	1201	0	0	0	0	24	152	298	1201	
03:00	29		302		0		0		29		302		
03:15	27		311		0		0		27		311		
03:30	38		291		0		0		38		291		
03:45	35	129	315	1219	0	0	0	0	35	129	315	1219	
04:00	53		334		0		0		53		334		
04:15	46		342		0		0		46		342		
04:30	52		320		0		0		52		320		
04:45	67	218	308	1304	0	0	0	0	67	218	308	1304	
05:00	86		334		0		0		86		334		
05:15	116		332		0		0		116		332		
05:30	80		299		0		0		80		299		
05:45	104	386	321	1286	0	0	0	0	104	386	321	1286	
06:00	118		340		0		0		118		340		
06:15	139		336		0		0		139		336		
06:30	162		329		0		0		162		329		
06:45	188	607	330	1335	0	0	0	0	188	607	330	1335	
07:00	169		304		0		0		169		304		
07:15	202		265		0		0		202		265		
07:30	242		288		0		0		242		288		
07:45	251	864	238	1095	0	0	0	0	251	864	238	1095	
08:00	208		226		0		0		208		226		
08:15	201		222		0		0		201		222		
08:30	194		191		0		0		194		191		
08:45	208	811	198	837	0	0	0	0	208	811	198	837	
09:00	212		236		0		0		212		236		
09:15	190		219		0		0		190		219		
09:30	211		208		0		0		211		208		
09:45	198	811	198	861	0	0	0	0	198	811	198	861	
10:00	206		174		0		0		206		174		
10:15	206		204		0		0		206		204		
10:30	254		216		0		0		254		216		
10:45	209	875	186	780	0	0	0	0	209	875	186	780	
11:00	212		152		0		0		212		152		
11:15	256		175		0		0		256		175		
11:30	262		144		0		0		262		144		
11:45	270	1000	138	609	0	0	0	0	270	1000	138	609	
Total	6459		12571		0		0		6459		12571		
Percent	100.0%		100.0%		0.0%		0.0%						
Day Total			19030				0				19030		
Peak	11:00		06:00						11:00		06:00		
Vol.	1000		1335						1000		1335		
P.H.F.	0.926		0.982						0.926		0.982		

Route 60
north of Bell Circle
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133300 C Volume
Site Code: 10271.01

Start Time	NB A.M.		NB P.M.		SB A.M.		SB P.M.		Combined A.M.		Combined P.M.		12-Apr-13 Fri
12:00	97		248		0		0		97		248		
12:15	96		268		0		0		96		268		
12:30	77		272		0		0		77		272		
12:45	84	354	268	1056	0	0	0	0	84	354	268	1056	
01:00	80		306		0		0		80		306		
01:15	52		281		0		0		52		281		
01:30	56		279		0		0		56		279		
01:45	48	236	282	1148	0	0	0	0	48	236	282	1148	
02:00	46		290		0		0		46		290		
02:15	52		308		0		0		52		308		
02:30	36		292		0		0		36		292		
02:45	34	168	282	1172	0	0	0	0	34	168	282	1172	
03:00	20		287		0		0		20		287		
03:15	22		288		0		0		22		288		
03:30	46		310		0		0		46		310		
03:45	36	124	328	1213	0	0	0	0	36	124	328	1213	
04:00	34		306		0		0		34		306		
04:15	44		324		0		0		44		324		
04:30	50		302		0		0		50		302		
04:45	72	200	305	1237	0	0	0	0	72	200	305	1237	
05:00	78		310		0		0		78		310		
05:15	108		318		0		0		108		318		
05:30	98		296		0		0		98		296		
05:45	86	370	296	1220	0	0	0	0	86	370	296	1220	
06:00	126		311		0		0		126		311		
06:15	144		286		0		0		144		286		
06:30	178		280		0		0		178		280		
06:45	214	662	298	1175	0	0	0	0	214	662	298	1175	
07:00	197		298		0		0		197		298		
07:15	220		244		0		0		220		244		
07:30	205		264		0		0		205		264		
07:45	252	874	258	1064	0	0	0	0	252	874	258	1064	
08:00	216		212		0		0		216		212		
08:15	190		215		0		0		190		215		
08:30	237		228		0		0		237		228		
08:45	165	808	226	881	0	0	0	0	165	808	226	881	
09:00	198		226		0		0		198		226		
09:15	227		222		0		0		227		222		
09:30	234		204		0		0		234		204		
09:45	210	869	198	850	0	0	0	0	210	869	198	850	
10:00	226		228		0		0		226		228		
10:15	236		178		0		0		236		178		
10:30	234		212		0		0		234		212		
10:45	252	948	150	768	0	0	0	0	252	948	150	768	
11:00	248		208		0		0		248		208		
11:15	254		184		0		0		254		184		
11:30	230		166		0		0		230		166		
11:45	263	995	134	692	0	0	0	0	263	995	134	692	
Total	6608		12476		0		0		6608		12476		
Percent	100.0%		100.0%		0.0%		0.0%						
Day Total			19084				0				19084		
Peak	11:00		03:30						11:00		03:30		
Vol.	995		1268						995		1268		
P.H.F.	0.946		0.966						0.946		0.966		

Revere Beach Highway (Route 16)
west of Mill Street
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133300 D Volume
Site Code: 10271.01

Start Time	EB A.M.		EB P.M.		WB A.M.		WB P.M.		Combined A.M.		Combined P.M.		06-Apr-13 Sat
12:00	134		323		78		332		212		655		
12:15	112		360		61		330		173		690		
12:30	116		363		51		322		167		685		
12:45	90	452	370	1416	46	236	324	1308	136	688	694	2724	
01:00	82		338		73		323		155		661		
01:15	84		366		44		303		128		669		
01:30	68		351		42		302		110		653		
01:45	63	297	367	1422	34	193	337	1265	97	490	704	2687	
02:00	84		340		36		284		120		624		
02:15	80		356		30		292		110		648		
02:30	62		358		45		296		107		654		
02:45	62	288	383	1437	48	159	314	1186	110	447	697	2623	
03:00	54		383		35		318		89		701		
03:15	50		422		40		338		90		760		
03:30	30		374		49		278		79		652		
03:45	39	173	393	1572	43	167	266	1200	82	340	659	2772	
04:00	34		382		58		315		92		697		
04:15	31		348		51		286		82		634		
04:30	27		350		46		266		73		616		
04:45	27	119	370	1450	46	201	270	1137	73	320	640	2587	
05:00	29		346		41		256		70		602		
05:15	44		340		76		278		120		618		
05:30	48		310		92		256		140		566		
05:45	34	155	316	1312	98	307	284	1074	132	462	600	2386	
06:00	56		290		99		256		155		546		
06:15	62		306		132		238		194		544		
06:30	72		296		138		270		210		566		
06:45	100	290	244	1136	140	509	255	1019	240	799	499	2155	
07:00	92		302		157		280		249		582		
07:15	111		267		164		256		275		523		
07:30	140		254		192		241		332		495		
07:45	156	499	264	1087	192	705	216	993	348	1204	480	2080	
08:00	159		262		206		182		365		444		
08:15	190		244		227		194		417		438		
08:30	206		224		231		194		437		418		
08:45	187	742	232	962	232	896	195	765	419	1638	427	1727	
09:00	196		196		256		156		452		352		
09:15	193		238		262		190		455		428		
09:30	208		188		262		156		470		344		
09:45	253	850	194	816	296	1076	182	684	549	1926	376	1500	
10:00	250		202		304		174		554		376		
10:15	267		198		272		150		539		348		
10:30	266		156		306		164		572		320		
10:45	280	1063	176	732	303	1185	122	610	583	2248	298	1342	
11:00	291		142		283		119		574		261		
11:15	306		180		270		117		576		297		
11:30	314		118		333		112		647		230		
11:45	356	1267	124	564	312	1198	94	442	668	2465	218	1006	
Total	6195		13906		6832		11683		13027		25589		
Percent	47.6%		54.3%		52.4%		45.7%						
Day Total		20101				18515				38616			
Peak	11:00		03:00		11:00		12:00		11:00		02:30		
Vol.	1267		1572		1198		1308		2465		2812		
P.H.F.	0.890		0.931		0.899		0.985		0.923		0.925		

Revere Beach Highway (Route 16)
west of Mill Street
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133300 D Volume
Site Code: 10271.01

Start Time	EB A.M.		EB P.M.		WB A.M.		WB P.M.		Combined A.M.		Combined P.M.		07-Apr-13 Sun
12:00	119		297		86		258		205		555		
12:15	104		330		66		324		170		654		
12:30	94		286		56		295		150		581		
12:45	93	410	351	1264	76	284	310	1187	169	694	661	2451	
01:00	125		336		102		310		227		646		
01:15	90		304		63		292		153		596		
01:30	62		338		38		327		100		665		
01:45	60	337	356	1334	48	251	279	1208	108	588	635	2542	
02:00	58		306		39		298		97		604		
02:15	70		362		40		298		110		660		
02:30	66		347		34		304		100		651		
02:45	52	246	322	1337	38	151	291	1191	90	397	613	2528	
03:00	60		349		30		292		90		641		
03:15	46		312		44		262		90		574		
03:30	39		348		32		258		71		606		
03:45	35	180	310	1319	26	132	272	1084	61	312	582	2403	
04:00	25		332		38		302		63		634		
04:15	20		356		36		229		56		585		
04:30	44		284		44		260		88		544		
04:45	20	109	342	1314	35	153	264	1055	55	262	606	2369	
05:00	21		316		48		268		69		584		
05:15	34		296		42		271		76		567		
05:30	26		318		62		226		88		544		
05:45	44	125	280	1210	47	199	288	1053	91	324	568	2263	
06:00	36		269		56		230		92		499		
06:15	33		327		85		220		118		547		
06:30	46		270		77		235		123		505		
06:45	60	175	234	1100	82	300	174	859	142	475	408	1959	
07:00	66		212		84		206		150		418		
07:15	70		216		101		202		171		418		
07:30	74		202		86		158		160		360		
07:45	80	290	210	840	123	394	188	754	203	684	398	1594	
08:00	79		183		138		167		217		350		
08:15	118		193		145		124		263		317		
08:30	128		189		193		172		321		361		
08:45	124	449	183	748	158	634	148	611	282	1083	331	1359	
09:00	148		146		178		124		326		270		
09:15	146		144		207		136		353		280		
09:30	187		141		218		110		405		251		
09:45	195	676	109	540	206	809	102	472	401	1485	211	1012	
10:00	212		116		228		120		440		236		
10:15	204		118		228		114		432		232		
10:30	238		84		261		109		499		193		
10:45	236	890	96	414	270	987	90	433	506	1877	186	847	
11:00	274		84		266		66		540		150		
11:15	264		99		260		74		524		173		
11:30	282		88		286		60		568		148		
11:45	330	1150	72	343	305	1117	54	254	635	2267	126	597	
Total	5037		11763		5411		10161		10448		21924		
Percent	48.2%		53.7%		51.8%		46.3%						
Day Total			16800				15572				32372		
Peak	11:00		02:15		11:00		00:15		11:00		00:45		
Vol.	1150		1380		1117		1239		2267		2568		
P.H.F.	0.871		0.953		0.916		0.956		0.893		0.965		

Revere Beach Highway (Route 16)
west of Mill Street
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
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133300 D Volume
Site Code: 10271.01

Start Time	EB A.M.		EB P.M.		WB A.M.		WB P.M.		Combined A.M.		Combined P.M.		08-Apr-13 Mon
12:00	58		316		41		246		99		562		
12:15	60		280		35		273		95		553		
12:30	47		312		36		291		83		603		
12:45	45	210	280	1188	29	141	242	1052	74	351	522	2240	
01:00	34		291		41		280		75		571		
01:15	36		290		35		269		71		559		
01:30	18		337		22		290		40		627		
01:45	26	114	320	1238	24	122	265	1104	50	236	585	2342	
02:00	37		322		22		270		59		592		
02:15	21		340		14		266		35		606		
02:30	21		354		22		291		43		645		
02:45	17	96	356	1372	30	88	312	1139	47	184	668	2511	
03:00	15		349		19		338		34		687		
03:15	22		410		36		324		58		734		
03:30	46		390		36		327		82		717		
03:45	25	108	400	1549	50	141	313	1302	75	249	713	2851	
04:00	20		392		52		320		72		712		
04:15	36		402		66		328		102		730		
04:30	36		412		90		332		126		744		
04:45	46	138	438	1644	80	288	310	1290	126	426	748	2934	
05:00	48		416		97		308		145		724		
05:15	53		477		133		338		186		815		
05:30	70		404		175		272		245		676		
05:45	114	285	345	1642	188	593	286	1204	302	878	631	2846	
06:00	136		330		188		261		324		591		
06:15	142		358		274		237		416		595		
06:30	190		382		338		239		528		621		
06:45	192	660	296	1366	303	1103	220	957	495	1763	516	2323	
07:00	255		361		370		243		625		604		
07:15	250		262		327		248		577		510		
07:30	278		267		310		212		588		479		
07:45	260	1043	285	1175	394	1401	223	926	654	2444	508	2101	
08:00	265		262		316		184		581		446		
08:15	286		250		320		166		606		416		
08:30	247		241		331		160		578		401		
08:45	234	1032	180	933	258	1225	138	648	492	2257	318	1581	
09:00	210		200		303		128		513		328		
09:15	252		201		282		132		534		333		
09:30	239		172		281		118		520		290		
09:45	240	941	152	725	270	1136	116	494	510	2077	268	1219	
10:00	212		158		264		91		476		249		
10:15	295		134		243		130		538		264		
10:30	248		120		304		110		552		230		
10:45	254	1009	104	516	257	1068	70	401	511	2077	174	917	
11:00	237		82		259		60		496		142		
11:15	272		100		245		68		517		168		
11:30	254		81		260		64		514		145		
11:45	280	1043	83	346	264	1028	52	244	544	2071	135	590	
Total	6679		13694		8334		10761		15013		24455		
Percent	44.5%		56.0%		55.5%		44.0%						
Day Total		20373				19095				39468			
Peak	07:30		04:30		07:00		03:00		07:00		04:30		
Vol.	1089		1743		1401		1302		2444		3031		
P.H.F.	0.952		0.914		0.889		0.963		0.934		0.930		

Revere Beach Highway (Route 16)
west of Mill Street
City, State: Revere, MA
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133300 D Volume
Site Code: 10271.01

Start Time	EB A.M.		EB P.M.		WB A.M.		WB P.M.		Combined A.M.		Combined P.M.		09-Apr-13 Tue
12:00	74		282		45		280		119		562		
12:15	64		324		44		281		108		605		
12:30	55		321		30		283		85		604		
12:45	42	235	330	1257	28	147	276	1120	70	382	606	2377	
01:00	47		300		17		266		64		566		
01:15	48		340		24		298		72		638		
01:30	30		321		18		315		48		636		
01:45	30	155	302	1263	17	76	317	1196	47	231	619	2459	
02:00	27		322		20		266		47		588		
02:15	18		366		17		300		35		666		
02:30	25		370		18		341		43		711		
02:45	22	92	388	1446	28	83	324	1231	50	175	712	2677	
03:00	17		366		32		350		49		716		
03:15	14		390		38		366		52		756		
03:30	26		415		30		346		56		761		
03:45	16	73	420	1591	36	136	290	1352	52	209	710	2943	
04:00	22		404		52		336		74		740		
04:15	24		442		53		278		77		720		
04:30	40		424		81		304		121		728		
04:45	38	124	448	1718	84	270	288	1206	122	394	736	2924	
05:00	43		456		88		332		131		788		
05:15	50		436		126		350		176		786		
05:30	74		404		174		302		248		706		
05:45	96	263	354	1650	198	586	296	1280	294	849	650	2930	
06:00	131		388		240		266		371		654		
06:15	136		364		264		272		400		636		
06:30	161		400		340		260		501		660		
06:45	198	626	331	1483	272	1116	232	1030	470	1742	563	2513	
07:00	222		308		327		266		549		574		
07:15	258		250		294		254		552		504		
07:30	270		315		341		229		611		544		
07:45	283	1033	264	1137	353	1315	202	951	636	2348	466	2088	
08:00	260		244		304		186		564		430		
08:15	284		246		340		178		624		424		
08:30	227		234		311		184		538		418		
08:45	269	1040	219	943	282	1237	182	730	551	2277	401	1673	
09:00	226		200		306		139		532		339		
09:15	252		220		296		146		548		366		
09:30	250		166		263		133		513		299		
09:45	234	962	164	750	238	1103	138	556	472	2065	302	1306	
10:00	252		173		266		104		518		277		
10:15	208		156		242		103		450		259		
10:30	253		128		252		120		505		248		
10:45	285	998	108	565	244	1004	92	419	529	2002	200	984	
11:00	292		111		258		84		550		195		
11:15	245		114		234		72		479		186		
11:30	282		78		304		57		586		135		
11:45	310	1129	87	390	298	1094	55	268	608	2223	142	658	
Total	6730		14193		8167		11339		14897		25532		
Percent	45.2%		55.6%		54.8%		44.4%						
Day Total			20923				19506				40429		
Peak	11:00		04:15		07:30		02:45		07:30		04:30		
Vol.	1129		1770		1338		1386		2435		3038		
P.H.F.	0.910		0.970		0.948		0.947		0.957		0.964		

Revere Beach Highway (Route 16)
west of Mill Street
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133300 D Volume
Site Code: 10271.01

Start Time	EB A.M.		EB P.M.		WB A.M.		WB P.M.		Combined A.M.		Combined P.M.		10-Apr-13 Wed
12:00	67		300		33		302		100		602		
12:15	62		279		36		266		98		545		
12:30	46		296		28		272		74		568		
12:45	34	209	292	1167	24	121	240	1080	58	330	532	2247	
01:00	47		278		32		270		79		548		
01:15	44		296		26		278		70		574		
01:30	30		278		19		294		49		572		
01:45	25	146	304	1156	16	93	280	1122	41	239	584	2278	
02:00	29		292		14		310		43		602		
02:15	20		310		18		312		38		622		
02:30	30		362		31		335		61		697		
02:45	18	97	388	1352	32	95	282	1239	50	192	670	2591	
03:00	18		312		21		349		39		661		
03:15	20		375		30		352		50		727		
03:30	18		419		39		297		57		716		
03:45	20	76	437	1543	42	132	296	1294	62	208	733	2837	
04:00	36		424		44		318		80		742		
04:15	37		413		54		292		91		705		
04:30	31		436		98		328		129		764		
04:45	32	136	404	1677	74	270	272	1210	106	406	676	2887	
05:00	44		450		96		334		140		784		
05:15	46		430		122		316		168		746		
05:30	60		385		200		285		260		670		
05:45	96	246	384	1649	204	622	270	1205	300	868	654	2854	
06:00	123		364		232		278		355		642		
06:15	136		374		268		246		404		620		
06:30	186		342		316		264		502		606		
06:45	202	647	302	1382	310	1126	226	1014	512	1773	528	2396	
07:00	222		313		382		254		604		567		
07:15	244		277		344		234		588		511		
07:30	284		263		304		182		588		445		
07:45	276	1026	253	1106	339	1369	162	832	615	2395	415	1938	
08:00	286		251		349		166		635		417		
08:15	272		257		313		151		585		408		
08:30	282		209		314		168		596		377		
08:45	258	1098	201	918	284	1260	129	614	542	2358	330	1532	
09:00	230		182		292		133		522		315		
09:15	230		172		296		146		526		318		
09:30	252		194		285		94		537		288		
09:45	261	973	148	696	222	1095	120	493	483	2068	268	1189	
10:00	228		165		268		105		496		270		
10:15	268		141		236		114		504		255		
10:30	249		138		260		88		509		226		
10:45	250	995	140	584	277	1041	96	403	527	2036	236	987	
11:00	282		119		217		80		499		199		
11:15	259		122		260		74		519		196		
11:30	250		96		278		66		528		162		
11:45	288	1079	74	411	263	1018	54	274	551	2097	128	685	
Total	6728		13641		8242		10780		14970		24421		
Percent	44.9%		55.9%		55.1%		44.1%						
Day Total			20369				19022				39391		
Peak	07:30		04:30		07:00		02:30		07:45		04:30		
Vol.	1118		1720		1369		1318		2431		2970		
P.H.F.	0.977		0.956		0.896		0.936		0.957		0.947		

Revere Beach Highway (Route 16)
west of Mill Street
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
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Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133300 D Volume
Site Code: 10271.01

Start Time	EB A.M.		EB P.M.		WB A.M.		WB P.M.		Combined A.M.		Combined P.M.		11-Apr-13 Thu
12:00	68		281		38		260		106		541		
12:15	54		277		38		280		92		557		
12:30	44		287		30		254		74		541		
12:45	37	203	299	1144	44	150	264	1058	81	353	563	2202	
01:00	44		311		37		305		81		616		
01:15	38		286		26		269		64		555		
01:30	32		294		38		304		70		598		
01:45	23	137	328	1219	31	132	264	1142	54	269	592	2361	
02:00	34		322		26		274		60		596		
02:15	29		300		24		298		53		598		
02:30	30		371		34		296		64		667		
02:45	26	119	388	1381	32	116	332	1200	58	235	720	2581	
03:00	26		334		33		298		59		632		
03:15	14		370		53		343		67		713		
03:30	18		376		48		320		66		696		
03:45	28	86	400	1480	52	186	295	1256	80	272	695	2736	
04:00	29		406		75		349		104		755		
04:15	31		432		73		270		104		702		
04:30	25		410		95		336		120		746		
04:45	40	125	368	1616	75	318	286	1241	115	443	654	2857	
05:00	50		450		96		320		146		770		
05:15	56		471		136		294		192		765		
05:30	65		423		180		262		245		685		
05:45	79	250	373	1717	197	609	310	1186	276	859	683	2903	
06:00	134		369		219		265		353		634		
06:15	142		376		284		277		426		653		
06:30	180		368		309		310		489		678		
06:45	216	672	302	1415	293	1105	214	1066	509	1777	516	2481	
07:00	220		304		343		241		563		545		
07:15	266		277		335		240		601		517		
07:30	256		290		336		188		592		478		
07:45	264	1006	261	1132	352	1366	191	860	616	2372	452	1992	
08:00	292		260		320		189		612		449		
08:15	278		238		316		198		594		436		
08:30	293		226		316		195		609		421		
08:45	238	1101	214	938	276	1228	172	754	514	2329	386	1692	
09:00	257		258		306		150		563		408		
09:15	241		239		284		143		525		382		
09:30	230		211		278		135		508		346		
09:45	232	960	180	888	264	1132	126	554	496	2092	306	1442	
10:00	256		202		266		114		522		316		
10:15	270		178		251		122		521		300		
10:30	240		156		247		122		487		278		
10:45	266	1032	122	658	269	1033	95	453	535	2065	217	1111	
11:00	224		110		254		74		478		184		
11:15	286		112		232		74		518		186		
11:30	308		100		270		72		578		172		
11:45	266	1084	90	412	241	997	58	278	507	2081	148	690	
Total	6775		14000		8372		11048		15147		25048		
Percent	44.7%		55.9%		55.3%		44.1%						
Day Total			20775				19420				40195		
Peak	07:45		05:00		07:00		03:15		07:45		04:30		
Vol.	1127		1717		1366		1307		2431		2935		
P.H.F.	0.962		0.911		0.970		0.936		0.987		0.953		

Revere Beach Highway (Route 16)
west of Mill Street
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
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Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133300 D Volume
Site Code: 10271.01

Start Time	EB A.M.		EB P.M.		WB A.M.		WB P.M.		Combined A.M.		Combined P.M.		12-Apr-13 Fri
12:00	72		304		49		246		121		550		
12:15	71		306		48		268		119		574		
12:30	69		296		37		258		106		554		
12:45	55	267	321	1227	40	174	264	1036	95	441	585	2263	
01:00	42		298		48		287		90		585		
01:15	52		296		30		263		82		559		
01:30	49		292		22		301		71		593		
01:45	25	168	353	1239	23	123	242	1093	48	291	595	2332	
02:00	40		352		32		270		72		622		
02:15	36		340		28		266		64		606		
02:30	30		300		28		284		58		584		
02:45	30	136	332	1324	39	127	282	1102	69	263	614	2426	
03:00	25		332		26		330		51		662		
03:15	24		339		34		303		58		642		
03:30	23		405		38		319		61		724		
03:45	30	102	364	1440	52	150	277	1229	82	252	641	2669	
04:00	27		396		48		310		75		706		
04:15	32		388		63		286		95		674		
04:30	35		396		67		303		102		699		
04:45	36	130	404	1584	91	269	234	1133	127	399	638	2717	
05:00	48		444		95		288		143		732		
05:15	36		434		134		310		170		744		
05:30	72		369		166		245		238		614		
05:45	102	258	358	1605	166	561	274	1117	268	819	632	2722	
06:00	110		368		198		233		308		601		
06:15	138		349		264		227		402		576		
06:30	187		377		291		224		478		601		
06:45	206	641	328	1422	294	1047	244	928	500	1688	572	2350	
07:00	232		318		315		230		547		548		
07:15	304		306		345		210		649		516		
07:30	319		262		291		191		610		453		
07:45	282	1137	268	1154	372	1323	208	839	654	2460	476	1993	
08:00	276		248		344		174		620		422		
08:15	287		213		332		144		619		357		
08:30	243		222		338		152		581		374		
08:45	234	1040	194	877	231	1245	146	616	465	2285	340	1493	
09:00	232		226		272		140		504		366		
09:15	226		220		282		142		508		362		
09:30	212		189		272		123		484		312		
09:45	252	922	159	794	246	1072	162	567	498	1994	321	1361	
10:00	247		190		245		147		492		337		
10:15	262		168		265		128		527		296		
10:30	266		156		247		126		513		282		
10:45	282	1057	152	666	261	1018	105	506	543	2075	257	1172	
11:00	256		145		278		119		534		264		
11:15	288		136		254		94		542		230		
11:30	258		158		270		102		528		260		
11:45	314	1116	113	552	256	1058	68	383	570	2174	181	935	
Total	6974		13884		8167		10549		15141		24433		
Percent	46.1%		56.8%		53.9%		43.2%						
Day Total			20858				18716				39574		
Peak	07:15		04:30		07:45		02:45		07:15		04:30		
Vol.	1181		1678		1386		1234		2533		2813		
P.H.F.	0.926		0.945		0.931		0.935		0.968		0.945		

Tomesello Way
east of Lee Burbank Highway (Route 1A)
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

122994 B Volume
Site Code: 10271.01

Start Time	EB A.M.		EB P.M.		WB A.M.		WB P.M.		Combined A.M.		Combined P.M.		23-Jul-12 Mon
12:00	2		61		0		14		2		75		
12:15	0		60		0		6		0		66		
12:30	3		45		1		7		4		52		
12:45	2	7	43	209	1	2	6	33	3	9	49	242	
01:00	1		40		1		13		2		53		
01:15	2		45		0		14		2		59		
01:30	0		35		0		14		0		49		
01:45	5	8	42	162	0	1	14	55	5	9	56	217	
02:00	0		34		0		10		0		44		
02:15	2		59		0		11		2		70		
02:30	0		27		0		13		0		40		
02:45	1	3	37	157	0	0	7	41	1	3	44	198	
03:00	0		44		0		12		0		56		
03:15	3		31		1		13		4		44		
03:30	0		49		1		10		1		59		
03:45	1	4	43	167	0	2	8	43	1	6	51	210	
04:00	2		50		1		14		3		64		
04:15	1		56		0		15		1		71		
04:30	3		67		0		21		3		88		
04:45	5	11	60	233	0	1	10	60	5	12	70	293	
05:00	4		62		0		12		4		74		
05:15	14		67		0		6		14		73		
05:30	7		38		2		7		9		45		
05:45	11	36	54	221	4	6	7	32	15	42	61	253	
06:00	5		69		4		7		9		76		
06:15	5		52		3		9		8		61		
06:30	1		57		6		2		7		59		
06:45	7	18	64	242	8	21	3	21	15	39	67	263	
07:00	6		44		13		4		19		48		
07:15	5		26		7		5		12		31		
07:30	15		29		18		4		33		33		
07:45	4	30	23	122	19	57	4	17	23	87	27	139	
08:00	9		14		22		2		31		16		
08:15	11		25		24		3		35		28		
08:30	8		12		11		3		19		15		
08:45	3	31	16	67	13	70	7	15	16	101	23	82	
09:00	13		18		15		4		28		22		
09:15	19		15		7		4		26		19		
09:30	12		15		6		2		18		17		
09:45	16	60	9	57	4	32	1	11	20	92	10	68	
10:00	26		6		3		5		29		11		
10:15	14		9		5		1		19		10		
10:30	20		12		4		4		24		16		
10:45	20	80	11	38	8	20	1	11	28	100	12	49	
11:00	32		3		5		0		37		3		
11:15	32		7		8		0		40		7		
11:30	31		3		10		1		41		4		
11:45	45	140	6	19	7	30	2	3	52	170	8	22	
Total	428		1694		242		342		670		2036		
Percent	63.9%		83.2%		36.1%		16.8%						
Day Total			2122				584				2706		
Peak	11:00		04:30		07:30		04:00		11:00		04:30		
Vol.	140		256		83		60		170		305		
P.H.F.	0.778		0.955		0.865		0.714		0.817		0.866		

Tomesello Way
east of Lee Burbank Highway (Route 1A)
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
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122994 B Volume
Site Code: 10271.01

Start Time	EB A.M.		EB P.M.		WB A.M.		WB P.M.		Combined A.M.		Combined P.M.		24-Jul-12 Tue
12:00	4		47		0		5		4		52		
12:15	4		43		1		3		5		46		
12:30	2		60		0		7		2		67		
12:45	1	11	45	195	1	2	9	24	2	13	54	219	
01:00	1		41		1		8		2		49		
01:15	3		35		0		12		3		47		
01:30	2		37		1		5		3		42		
01:45	2	8	31	144	0	2	10	35	2	10	41	179	
02:00	0		38		1		12		1		50		
02:15	2		25		1		5		3		30		
02:30	2		37		0		7		2		44		
02:45	3	7	53	153	0	2	11	35	3	9	64	188	
03:00	0		32		0		10		0		42		
03:15	0		34		1		8		1		42		
03:30	1		36		0		5		1		41		
03:45	1	2	44	146	0	1	8	31	1	3	52	177	
04:00	2		44		2		12		4		56		
04:15	0		68		0		21		0		89		
04:30	7		58		0		8		7		66		
04:45	4	13	67	237	0	2	9	50	4	15	76	287	
05:00	1		64		0		7		1		71		
05:15	10		80		0		8		10		88		
05:30	13		80		1		12		14		92		
05:45	15	39	69	293	2	3	6	33	17	42	75	326	
06:00	8		64		3		1		11		65		
06:15	8		54		5		5		13		59		
06:30	6		51		7		6		13		57		
06:45	10	32	40	209	7	22	5	17	17	54	45	226	
07:00	8		46		12		6		20		52		
07:15	7		26		13		4		20		30		
07:30	11		22		19		4		30		26		
07:45	9	35	28	122	15	59	4	18	24	94	32	140	
08:00	9		15		32		7		41		22		
08:15	8		21		23		3		31		24		
08:30	11		17		19		8		30		25		
08:45	3	31	16	69	14	88	0	18	17	119	16	87	
09:00	9		22		8		2		17		24		
09:15	15		14		8		3		23		17		
09:30	15		13		4		2		19		15		
09:45	15	54	10	59	7	27	1	8	22	81	11	67	
10:00	20		10		5		3		25		13		
10:15	26		8		6		1		32		9		
10:30	9		5		5		0		14		5		
10:45	20	75	7	30	4	20	0	4	24	95	7	34	
11:00	26		6		6		1		32		7		
11:15	22		12		5		1		27		13		
11:30	33		5		7		0		40		5		
11:45	41	122	5	28	7	25	1	3	48	147	6	31	
Total	429		1685		253		276		682		1961		
Percent	62.9%		85.9%		37.1%		14.1%						
Day Total		2114				529				2643			
Peak	11:00		05:00		07:30		04:00		11:00		04:45		
Vol.	122		293		89		50		147		327		
P.H.F.	0.744		0.916		0.695		0.595		0.766		0.889		

Tomesello Way
east of Lee Burbank Highway (Route 1A)
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

122994 B Volume
Site Code: 10271.01

Start Time	EB A.M.		EB P.M.		WB A.M.		WB P.M.		Combined A.M.		Combined P.M.		25-Jul-12 Wed
12:00	4		55		0		11		4		66		
12:15	7		74		2		9		9		83		
12:30	4		56		0		7		4		63		
12:45	1	16	61	246	0	2	15	42	1	18	76	288	
01:00	2		57		0		3		2		60		
01:15	0		70		0		11		0		81		
01:30	5		49		1		7		6		56		
01:45	0	7	37	213	0	1	16	37	0	8	53	250	
02:00	1		35		1		17		2		52		
02:15	2		34		0		17		2		51		
02:30	2		39		2		9		4		48		
02:45	1	6	45	153	0	3	19	62	1	9	64	215	
03:00	0		59		1		17		1		76		
03:15	1		43		0		18		1		61		
03:30	0		37		1		12		1		49		
03:45	1	2	39	178	0	2	13	60	1	4	52	238	
04:00	2		35		0		12		2		47		
04:15	1		49		1		16		2		65		
04:30	5		60		0		16		5		76		
04:45	2	10	54	198	0	1	22	66	2	11	76	264	
05:00	6		63		2		17		8		80		
05:15	11		61		1		7		12		68		
05:30	12		64		4		6		16		70		
05:45	9	38	56	244	1	8	6	36	10	46	62	280	
06:00	8		48		5		6		13		54		
06:15	6		57		5		18		11		75		
06:30	5		57		10		7		15		64		
06:45	8	27	44	206	9	29	10	41	17	56	54	247	
07:00	4		33		16		4		20		37		
07:15	5		24		18		7		23		31		
07:30	8		27		20		7		28		34		
07:45	10	27	35	119	18	72	6	24	28	99	41	143	
08:00	9		26		27		4		36		30		
08:15	15		24		17		5		32		29		
08:30	3		18		23		7		26		25		
08:45	7	34	22	90	18	85	3	19	25	119	25	109	
09:00	17		20		14		3		31		23		
09:15	11		17		4		7		15		24		
09:30	11		11		9		2		20		13		
09:45	18	57	9	57	5	32	1	13	23	89	10	70	
10:00	17		14		4		3		21		17		
10:15	21		10		7		2		28		12		
10:30	21		9		7		3		28		12		
10:45	42	101	7	40	9	27	3	11	51	128	10	51	
11:00	20		16		4		3		24		19		
11:15	30		9		5		1		35		10		
11:30	44		9		2		2		46		11		
11:45	43	137	6	40	6	17	2	8	49	154	8	48	
Total	462		1784		279		419		741		2203		
Percent	62.3%		81.0%		37.7%		19.0%						
Day Total			2246				698				2944		
Peak	11:00		00:15		07:45		04:15		10:45		04:30		
Vol.	137		248		85		71		156		300		
P.H.F.	0.778		0.838		0.787		0.807		0.765		0.938		

Tomesello Way
east of Lee Burbank Highway (Route 1A)
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

122994 B Volume
Site Code: 10271.01

Start	EB				WB				Combined				26-Jul-12
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Thu
12:00	5		36		2		4		7		40		
12:15	8		50		0		7		8		57		
12:30	1		38		0		5		1		43		
12:45	2	16	39	163	0	2	4	20	2	18	43	183	
01:00	2		40		0		5		2		45		
01:15	0		43		0		7		0		50		
01:30	0		31		0		9		0		40		
01:45	2	4	29	143	1	1	4	25	3	5	33	168	
02:00	2		32		1		21		3		53		
02:15	2		49		1		11		3		60		
02:30	3		38		0		9		3		47		
02:45	1	8	36	155	0	2	6	47	1	10	42	202	
03:00	1		41		1		6		2		47		
03:15	0		39		0		10		0		49		
03:30	2		48		2		9		4		57		
03:45	1	4	42	170	0	3	7	32	1	7	49	202	
04:00	3		39		1		4		4		43		
04:15	1		53		0		6		1		59		
04:30	3		60		1		6		4		66		
04:45	5	12	54	206	1	3	9	25	6	15	63	231	
05:00	6		56		1		7		7		63		
05:15	11		45		0		4		11		49		
05:30	8		55		3		9		11		64		
05:45	14	39	55	211	4	8	6	26	18	47	61	237	
06:00	10		55		3		1		13		56		
06:15	11		64		3		10		14		74		
06:30	5		48		10		5		15		53		
06:45	10	36	44	211	6	22	12	28	16	58	56	239	
07:00	7		49		7		5		14		54		
07:15	9		35		16		2		25		37		
07:30	14		30		16		9		30		39		
07:45	8	38	30	144	26	65	8	24	34	103	38	168	
08:00	3		26		30		3		33		29		
08:15	9		24		18		7		27		31		
08:30	10		15		25		8		35		23		
08:45	6	28	6	71	16	89	14	32	22	117	20	103	
09:00	14		19		12		4		26		23		
09:15	12		16		14		2		26		18		
09:30	9		16		3		1		12		17		
09:45	20	55	14	65	3	32	4	11	23	87	18	76	
10:00	16		11		7		1		23		12		
10:15	14		18		2		1		16		19		
10:30	29		13		7		0		36		13		
10:45	22	81	8	50	3	19	0	2	25	100	8	52	
11:00	22		14		8		3		30		17		
11:15	22		11		1		1		23		12		
11:30	25		3		4		2		29		5		
11:45	34	103	1	29	9	22	1	7	43	125	2	36	
Total	424		1618		268		279		692		1897		
Percent	61.3%		85.3%		38.7%		14.7%						
Day Total		2042				547				2589			
Peak	11:00		05:30		07:45		02:00		07:45		05:30		
Vol.	103		229		99		47		129		255		
P.H.F.	0.757		0.895		0.825		0.560		0.921		0.861		

Tomesello Way
east of Lee Burbank Highway (Route 1A)
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

122994 B Volume
Site Code: 10271.01

Start Time	EB A.M.		EB P.M.		WB A.M.		WB P.M.		Combined A.M.		Combined P.M.		27-Jul-12 Fri
12:00	5		39		1		1		6		40		
12:15	6		44		0		9		6		53		
12:30	5		37		0		9		5		46		
12:45	1	17	37	157	1	2	12	31	2	19	49	188	
01:00	2		49		0		7		2		56		
01:15	1		43		1		10		2		53		
01:30	1		47		0		10		1		57		
01:45	2	6	39	178	0	1	9	36	2	7	48	214	
02:00	2		55		1		11		3		66		
02:15	3		36		0		5		3		41		
02:30	3		60		0		13		3		73		
02:45	2	10	54	205	0	1	6	35	2	11	60	240	
03:00	0		58		0		6		0		64		
03:15	3		59		0		4		3		63		
03:30	0		49		0		11		0		60		
03:45	1	4	55	221	1	1	14	35	2	5	69	256	
04:00	2		51		1		13		3		64		
04:15	3		37		3		5		6		42		
04:30	3		49		1		2		4		51		
04:45	3	11	53	190	0	5	7	27	3	16	60	217	
05:00	5		72		0		9		5		81		
05:15	10		60		1		12		11		72		
05:30	13		51		2		14		15		65		
05:45	12	40	56	239	1	4	2	37	13	44	58	276	
06:00	11		44		4		9		15		53		
06:15	4		37		4		6		8		43		
06:30	6		43		6		9		12		52		
06:45	12	33	32	156	5	19	4	28	17	52	36	184	
07:00	17		23		11		10		28		33		
07:15	10		28		13		8		23		36		
07:30	8		21		13		9		21		30		
07:45	7	42	26	98	21	58	9	36	28	100	35	134	
08:00	9		23		13		9		22		32		
08:15	12		23		19		6		31		29		
08:30	10		22		18		6		28		28		
08:45	12	43	18	86	15	65	3	24	27	108	21	110	
09:00	16		18		7		8		23		26		
09:15	14		14		5		11		19		25		
09:30	9		11		4		6		13		17		
09:45	12	51	17	60	4	20	6	31	16	71	23	91	
10:00	23		13		6		5		29		18		
10:15	15		13		2		5		17		18		
10:30	22		14		8		8		30		22		
10:45	20	80	11	51	5	21	12	30	25	101	23	81	
11:00	21		9		5		2		26		11		
11:15	24		10		7		0		31		10		
11:30	31		10		4		2		35		12		
11:45	28	104	6	35	6	22	1	5	34	126	7	40	
Total	441		1676		219		355		660		2031		
Percent	66.8%		82.5%		33.2%		17.5%						
Day Total		2117				574				2691			
Peak	11:00		05:00		07:45		03:30		11:00		04:45		
Vol.	104		239		71		43		126		278		
P.H.F.	0.839		0.830		0.845		0.768		0.900		0.858		

Tomesello Way
east of Lee Burbank Highway (Route 1A)
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

122994 B Volume
Site Code: 10271.01

Start Time	EB A.M.		EB P.M.		WB A.M.		WB P.M.		Combined A.M.		Combined P.M.		28-Jul-12 Sat
12:00	11		95		1		8		12		103		
12:15	10		104		2		11		12		115		
12:30	4		95		1		13		5		108		
12:45	2	27	87	381	0	4	11	43	2	31	98	424	
01:00	3		64		2		11		5		75		
01:15	2		76		2		10		4		86		
01:30	1		52		2		10		3		62		
01:45	4	10	59	251	1	7	6	37	5	17	65	288	
02:00	4		47		2		10		6		57		
02:15	3		46		0		18		3		64		
02:30	3		50		0		30		3		80		
02:45	2	12	49	192	0	2	15	73	2	14	64	265	
03:00	0		35		1		30		1		65		
03:15	0		35		0		20		0		55		
03:30	2		41		2		24		4		65		
03:45	2	4	34	145	0	3	19	93	2	7	53	238	
04:00	3		35		1		28		4		63		
04:15	0		31		0		20		0		51		
04:30	6		41		0		34		6		75		
04:45	3	12	39	146	0	1	30	112	3	13	69	258	
05:00	6		29		1		67		7		96		
05:15	7		30		1		36		8		66		
05:30	14		30		0		15		14		45		
05:45	11	38	27	116	2	4	16	134	13	42	43	250	
06:00	15		41		2		18		17		59		
06:15	5		22		1		15		6		37		
06:30	5		30		1		17		6		47		
06:45	9	34	12	105	2	6	17	67	11	40	29	172	
07:00	9		26		2		7		11		33		
07:15	8		17		2		8		10		25		
07:30	7		22		0		3		7		25		
07:45	10	34	25	90	4	8	6	24	14	42	31	114	
08:00	14		18		1		5		15		23		
08:15	9		17		3		4		12		21		
08:30	13		12		3		9		16		21		
08:45	15	51	16	63	5	12	6	24	20	63	22	87	
09:00	15		10		5		4		20		14		
09:15	15		15		5		7		20		22		
09:30	21		6		8		5		29		11		
09:45	18	69	18	49	2	20	3	19	20	89	21	68	
10:00	18		18		5		5		23		23		
10:15	25		14		5		6		30		20		
10:30	32		12		10		5		42		17		
10:45	27	102	5	49	6	26	9	25	33	128	14	74	
11:00	37		10		2		7		39		17		
11:15	51		9		4		1		55		10		
11:30	57		11		8		1		65		12		
11:45	90	235	8	38	5	19	1	10	95	254	9	48	
Total	628		1625		112		661		740		2286		
Percent	84.9%		71.1%		15.1%		28.9%						
Day Total		2253				773				3026			
Peak	11:00		12:00		10:00		04:30		11:00		12:00		
Vol.	235		381		26		167		254		424		
P.H.F.	0.653		0.916		0.650		0.623		0.668		0.922		

Tomesello Way
east of Lee Burbank Highway (Route 1A)
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
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Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

122994 B Volume
Site Code: 10271.01

Start Time	EB A.M.		EB P.M.		WB A.M.		WB P.M.		Combined A.M.		Combined P.M.		29-Jul-12 Sun
12:00	9		36		5		5		14		41		
12:15	7		35		2		8		9		43		
12:30	9		44		1		7		10		51		
12:45	6	31	48	163	2	10	10	30	8	41	58	193	
01:00	2		38		0		10		2		48		
01:15	4		38		0		12		4		50		
01:30	5		32		1		12		6		44		
01:45	2	13	33	141	1	2	6	40	3	15	39	181	
02:00	11		44		0		10		11		54		
02:15	1		34		0		10		1		44		
02:30	3		33		0		10		3		43		
02:45	2	17	31	142	4	4	7	37	6	21	38	179	
03:00	4		27		2		11		6		38		
03:15	2		42		0		20		2		62		
03:30	3		34		1		9		4		43		
03:45	1	10	39	142	0	3	11	51	1	13	50	193	
04:00	2		27		1		7		3		34		
04:15	0		27		0		14		0		41		
04:30	5		30		0		14		5		44		
04:45	1	8	19	103	2	3	8	43	3	11	27	146	
05:00	0		36		0		9		0		45		
05:15	5		29		0		10		5		39		
05:30	4		24		1		7		5		31		
05:45	6	15	19	108	1	2	10	36	7	17	29	144	
06:00	4		25		3		6		7		31		
06:15	4		29		0		9		4		38		
06:30	8		17		0		8		8		25		
06:45	3	19	27	98	0	3	18	41	3	22	45	139	
07:00	9		23		0		8		9		31		
07:15	4		18		0		6		4		24		
07:30	7		24		1		5		8		29		
07:45	7	27	23	88	1	2	5	24	8	29	28	112	
08:00	4		18		4		6		8		24		
08:15	6		11		2		2		8		13		
08:30	3		13		4		7		7		20		
08:45	5	18	13	55	3	13	5	20	8	31	18	75	
09:00	11		8		3		3		14		11		
09:15	5		13		2		1		7		14		
09:30	11		9		5		4		16		13		
09:45	18	45	8	38	4	14	9	17	22	59	17	55	
10:00	9		9		1		3		10		12		
10:15	18		11		2		4		20		15		
10:30	15		9		6		1		21		10		
10:45	23	65	8	37	6	15	2	10	29	80	10	47	
11:00	18		9		3		0		21		9		
11:15	30		5		5		0		35		5		
11:30	34		5		7		1		41		6		
11:45	35	117	1	20	2	17	0	1	37	134	1	21	
Total	385		1135		88		350		473		1485		
Percent	81.4%		76.4%		18.6%		23.6%						
Day Total			1520				438				1958		
Peak	11:00		00:30		10:45		03:00		11:00		00:30		
Vol.	117		168		21		51		134		207		
P.H.F.	0.836		0.875		0.750		0.638		0.817		0.892		

Tomesello Way
south of Rever Beach Parkway (Route 145)
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

122994 C Volume
Site Code: 10271.01

Start	SB				NB				Combined				23-Jul-12
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Mon
12:00	3		117		6		84		9		201		
12:15	5		108		6		106		11		214		
12:30	3		99		5		93		8		192		
12:45	2	13	100	424	3	20	91	374	5	33	191	798	
01:00	1		93		2		99		3		192		
01:15	1		99		2		107		3		206		
01:30	2		78		3		93		5		171		
01:45	1	5	88	358	4	11	102	401	5	16	190	759	
02:00	2		83		5		110		7		193		
02:15	3		82		5		110		8		192		
02:30	1		101		1		112		2		213		
02:45	3	9	90	356	1	12	103	435	4	21	193	791	
03:00	3		90		0		123		3		213		
03:15	3		88		3		121		6		209		
03:30	0		74		0		162		0		236		
03:45	4	10	90	342	2	5	135	541	6	15	225	883	
04:00	2		89		2		158		4		247		
04:15	9		71		3		157		12		228		
04:30	11		84		9		198		20		282		
04:45	14	36	83	327	1	15	157	670	15	51	240	997	
05:00	11		87		6		173		17		260		
05:15	19		73		7		164		26		237		
05:30	29		79		6		146		35		225		
05:45	33	92	83	322	4	23	145	628	37	115	228	950	
06:00	25		80		9		159		34		239		
06:15	14		67		1		177		15		244		
06:30	21		67		10		128		31		195		
06:45	42	102	71	285	10	30	122	586	52	132	193	871	
07:00	31		76		15		127		46		203		
07:15	36		74		16		89		52		163		
07:30	39		60		19		81		58		141		
07:45	52	158	53	263	23	73	89	386	75	231	142	649	
08:00	57		49		17		88		74		137		
08:15	56		46		32		81		88		127		
08:30	45		47		30		61		75		108		
08:45	55	213	49	191	29	108	50	280	84	321	99	471	
09:00	47		37		38		60		85		97		
09:15	45		30		39		55		84		85		
09:30	56		27		33		65		89		92		
09:45	75	223	24	118	62	172	52	232	137	395	76	350	
10:00	59		15		50		45		109		60		
10:15	59		17		72		27		131		44		
10:30	79		13		72		31		151		44		
10:45	70	267	12	57	70	264	20	123	140	531	32	180	
11:00	80		8		86		21		166		29		
11:15	93		6		84		10		177		16		
11:30	102		5		80		11		182		16		
11:45	98	373	4	23	95	345	10	52	193	718	14	75	
Total	1501		3066		1078		4708		2579		7774		
Percent	58.2%		39.4%		41.8%		60.6%						
Day Total		4567				5786				10353			
Peak	11:00		12:00		11:00		04:30		11:00		04:30		
Vol.	373		424		345		692		718		1019		
P.H.F.	0.914		0.906		0.908		0.874		0.930		0.903		

Tomesello Way
south of Rever Beach Parkway (Route 145)
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

122994 C Volume
Site Code: 10271.01

Start Time	SB A.M.		SB P.M.		NB A.M.		NB P.M.		Combined A.M.		Combined P.M.		24-Jul-12 Tue
12:00	5		108		8		92		13		200		
12:15	3		99		4		77		7		176		
12:30	2		77		8		92		10		169		
12:45	2	12	90	374	2	22	94	355	4	34	184	729	
01:00	1		94		5		99		6		193		
01:15	4		83		11		97		15		180		
01:30	2		71		3		86		5		157		
01:45	1	8	75	323	1	20	97	379	2	28	172	702	
02:00	2		81		1		113		3		194		
02:15	1		71		2		99		3		170		
02:30	2		78		3		122		5		200		
02:45	8	13	80	310	4	10	106	440	12	23	186	750	
03:00	0		73		0		116		0		189		
03:15	2		63		1		122		3		185		
03:30	3		59		2		97		5		156		
03:45	2	7	68	263	1	4	115	450	3	11	183	713	
04:00	6		64		1		142		7		206		
04:15	5		87		3		160		8		247		
04:30	9		73		7		147		16		220		
04:45	10	30	79	303	6	17	143	592	16	47	222	895	
05:00	7		90		5		178		12		268		
05:15	12		68		11		170		23		238		
05:30	20		76		12		162		32		238		
05:45	37	76	76	310	11	39	142	652	48	115	218	962	
06:00	24		62		9		135		33		197		
06:15	17		74		7		126		24		200		
06:30	29		77		11		123		40		200		
06:45	33	103	63	276	14	41	106	490	47	144	169	766	
07:00	40		74		15		132		55		206		
07:15	40		59		18		93		58		152		
07:30	49		69		24		82		73		151		
07:45	47	176	68	270	28	85	91	398	75	261	159	668	
08:00	62		50		28		92		90		142		
08:15	47		56		23		91		70		147		
08:30	57		52		23		78		80		130		
08:45	68	234	30	188	32	106	71	332	100	340	101	520	
09:00	60		46		45		57		105		103		
09:15	56		25		52		57		108		82		
09:30	47		29		62		42		109		71		
09:45	59	222	20	120	60	219	39	195	119	441	59	315	
10:00	57		16		54		38		111		54		
10:15	72		9		59		21		131		30		
10:30	64		21		53		19		117		40		
10:45	69	262	11	57	67	233	26	104	136	495	37	161	
11:00	71		13		74		26		145		39		
11:15	84		3		76		13		160		16		
11:30	101		3		84		10		185		13		
11:45	86	342	3	22	100	334	8	57	186	676	11	79	
Total	1485		2816		1130		4444		2615		7260		
Percent	56.8%		38.8%		43.2%		61.2%						
Day Total		4301				5574				9875			
Peak	11:00		12:00		11:00		04:45		11:00		04:45		
Vol.	342		374		334		653		676		966		
P.H.F.	0.847		0.866		0.835		0.917		0.909		0.901		

Tomesello Way
south of Rever Beach Parkway (Route 145)
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
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Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

122994 C Volume
Site Code: 10271.01

Start Time	SB A.M.		SB P.M.		NB A.M.		NB P.M.		Combined A.M.		Combined P.M.		25-Jul-12 Wed
12:00	4		116		6		99		10		215		
12:15	2		116		7		96		9		212		
12:30	1		108		6		101		7		209		
12:45	1	8	95	435	2	21	86	382	3	29	181	817	
01:00	1		78		7		101		8		179		
01:15	3		86		0		103		3		189		
01:30	3		88		8		104		11		192		
01:45	3	10	86	338	0	15	101	409	3	25	187	747	
02:00	2		82		4		111		6		193		
02:15	2		97		3		103		5		200		
02:30	0		77		10		105		10		182		
02:45	3	7	90	346	5	22	127	446	8	29	217	792	
03:00	8		99		1		119		9		218		
03:15	1		82		0		148		1		230		
03:30	4		85		2		126		6		211		
03:45	5	18	91	357	4	7	127	520	9	25	218	877	
04:00	2		74		3		122		5		196		
04:15	13		81		9		145		22		226		
04:30	6		82		4		132		10		214		
04:45	12	33	77	314	4	20	167	566	16	53	244	880	
05:00	11		63		7		174		18		237		
05:15	11		78		6		150		17		228		
05:30	29		77		15		159		44		236		
05:45	30	81	87	305	2	30	155	638	32	111	242	943	
06:00	28		80		5		141		33		221		
06:15	15		81		4		165		19		246		
06:30	24		74		7		127		31		201		
06:45	34	101	63	298	9	25	117	550	43	126	180	848	
07:00	44		81		15		106		59		187		
07:15	46		38		19		98		65		136		
07:30	42		83		19		82		61		165		
07:45	48	180	55	257	24	77	91	377	72	257	146	634	
08:00	65		66		24		101		89		167		
08:15	54		47		38		79		92		126		
08:30	67		53		29		75		96		128		
08:45	54	240	38	204	30	121	83	338	84	361	121	542	
09:00	47		44		42		74		89		118		
09:15	59		39		44		68		103		107		
09:30	50		33		55		56		105		89		
09:45	56	212	24	140	45	186	55	253	101	398	79	393	
10:00	70		10		58		42		128		52		
10:15	69		11		59		23		128		34		
10:30	58		13		72		21		130		34		
10:45	63	260	19	53	61	250	21	107	124	510	40	160	
11:00	85		10		74		35		159		45		
11:15	86		3		78		17		164		20		
11:30	102		7		83		14		185		21		
11:45	103	376	3	23	96	331	9	75	199	707	12	98	
Total	1526		3070		1105		4661		2631		7731		
Percent	58.0%		39.7%		42.0%		60.3%						
Day Total		4596				5766				10362			
Peak	11:00		12:00		11:00		04:45		11:00		04:45		
Vol.	376		435		331		650		707		945		
P.H.F.	0.913		0.938		0.862		0.934		0.888		0.968		

Tomesello Way
south of Rever Beach Parkway (Route 145)
City, State: Revere, MA
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PRECISION
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INDUSTRIES, LLC
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122994 C Volume
Site Code: 10271.01

Start Time	SB A.M.		SB P.M.		NB A.M.		NB P.M.		Combined A.M.		Combined P.M.		26-Jul-12 Thu
12:00	2		83		7		93		9		176		
12:15	9		108		10		95		19		203		
12:30	4		102		8		86		12		188		
12:45	3	18	81	374	5	30	103	377	8	48	184	751	
01:00	4		69		8		101		12		170		
01:15	2		84		2		107		4		191		
01:30	3		85		7		94		10		179		
01:45	4	13	84	322	2	19	98	400	6	32	182	722	
02:00	4		81		2		94		6		175		
02:15	0		83		3		109		3		192		
02:30	3		92		3		99		6		191		
02:45	5	12	76	332	2	10	108	410	7	22	184	742	
03:00	3		66		1		125		4		191		
03:15	0		88		3		118		3		206		
03:30	2		73		3		113		5		186		
03:45	2	7	83	310	1	8	112	468	3	15	195	778	
04:00	5		86		2		127		7		213		
04:15	8		82		1		134		9		216		
04:30	7		84		2		152		9		236		
04:45	13	33	82	334	10	15	132	545	23	48	214	879	
05:00	7		65		4		147		11		212		
05:15	13		77		7		120		20		197		
05:30	20		77		15		143		35		220		
05:45	35	75	91	310	6	32	130	540	41	107	221	850	
06:00	24		82		6		133		30		215		
06:15	16		89		10		139		26		228		
06:30	24		72		12		132		36		204		
06:45	30	94	82	325	14	42	105	509	44	136	187	834	
07:00	29		64		12		108		41		172		
07:15	39		59		21		125		60		184		
07:30	34		73		25		90		59		163		
07:45	49	151	43	239	22	80	104	427	71	231	147	666	
08:00	67		57		21		78		88		135		
08:15	51		60		33		73		84		133		
08:30	63		45		27		76		90		121		
08:45	54	235	43	205	42	123	80	307	96	358	123	512	
09:00	54		36		38		75		92		111		
09:15	49		23		51		52		100		75		
09:30	52		20		39		49		91		69		
09:45	67	222	15	94	47	175	49	225	114	397	64	319	
10:00	66		12		58		31		124		43		
10:15	65		14		67		28		132		42		
10:30	60		18		79		20		139		38		
10:45	60	251	9	53	70	274	21	100	130	525	30	153	
11:00	66		5		90		21		156		26		
11:15	68		7		78		17		146		24		
11:30	86		4		69		6		155		10		
11:45	73	293	8	24	107	344	4	48	180	637	12	72	
Total	1404		2922		1152		4356		2556		7278		
Percent	54.9%		40.1%		45.1%		59.9%						
Day Total		4326				5508				9834			
Peak	11:00		12:00		11:00		04:15		11:00		05:30		
Vol.	293		374		344		565		637		884		
P.H.F.	0.852		0.866		0.804		0.929		0.885		0.936		

Tomesello Way
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122994 C Volume
Site Code: 10271.01

Start Time	SB A.M.		SB P.M.		NB A.M.		NB P.M.		Combined A.M.		Combined P.M.		27-Jul-12 Fri
12:00	2		109		12		79		14		188		
12:15	2		130		8		53		10		183		
12:30	1		142		7		71		8		213		
12:45	6	11	121	502	3	30	70	273	9	41	191	775	
01:00	3		125		6		75		9		200		
01:15	4		114		6		89		10		203		
01:30	6		92		6		121		12		213		
01:45	1	14	94	425	4	22	124	409	5	36	218	834	
02:00	2		96		3		107		5		203		
02:15	1		100		3		109		4		209		
02:30	2		101		4		128		6		229		
02:45	2	7	97	394	3	13	111	455	5	20	208	849	
03:00	7		99		0		130		7		229		
03:15	0		98		3		138		3		236		
03:30	0		85		2		130		2		215		
03:45	7	14	94	376	2	7	143	541	9	21	237	917	
04:00	7		91		4		149		11		240		
04:15	7		92		0		131		7		223		
04:30	8		80		3		145		11		225		
04:45	11	33	102	365	9	16	146	571	20	49	248	936	
05:00	10		85		4		166		14		251		
05:15	15		88		7		144		22		232		
05:30	19		77		12		144		31		221		
05:45	40	84	87	337	8	31	130	584	48	115	217	921	
06:00	24		71		11		125		35		196		
06:15	21		93		4		98		25		191		
06:30	14		93		3		109		17		202		
06:45	40	99	70	327	20	38	114	446	60	137	184	773	
07:00	31		63		18		105		49		168		
07:15	37		71		15		108		52		179		
07:30	34		68		20		73		54		141		
07:45	50	152	51	253	13	66	91	377	63	218	142	630	
08:00	56		56		19		98		75		154		
08:15	46		56		30		73		76		129		
08:30	51		45		34		81		85		126		
08:45	56	209	42	199	31	114	55	307	87	323	97	506	
09:00	51		43		31		68		82		111		
09:15	55		40		39		55		94		95		
09:30	66		32		35		65		101		97		
09:45	62	234	13	128	52	157	52	240	114	391	65	368	
10:00	60		15		58		45		118		60		
10:15	58		22		69		42		127		64		
10:30	53		16		82		43		135		59		
10:45	84	255	23	76	70	279	45	175	154	534	68	251	
11:00	78		13		75		35		153		48		
11:15	75		4		74		25		149		29		
11:30	105		8		56		14		161		22		
11:45	84	342	9	34	106	311	12	86	190	653	21	120	
Total	1454		3416		1084		4464		2538		7880		
Percent	57.3%		43.4%		42.7%		56.6%						
Day Total		4870				5548				10418			
Peak	10:45		00:15		11:00		04:30		11:00		04:30		
Vol.	342		518		311		601		653		956		
P.H.F.	0.814		0.912		0.733		0.905		0.859		0.952		

Tomesello Way
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122994 C Volume
Site Code: 10271.01

Start Time	SB A.M.		SB P.M.		NB A.M.		NB P.M.		Combined A.M.		Combined P.M.		28-Jul-12 Sat
12:00	3		131		15		123		18		254		
12:15	10		157		12		123		22		280		
12:30	6		129		11		108		17		237		
12:45	3	22	121	538	10	48	112	466	13	70	233	1004	
01:00	1		130		5		107		6		237		
01:15	4		126		4		113		8		239		
01:30	1		111		6		129		7		240		
01:45	3	9	108	475	8	23	109	458	11	32	217	933	
02:00	0		111		4		122		4		233		
02:15	0		108		4		109		4		217		
02:30	2		95		5		144		7		239		
02:45	6	8	114	428	1	14	134	509	7	22	248	937	
03:00	3		92		2		142		5		234		
03:15	2		106		1		109		3		215		
03:30	5		89		0		141		5		230		
03:45	7	17	77	364	3	6	132	524	10	23	209	888	
04:00	5		92		6		152		11		244		
04:15	7		90		0		119		7		209		
04:30	8		72		4		149		12		221		
04:45	10	30	96	350	2	12	133	553	12	42	229	903	
05:00	8		91		1		186		9		277		
05:15	13		91		9		197		22		288		
05:30	17		82		11		148		28		230		
05:45	41	79	68	332	6	27	117	648	47	106	185	980	
06:00	19		64		6		137		25		201		
06:15	10		67		3		123		13		190		
06:30	9		45		6		108		15		153		
06:45	29	67	48	224	10	25	91	459	39	92	139	683	
07:00	27		56		14		72		41		128		
07:15	21		40		14		73		35		113		
07:30	26		47		18		71		44		118		
07:45	40	114	57	200	16	62	74	290	56	176	131	490	
08:00	42		55		31		70		73		125		
08:15	41		42		44		61		85		103		
08:30	44		33		33		66		77		99		
08:45	44	171	28	158	39	147	60	257	83	318	88	415	
09:00	71		25		50		50		121		75		
09:15	52		25		42		39		94		64		
09:30	53		26		63		41		116		67		
09:45	85	261	14	90	55	210	50	180	140	471	64	270	
10:00	50		14		82		52		132		66		
10:15	75		17		69		30		144		47		
10:30	102		10		79		29		181		39		
10:45	83	310	9	50	81	311	24	135	164	621	33	185	
11:00	83		10		89		39		172		49		
11:15	108		4		93		25		201		29		
11:30	135		8		87		17		222		25		
11:45	159	485	7	29	97	366	15	96	256	851	22	125	
Total	1573		3238		1251		4575		2824		7813		
Percent	55.7%		41.4%		44.3%		58.6%						
Day Total		4811				5826				10637			
Peak	11:00		12:00		11:00		04:30		11:00		04:45		
Vol.	485		538		366		665		851		1024		
P.H.F.	0.763		0.857		0.943		0.844		0.831		0.889		

Tomesello Way
south of Rever Beach Parkway (Route 145)
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

122994 C Volume
Site Code: 10271.01

Start Time	SB A.M.		SB P.M.		NB A.M.		NB P.M.		Combined A.M.		Combined P.M.		29-Jul-12 Sun
12:00	12		127		15		97		27		224		
12:15	6		129		12		120		18		249		
12:30	2		119		7		117		9		236		
12:45	4	24	122	497	10	44	122	456	14	68	244	953	
01:00	5		111		5		94		10		205		
01:15	2		122		7		113		9		235		
01:30	5		97		8		107		13		204		
01:45	3	15	116	446	3	23	122	436	6	38	238	882	
02:00	1		94		11		126		12		220		
02:15	2		104		4		113		6		217		
02:30	1		104		2		116		3		220		
02:45	5	9	107	409	3	20	124	479	8	29	231	888	
03:00	5		95		7		125		12		220		
03:15	4		94		3		123		7		217		
03:30	4		97		3		119		7		216		
03:45	7	20	120	406	2	15	128	495	9	35	248	901	
04:00	2		96		3		137		5		233		
04:15	3		87		6		126		9		213		
04:30	3		77		4		108		7		185		
04:45	7	15	90	350	2	15	118	489	9	30	208	839	
05:00	9		57		3		95		12		152		
05:15	5		68		3		129		8		197		
05:30	8		72		6		105		14		177		
05:45	16	38	51	248	2	14	97	426	18	52	148	674	
06:00	12		75		5		80		17		155		
06:15	8		76		4		95		12		171		
06:30	13		64		8		99		21		163		
06:45	11	44	64	279	5	22	130	404	16	66	194	683	
07:00	15		53		8		94		23		147		
07:15	19		70		7		87		26		157		
07:30	26		65		19		87		45		152		
07:45	30	90	47	235	26	60	94	362	56	150	141	597	
08:00	24		38		19		77		43		115		
08:15	32		37		35		51		67		88		
08:30	37		41		32		67		69		108		
08:45	41	134	23	139	30	116	70	265	71	250	93	404	
09:00	41		25		44		53		85		78		
09:15	57		22		58		47		115		69		
09:30	45		14		59		34		104		48		
09:45	50	193	11	72	47	208	36	170	97	401	47	242	
10:00	67		9		52		22		119		31		
10:15	61		9		57		19		118		28		
10:30	77		5		66		11		143		16		
10:45	89	294	10	33	69	244	18	70	158	538	28	103	
11:00	95		8		76		12		171		20		
11:15	97		4		88		9		185		13		
11:30	114		5		104		13		218		18		
11:45	96	402	7	24	112	380	3	37	208	782	10	61	
Total	1278		3138		1161		4089		2439		7227		
Percent	52.4%		43.4%		47.6%		56.6%						
Day Total		4416				5250				9666			
Peak	11:00		12:00		11:00		03:30		11:00		12:00		
Vol.	402		497		380		510		782		953		
P.H.F.	0.882		0.963		0.848		0.931		0.897		0.957		

Furlong Drive
east of Lee Burbank Highway (Route 1A)
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

122994 D Volume
Site Code: 10271.01

Start Time	EB A.M.		EB P.M.		WB A.M.		WB P.M.		Combined A.M.		Combined P.M.		23-Jul-12 Mon
12:00	1		39		2		23		3		62		
12:15	1		24		1		35		2		59		
12:30	3		32		1		24		4		56		
12:45	2	7	27	122	4	8	27	109	6	15	54	231	
01:00	0		40		4		34		4		74		
01:15	1		48		1		24		2		72		
01:30	3		34		2		35		5		69		
01:45	1	5	30	152	0	7	43	136	1	12	73	288	
02:00	4		39		1		37		5		76		
02:15	1		32		2		30		3		62		
02:30	1		28		3		38		4		66		
02:45	6	12	34	133	2	8	36	141	8	20	70	274	
03:00	0		26		1		25		1		51		
03:15	3		28		1		27		4		55		
03:30	2		28		1		30		3		58		
03:45	7	12	27	109	2	5	20	102	9	17	47	211	
04:00	2		16		4		35		6		51		
04:15	5		28		7		34		12		62		
04:30	5		24		1		34		6		58		
04:45	9	21	21	89	4	16	24	127	13	37	45	216	
05:00	1		25		4		34		5		59		
05:15	4		24		2		22		6		46		
05:30	4		31		7		24		11		55		
05:45	13	22	30	110	0	13	31	111	13	35	61	221	
06:00	10		22		7		27		17		49		
06:15	7		34		3		28		10		62		
06:30	8		33		3		26		11		59		
06:45	8	33	36	125	4	17	28	109	12	50	64	234	
07:00	16		23		9		19		25		42		
07:15	13		29		6		27		19		56		
07:30	10		22		9		27		19		49		
07:45	6	45	25	99	12	36	28	101	18	81	53	200	
08:00	11		23		10		24		21		47		
08:15	12		15		13		29		25		44		
08:30	9		15		11		22		20		37		
08:45	19	51	18	71	8	42	11	86	27	93	29	157	
09:00	11		24		7		19		18		43		
09:15	15		14		18		21		33		35		
09:30	20		18		11		11		31		29		
09:45	20	66	10	66	17	53	8	59	37	119	18	125	
10:00	27		13		19		9		46		22		
10:15	23		12		23		7		46		19		
10:30	22		5		17		10		39		15		
10:45	19	91	2	32	30	89	5	31	49	180	7	63	
11:00	31		3		31		7		62		10		
11:15	34		2		29		4		63		6		
11:30	33		1		37		2		70		3		
11:45	35	133	1	7	31	128	1	14	66	261	2	21	
Total	498		1115		422		1126		920		2241		
Percent	54.1%		49.8%		45.9%		50.2%						
Day Total		1613				1548				3161			
Peak	11:00		01:00		11:00		01:45		11:00		01:15		
Vol.	133		152		128		148		261		290		
P.H.F.	0.950		0.792		0.865		0.860		0.932		0.954		

Furlong Drive
east of Lee Burbank Highway (Route 1A)
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

122994 D Volume
Site Code: 10271.01

Start	EB				WB				Combined				24-Jul-12
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Tue
12:00	2		52		2		0		4		52		
12:15	1		60		1		0		2		60		
12:30	4		74		3		0		7		74		
12:45	4	11	73	259	3	9	0	0	7	20	73	259	
01:00	7		69		3		0		10		69		
01:15	3		67		4		0		7		67		
01:30	2		63		3		0		5		63		
01:45	1	13	54	253	4	14	0	0	5	27	54	253	
02:00	5		54		0		0		5		54		
02:15	1		41		6		0		7		41		
02:30	2		56		2		0		4		56		
02:45	5	13	57	208	3	11	0	0	8	24	57	208	
03:00	2		24		1		31		3		55		
03:15	0		21		6		29		6		50		
03:30	3		22		3		19		6		41		
03:45	9	14	34	101	2	12	15	94	11	26	49	195	
04:00	7		40		6		41		13		81		
04:15	4		19		11		39		15		58		
04:30	8		24		5		31		13		55		
04:45	10	29	29	112	2	24	28	139	12	53	57	251	
05:00	4		35		3		28		7		63		
05:15	6		24		4		32		10		56		
05:30	9		34		7		26		16		60		
05:45	5	24	25	118	4	18	24	110	9	42	49	228	
06:00	13		36		4		25		17		61		
06:15	5		23		7		23		12		46		
06:30	11		26		3		25		14		51		
06:45	10	39	31	116	4	18	22	95	14	57	53	211	
07:00	9		22		5		13		14		35		
07:15	14		24		11		25		25		49		
07:30	13		18		15		23		28		41		
07:45	11	47	23	87	14	45	22	83	25	92	45	170	
08:00	8		21		7		13		15		34		
08:15	13		19		11		14		24		33		
08:30	14		20		8		24		22		44		
08:45	14	49	21	81	9	35	5	56	23	84	26	137	
09:00	21		12		10		7		31		19		
09:15	34		16		0		16		34		32		
09:30	36		11		0		10		36		21		
09:45	34	125	10	49	0	10	9	42	34	135	19	91	
10:00	30		15		0		11		30		26		
10:15	36		8		0		11		36		19		
10:30	43		3		0		13		43		16		
10:45	42	151	3	29	0	0	3	38	42	151	6	67	
11:00	46		1		0		7		46		8		
11:15	58		2		0		4		58		6		
11:30	58		3		0		4		58		7		
11:45	67	229	0	6	0	0	1	16	67	229	1	22	
Total	744		1419		196		673		940		2092		
Percent	79.1%		67.8%		20.9%		32.2%						
Day Total		2163				869				3032			
Peak	11:00		00:30		07:15		04:00		11:00		00:30		
Vol.	229		283		47		139		229		283		
P.H.F.	0.854		0.956		0.783		0.848		0.854		0.956		

Furlong Drive
east of Lee Burbank Highway (Route 1A)
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

122994 D Volume
Site Code: 10271.01

Start Time	EB A.M.		EB P.M.		WB A.M.		WB P.M.		Combined A.M.		Combined P.M.		25-Jul-12 Wed
12:00	2		41		0		32		2		73		
12:15	3		43		1		38		4		81		
12:30	3		27		1		33		4		60		
12:45	7	15	27	138	4	6	39	142	11	21	66	280	
01:00	3		28		5		33		8		61		
01:15	1		34		3		30		4		64		
01:30	3		24		2		33		5		57		
01:45	4	11	31	117	7	17	34	130	11	28	65	247	
02:00	0		20		1		38		1		58		
02:15	4		30		3		30		7		60		
02:30	1		25		8		29		9		54		
02:45	6	11	24	99	4	16	26	123	10	27	50	222	
03:00	3		29		2		32		5		61		
03:15	4		35		6		28		10		63		
03:30	4		28		6		38		10		66		
03:45	9	20	28	120	3	17	22	120	12	37	50	240	
04:00	5		24		5		27		10		51		
04:15	8		20		8		26		16		46		
04:30	4		23		7		28		11		51		
04:45	11	28	27	94	1	21	40	121	12	49	67	215	
05:00	1		22		5		31		6		53		
05:15	2		31		3		22		5		53		
05:30	3		28		2		23		5		51		
05:45	7	13	25	106	1	11	31	107	8	24	56	213	
06:00	10		22		10		23		20		45		
06:15	6		27		4		20		10		47		
06:30	5		29		4		33		9		62		
06:45	6	27	20	98	2	20	33	109	8	47	53	207	
07:00	11		29		7		26		18		55		
07:15	8		23		10		20		18		43		
07:30	7		29		9		20		16		49		
07:45	12	38	22	103	12	38	34	100	24	76	56	203	
08:00	7		22		12		27		19		49		
08:15	8		23		12		22		20		45		
08:30	11		15		7		14		18		29		
08:45	23	49	16	76	10	41	19	82	33	90	35	158	
09:00	25		12		12		26		37		38		
09:15	19		18		14		13		33		31		
09:30	26		16		20		17		46		33		
09:45	17	87	16	62	16	62	17	73	33	149	33	135	
10:00	15		15		18		13		33		28		
10:15	27		6		20		8		47		14		
10:30	22		13		18		4		40		17		
10:45	26	90	6	40	23	79	10	35	49	169	16	75	
11:00	30		3		31		11		61		14		
11:15	28		4		27		6		55		10		
11:30	32		4		26		2		58		6		
11:45	39	129	3	14	29	113	2	21	68	242	5	35	
Total	518		1067		441		1163		959		2230		
Percent	54.0%		47.8%		46.0%		52.2%						
Day Total			1585				1604				3189		
Peak	11:00		12:00		11:00		00:15		11:00		12:00		
Vol.	129		138		113		143		242		280		
P.H.F.	0.827		0.802		0.911		0.917		0.890		0.864		

Furlong Drive
east of Lee Burbank Highway (Route 1A)
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
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Email: datarequests@pdillc.com

122994 D Volume
Site Code: 10271.01

Start Time	EB A.M.		EB P.M.		WB A.M.		WB P.M.		Combined A.M.		Combined P.M.		26-Jul-12 Thu
12:00	3		0		2		51		5		51		
12:15	2		0		2		71		4		71		
12:30	1		0		2		59		3		59		
12:45	8	14	0	0	1	7	57	238	9	21	57	238	
01:00	4		0		5		54		9		54		
01:15	3		0		3		51		6		51		
01:30	3		0		0		62		3		62		
01:45	4	14	0	0	5	13	55	222	9	27	55	222	
02:00	9		0		2		57		11		57		
02:15	6		0		6		52		12		52		
02:30	2		0		8		55		10		55		
02:45	3	20	0	0	2	18	46	210	5	38	46	210	
03:00	3		0		1		49		4		49		
03:15	1		0		4		41		5		41		
03:30	5		0		0		53		5		53		
03:45	7	16	0	0	3	8	46	189	10	24	46	189	
04:00	6		0		6		45		12		45		
04:15	7		21		7		34		14		55		
04:30	5		26		7		24		12		50		
04:45	12	30	21	68	3	23	27	130	15	53	48	198	
05:00	8		27		9		25		17		52		
05:15	3		28		3		22		6		50		
05:30	11		25		4		19		15		44		
05:45	7	29	28	108	6	22	29	95	13	51	57	203	
06:00	7		23		3		24		10		47		
06:15	5		24		5		27		10		51		
06:30	17		26		1		28		18		54		
06:45	12	41	34	107	6	15	36	115	18	56	70	222	
07:00	4		35		7		31		11		66		
07:15	14		17		8		18		22		35		
07:30	9		18		11		27		20		45		
07:45	7	34	25	95	7	33	27	103	14	67	52	198	
08:00	16		23		14		24		30		47		
08:15	11		18		8		22		19		40		
08:30	13		12		13		19		26		31		
08:45	13	53	19	72	7	42	18	83	20	95	37	155	
09:00	19		23		9		14		28		37		
09:15	17		18		13		17		30		35		
09:30	19		16		15		15		34		31		
09:45	20	75	11	68	18	55	14	60	38	130	25	128	
10:00	25		7		19		19		44		26		
10:15	23		8		18		7		41		15		
10:30	0		5		61		12		61		17		
10:45	0	48	3	23	46	144	14	52	46	192	17	75	
11:00	0		6		43		7		43		13		
11:15	0		1		46		3		46		4		
11:30	0		1		63		1		63		2		
11:45	0	0	2	10	68	220	1	12	68	220	3	22	
Total	374		551		600		1509		974		2060		
Percent	38.4%		26.7%		61.6%		73.3%						
Day Total			925				2109				3034		
Peak	09:30		06:15		11:00		00:15		11:00		00:15		
Vol.	87		119		220		241		220		241		
P.H.F.	0.870		0.850		0.809		0.849		0.809		0.849		

Furlong Drive
east of Lee Burbank Highway (Route 1A)
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

122994 D Volume
Site Code: 10271.01

Start Time	EB A.M.		EB P.M.		WB A.M.		WB P.M.		Combined A.M.		Combined P.M.		27-Jul-12 Fri
12:00	6		45		4		32		10		77		
12:15	4		37		5		43		9		80		
12:30	2		46		2		48		4		94		
12:45	0	12	34	162	1	12	36	159	1	24	70	321	
01:00	3		36		1		32		4		68		
01:15	1		39		2		35		3		74		
01:30	6		24		2		35		8		59		
01:45	2	12	35	134	1	6	33	135	3	18	68	269	
02:00	3		33		5		35		8		68		
02:15	2		23		4		29		6		52		
02:30	2		33		3		20		5		53		
02:45	7	14	27	116	1	13	35	119	8	27	62	235	
03:00	2		31		3		30		5		61		
03:15	1		30		6		39		7		69		
03:30	5		35		2		26		7		61		
03:45	6	14	18	114	2	13	40	135	8	27	58	249	
04:00	9		29		8		32		17		61		
04:15	6		24		7		27		13		51		
04:30	7		21		4		30		11		51		
04:45	11	33	23	97	4	23	38	127	15	56	61	224	
05:00	8		27		5		37		13		64		
05:15	5		30		3		29		8		59		
05:30	8		25		5		27		13		52		
05:45	6	27	32	114	2	15	28	121	8	42	60	235	
06:00	6		29		4		24		10		53		
06:15	5		28		2		38		7		66		
06:30	8		22		4		28		12		50		
06:45	16	35	29	108	6	16	26	116	22	51	55	224	
07:00	9		20		9		21		18		41		
07:15	10		22		9		20		19		42		
07:30	7		15		6		20		13		35		
07:45	8	34	20	77	7	31	16	77	15	65	36	154	
08:00	8		27		6		26		14		53		
08:15	7		28		11		16		18		44		
08:30	7		14		13		25		20		39		
08:45	17	39	13	82	15	45	19	86	32	84	32	168	
09:00	16		17		10		14		26		31		
09:15	16		11		24		20		40		31		
09:30	14		9		16		13		30		22		
09:45	17	63	9	46	11	61	21	68	28	124	30	114	
10:00	19		16		17		12		36		28		
10:15	30		10		24		17		54		27		
10:30	26		8		23		9		49		17		
10:45	33	108	7	41	31	95	9	47	64	203	16	88	
11:00	23		4		24		11		47		15		
11:15	33		2		35		3		68		5		
11:30	29		2		39		2		68		4		
11:45	31	116	4	12	32	130	5	21	63	246	9	33	
Total	507		1103		460		1211		967		2314		
Percent	52.4%		47.7%		47.6%		52.3%						
Day Total			1610				1671				3281		
Peak	10:45		12:00		11:00		12:00		10:45		12:00		
Vol.	118		162		130		159		247		321		
P.H.F.	0.894		0.880		0.833		0.828		0.908		0.854		

Furlong Drive
east of Lee Burbank Highway (Route 1A)
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

122994 D Volume
Site Code: 10271.01

Start	EB				WB				Combined				28-Jul-12
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Sat
12:00	2		32		1		26		3		58		
12:15	5		35		4		33		9		68		
12:30	5		47		1		29		6		76		
12:45	3	15	32	146	2	8	31	119	5	23	63	265	
01:00	2		19		3		32		5		51		
01:15	2		33		3		26		5		59		
01:30	9		30		1		25		10		55		
01:45	4	17	43	125	3	10	31	114	7	27	74	239	
02:00	2		36		4		40		6		76		
02:15	1		37		3		27		4		64		
02:30	1		37		2		33		3		70		
02:45	4	8	30	140	1	10	32	132	5	18	62	272	
03:00	1		29		1		41		2		70		
03:15	0		30		2		31		2		61		
03:30	3		31		6		29		9		60		
03:45	4	8	37	127	3	12	43	144	7	20	80	271	
04:00	7		30		9		39		16		69		
04:15	3		19		10		26		13		45		
04:30	7		22		2		33		9		55		
04:45	11	28	38	109	6	27	33	131	17	55	71	240	
05:00	3		19		2		49		5		68		
05:15	3		38		4		41		7		79		
05:30	5		23		2		23		7		46		
05:45	10	21	17	97	2	10	27	140	12	31	44	237	
06:00	5		18		7		29		12		47		
06:15	6		23		2		30		8		53		
06:30	7		14		2		25		9		39		
06:45	5	23	17	72	7	18	21	105	12	41	38	177	
07:00	11		22		4		16		15		38		
07:15	2		17		3		16		5		33		
07:30	10		23		5		14		15		37		
07:45	12	35	16	78	6	18	19	65	18	53	35	143	
08:00	22		13		16		18		38		31		
08:15	7		17		10		16		17		33		
08:30	9		13		10		11		19		24		
08:45	21	59	15	58	8	44	8	53	29	103	23	111	
09:00	23		14		12		16		35		30		
09:15	21		13		19		6		40		19		
09:30	16		16		21		11		37		27		
09:45	20	80	10	53	15	67	11	44	35	147	21	97	
10:00	25		8		19		9		44		17		
10:15	36		5		23		4		59		9		
10:30	26		9		33		9		59		18		
10:45	32	119	4	26	28	103	5	27	60	222	9	53	
11:00	29		1		16		9		45		10		
11:15	26		5		28		3		54		8		
11:30	32		4		37		3		69		7		
11:45	28	115	6	16	24	105	3	18	52	220	9	34	
Total	528		1047		432		1092		960		2139		
Percent	55.0%		48.9%		45.0%		51.1%						
Day Total		1575				1524				3099			
Peak	10:15		01:45		10:45		04:30		10:45		01:45		
Vol.	123		153		109		156		228		284		
P.H.F.	0.854		0.814		0.736		0.796		0.826		0.934		

Furlong Drive
east of Lee Burbank Highway (Route 1A)
City, State: Revere, MA
Client: VHB/ E. Guidoboni

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

122994 D Volume
Site Code: 10271.01

Start Time	EB A.M.		EB P.M.		WB A.M.		WB P.M.		Combined A.M.		Combined P.M.		29-Jul-12 Sun
12:00	1		35		1		45		2		80		
12:15	2		31		4		22		6		53		
12:30	4		41		0		31		4		72		
12:45	2	9	34	141	4	9	30	128	6	18	64	269	
01:00	4		36		1		23		5		59		
01:15	2		28		2		43		4		71		
01:30	3		42		5		34		8		76		
01:45	1	10	35	141	1	9	33	133	2	19	68	274	
02:00	3		41		1		35		4		76		
02:15	2		33		2		35		4		68		
02:30	0		41		0		35		0		76		
02:45	2	7	22	137	1	4	36	141	3	11	58	278	
03:00	4		30		0		29		4		59		
03:15	1		32		4		29		5		61		
03:30	2		34		2		27		4		61		
03:45	4	11	45	141	0	6	26	111	4	17	71	252	
04:00	0		23		5		26		5		49		
04:15	3		34		6		31		9		65		
04:30	4		32		2		31		6		63		
04:45	5	12	26	115	1	14	30	118	6	26	56	233	
05:00	1		32		3		30		4		62		
05:15	2		22		1		28		3		50		
05:30	4		21		0		35		4		56		
05:45	4	11	36	111	2	6	28	121	6	17	64	232	
06:00	2		27		3		20		5		47		
06:15	3		29		2		26		5		55		
06:30	3		23		2		27		5		50		
06:45	8	16	28	107	2	9	21	94	10	25	49	201	
07:00	5		25		2		16		7		41		
07:15	6		22		8		25		14		47		
07:30	7		22		2		15		9		37		
07:45	9	27	17	86	4	16	23	79	13	43	40	165	
08:00	8		19		6		18		14		37		
08:15	10		18		3		18		13		36		
08:30	16		12		5		25		21		37		
08:45	13	47	10	59	8	22	20	81	21	69	30	140	
09:00	15		11		12		12		27		23		
09:15	12		6		13		9		25		15		
09:30	21		7		22		9		43		16		
09:45	24	72	2	26	12	59	6	36	36	131	8	62	
10:00	26		5		16		4		42		9		
10:15	25		3		23		4		48		7		
10:30	20		3		16		3		36		6		
10:45	29	100	4	15	26	81	1	12	55	181	5	27	
11:00	26		1		24		6		50		7		
11:15	36		2		26		2		62		4		
11:30	19		5		19		3		38		8		
11:45	35	116	3	11	32	101	1	12	67	217	4	23	
Total	438		1090		336		1066		774		2156		
Percent	56.6%		50.6%		43.4%		49.4%						
Day Total		1528				1402				2930			
Peak	11:00		01:30		11:00		01:15		11:00		01:15		
Vol.	116		151		101		145		217		291		
P.H.F.	0.806		0.899		0.789		0.843		0.810		0.957		

Accurate Counts
978-664-2565

N/S Street : Route 1A
E/W Street: Boardman Street
City/State : Boston, MA
Weather : Clear

File Name : 10271001
Site Code : 10271001
Start Date : 6/11/2010

Groups Printed- Cars - Trucks

	Route 1A From North				Boardman St From East				Route 1A From South				Boardman St From West						
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	Peds	Left	Thru	Right	U-Turn	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
15:30	22	396	0	0	56	3	71	0	12	478	1	7	3	0	11	0	7	1053	1060
15:45	39	396	1	0	35	4	42	7	9	473	11	5	14	0	12	1	13	1036	1049
Total	61	792	1	0	91	7	113	7	21	951	12	12	17	0	23	1	20	2089	2109
16:00	43	390	4	0	35	3	41	1	8	458	4	2	9	1	10	0	3	1006	1009
16:15	46	389	6	0	54	5	45	0	11	472	7	12	8	2	15	0	12	1060	1072
16:30	27	346	3	0	33	2	26	0	9	498	4	8	16	0	15	0	8	979	987
16:45	43	334	2	0	45	2	39	0	11	464	5	9	7	0	13	0	9	965	974
Total	159	1459	15	0	167	12	151	1	39	1892	20	31	40	3	53	0	32	4010	4042
17:00	29	329	3	0	23	2	45	0	4	465	8	3	16	0	9	0	3	933	936
17:15	48	360	4	0	34	1	46	0	4	498	5	4	22	1	14	0	4	1037	1041
17:30	41	370	3	0	36	3	58	0	11	486	6	4	15	0	9	0	4	1038	1042
17:45	26	300	0	0	17	3	43	0	9	503	4	5	23	0	11	0	5	939	944
Total	144	1359	10	0	110	9	192	0	28	1952	23	16	76	1	43	0	16	3947	3963
18:00	31	333	6	0	48	5	47	0	23	495	9	10	20	2	11	0	10	1030	1040
18:15	24	344	1	0	34	0	19	0	16	536	3	8	17	0	6	0	8	1000	1008
Grand Total	419	4287	33	0	450	33	522	8	127	5826	67	77	170	6	136	1	86	12076	12162
Apprch %	8.8	90.5	0.7		44.8	3.3	51.9		2.1	96.8	1.1		54.5	1.9	43.6				
Total %	3.5	35.5	0.3		3.7	0.3	4.3		1.1	48.2	0.6		1.4	0	1.1		0.7	99.3	
Cars	417	4054	31		421	30	497		74	5552	65		156	6	119		0	0	11508
% Cars	99.5	94.6	93.9	0	93.6	90.9	95.2	100	58.3	95.3	97	100	91.8	100	87.5	100	0	0	94.6
Trucks	2	233	2		29	3	25		53	274	2		14	0	17		0	0	654
% Trucks	0.5	5.4	6.1	0	6.4	9.1	4.8	0	41.7	4.7	3	0	8.2	0	12.5	0	0	0	5.4

	Route 1A From North				Boardman St From East				Route 1A From South				Boardman St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 15:30																	
15:30	22	396	0	418	56	3	71	130	12	478	1	491	3	0	11	14	1053
15:45	39	396	1	436	35	4	42	81	9	473	11	493	14	0	12	26	1036
16:00	43	390	4	437	35	3	41	79	8	458	4	470	9	1	10	20	1006
16:15	46	389	6	441	54	5	45	104	11	472	7	490	8	2	15	25	1060
Total Volume	150	1571	11	1732	180	15	199	394	40	1881	23	1944	34	3	48	85	4155
% App. Total	8.7	90.7	0.6		45.7	3.8	50.5		2.1	96.8	1.2		40	3.5	56.5		
PHF	.815	.992	.458	.982	.804	.750	.701	.758	.833	.984	.523	.986	.607	.375	.800	.817	.980
Cars	149	1479	10	1638	171	14	187	372	28	1771	21	1820	33	3	42	78	3908
% Cars	99.3	94.1	90.9	94.6	95.0	93.3	94.0	94.4	70.0	94.2	91.3	93.6	97.1	100	87.5	91.8	94.1
Trucks	1	92	1	94	9	1	12	22	12	110	2	124	1	0	6	7	247
% Trucks	0.7	5.9	9.1	5.4	5.0	6.7	6.0	5.6	30.0	5.8	8.7	6.4	2.9	0	12.5	8.2	5.9

Accurate Counts
978-664-2565

N/S Street : Route 1A
E/W Street: Boardman Street
City/State : Boston, MA
Weather : Clear

File Name : 10271001
Site Code : 10271001
Start Date : 6/11/2010
Page No : 1

Groups Printed- Trucks

	Route 1A From North				Boardman St From East				Route 1A From South				Boardman St From West						
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	Peds	Left	Thru	Right	U-Turn	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
15:30	0	32	0	0	2	0	6	0	1	30	0	0	0	0	1	0	0	72	72
15:45	0	24	0	0	2	0	3	0	2	29	2	0	1	0	2	0	0	65	65
Total	0	56	0	0	4	0	9	0	3	59	2	0	1	0	3	0	0	137	137
16:00	0	19	0	0	0	0	0	0	3	32	0	0	0	0	1	0	0	55	55
16:15	1	17	1	0	5	1	3	0	6	19	0	0	0	0	2	0	0	55	55
16:30	0	25	0	0	4	0	3	0	2	20	0	0	2	0	2	0	0	58	58
16:45	0	17	0	0	5	0	2	0	4	18	0	0	0	0	1	0	0	47	47
Total	1	78	1	0	14	1	8	0	15	89	0	0	2	0	6	0	0	215	215
17:00	0	19	0	0	3	0	2	0	2	23	0	0	0	0	1	0	0	50	50
17:15	0	15	0	0	2	0	1	0	0	24	0	0	0	0	0	0	0	42	42
17:30	0	21	1	0	1	1	3	0	8	19	0	0	0	0	0	0	0	54	54
17:45	1	19	0	0	0	0	0	0	5	23	0	0	2	0	3	0	0	53	53
Total	1	74	1	0	6	1	6	0	15	89	0	0	2	0	4	0	0	199	199
18:00	0	12	0	0	3	1	1	0	12	22	0	0	4	0	1	0	0	56	56
18:15	0	13	0	0	2	0	1	0	8	15	0	0	5	0	3	0	0	47	47
Grand Total	2	233	2	0	29	3	25	0	53	274	2	0	14	0	17	0	0	654	654
Apprch %	0.8	98.3	0.8		50.9	5.3	43.9		16.1	83.3	0.6		45.2	0	54.8				
Total %	0.3	35.6	0.3		4.4	0.5	3.8		8.1	41.9	0.3		2.1	0	2.6		0	100	

	Route 1A From North				Boardman St From East				Route 1A From South				Boardman St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 15:30																	
15:30	0	32	0	32	2	0	6	8	1	30	0	31	0	0	1	1	72
15:45	0	24	0	24	2	0	3	5	2	29	2	33	1	0	2	3	65
16:00	0	19	0	19	0	0	0	0	3	32	0	35	0	0	1	1	55
16:15	1	17	1	19	5	1	3	9	6	19	0	25	0	0	2	2	55
Total Volume	1	92	1	94	9	1	12	22	12	110	2	124	1	0	6	7	247
% App. Total	1.1	97.9	1.1		40.9	4.5	54.5		9.7	88.7	1.6		14.3	0	85.7		
PHF	.250	.719	.250	.734	.450	.250	.500	.611	.500	.859	.250	.886	.250	.000	.750	.583	.858

Accurate Counts
978-664-2565

N/S Street : Route 1A
E/W Street: Boardman Street
City/State : Boston, MA
Weather : Clear

File Name : 102710A1
Site Code : 10271001
Start Date : 6/12/2010
Page No : 1

Groups Printed- Cars - Trucks

	Route 1A From North				Boardman St From East				Route 1A From South				Boardman St From West						
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	Peds	Left	Thru	Right	U-Turn	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
14:30	7	373	23	12	11	0	7	0	61	370	1	1	46	5	65	0	13	969	982
14:45	7	351	20	5	4	3	11	0	66	386	7	1	57	5	62	0	6	979	985
Total	14	724	43	17	15	3	18	0	127	756	8	2	103	10	127	0	19	1948	1967
15:00	9	333	30	14	8	2	6	0	68	374	5	2	35	2	79	0	16	951	967
15:15	7	342	26	11	6	3	11	0	73	330	7	2	49	6	61	0	13	921	934
15:30	6	379	19	18	12	2	7	0	63	344	5	2	49	10	45	0	20	941	961
15:45	7	332	12	13	9	2	16	0	58	378	2	2	43	1	61	0	15	921	936
Total	29	1386	87	56	35	9	40	0	262	1426	19	8	176	19	246	0	64	3734	3798
16:00	8	369	19	7	5	1	13	0	69	320	2	4	38	3	60	0	11	907	918
16:15	7	362	26	17	10	1	13	0	50	377	3	2	39	4	51	2	21	943	964
16:30	5	383	10	5	5	1	8	0	47	373	1	4	58	4	81	0	9	976	985
16:45	6	336	21	9	16	1	8	0	70	398	6	8	48	1	70	0	17	981	998
Total	26	1450	76	38	36	4	42	0	236	1468	12	18	183	12	262	2	58	3807	3865
17:00	6	313	29	5	3	6	4	0	70	434	1	4	37	2	70	0	9	975	984
17:15	7	321	21	9	7	3	7	0	52	418	2	4	33	1	73	0	13	945	958
Grand Total	82	4194	256	125	96	25	111	0	747	4502	42	36	532	44	778	2	163	11409	11572
Apprch %	1.8	92.5	5.6		41.4	10.8	47.8		14.1	85.1	0.8		39.3	3.2	57.5				
Total %	0.7	36.8	2.2		0.8	0.2	1		6.5	39.5	0.4		4.7	0.4	6.8		1.4	98.6	
Cars	57	4126	253		95	24	98		737	4422	42		511	44	769		0	0	11338
% Cars	69.5	98.4	98.8	97.6	99	96	88.3	0	98.7	98.2	100	100	96.1	100	98.8	100	0	0	98
Trucks	25	68	3		1	1	13		10	80	0		21	0	9		0	0	234
% Trucks	30.5	1.6	1.2	2.4	1	4	11.7	0	1.3	1.8	0	0	3.9	0	1.2	0	0	0	2

	Route 1A From North				Boardman St From East				Route 1A From South				Boardman St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 16:15 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 14:30																	
14:30	7	373	23	403	11	0	7	18	61	370	1	432	46	5	65	116	969
14:45	7	351	20	378	4	3	11	18	66	386	7	459	57	5	62	124	979
15:00	9	333	30	372	8	2	6	16	68	374	5	447	35	2	79	116	951
15:15	7	342	26	375	6	3	11	20	73	330	7	410	49	6	61	116	921
Total Volume	30	1399	99	1528	29	8	35	72	268	1460	20	1748	187	18	267	472	3820
% App. Total	2	91.6	6.5		40.3	11.1	48.6		15.3	83.5	1.1		39.6	3.8	56.6		
PHF	.833	.938	.825	.948	.659	.667	.795	.900	.918	.946	.714	.952	.820	.750	.845	.952	.975
Cars	21	1377	96	1494	28	8	31	67	261	1431	20	1712	176	18	264	458	3731
% Cars	70.0	98.4	97.0	97.8	96.6	100	88.6	93.1	97.4	98.0	100	97.9	94.1	100	98.9	97.0	97.7
Trucks	9	22	3	34	1	0	4	5	7	29	0	36	11	0	3	14	89
% Trucks	30.0	1.6	3.0	2.2	3.4	0	11.4	6.9	2.6	2.0	0	2.1	5.9	0	1.1	3.0	2.3

Accurate Counts
978-664-2565

N/S Street : Route 1A
E/W Street: Boardman Street
City/State : Boston, MA
Weather : Clear

File Name : 102710A1
Site Code : 10271001
Start Date : 6/12/2010
Page No : 1

Groups Printed- Trucks

	Route 1A From North				Boardman St From East				Route 1A From South				Boardman St From West						
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	Peds	Left	Thru	Right	U-Turn	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
14:30	1	9	0	0	0	0	1	0	1	9	0	0	1	0	2	0	0	24	24
14:45	2	4	1	0	0	0	1	0	1	7	0	0	3	0	0	0	0	19	19
Total	3	13	1	0	0	0	2	0	2	16	0	0	4	0	2	0	0	43	43
15:00	2	4	0	0	0	0	2	0	2	2	0	0	3	0	0	0	0	15	15
15:15	4	5	2	1	1	0	0	0	3	11	0	0	4	0	1	0	1	31	32
15:30	3	2	0	0	0	0	1	0	0	9	0	0	2	0	2	0	0	19	19
15:45	2	8	0	0	0	0	4	0	0	2	0	0	1	0	0	0	0	17	17
Total	11	19	2	1	1	0	7	0	5	24	0	0	10	0	3	0	1	82	83
16:00	2	4	0	0	0	0	1	0	0	6	0	0	1	0	0	0	0	14	14
16:15	3	11	0	1	0	0	0	0	3	5	0	0	1	0	2	0	1	25	26
16:30	1	10	0	0	0	0	0	0	0	4	0	0	2	0	1	0	0	18	18
16:45	2	0	0	0	0	1	0	0	0	9	0	0	2	0	0	0	0	14	14
Total	8	25	0	1	0	1	1	0	3	24	0	0	6	0	3	0	1	71	72
17:00	2	8	0	0	0	0	2	0	0	5	0	0	0	0	0	0	0	17	17
17:15	1	3	0	1	0	0	1	0	0	11	0	0	1	0	1	0	1	18	19
Grand Total	25	68	3	3	1	1	13	0	10	80	0	0	21	0	9	0	3	231	234
Apprch %	26	70.8	3.1		6.7	6.7	86.7		11.1	88.9	0		70	0	30				
Total %	10.8	29.4	1.3		0.4	0.4	5.6		4.3	34.6	0		9.1	0	3.9		1.3	98.7	

	Route 1A From North				Boardman St From East				Route 1A From South				Boardman St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 16:15 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 14:30																	
14:30	1	9	0	10	0	0	1	1	1	9	0	10	1	0	2	3	24
14:45	2	4	1	7	0	0	1	1	1	7	0	8	3	0	0	3	19
15:00	2	4	0	6	0	0	2	2	2	2	0	4	3	0	0	3	15
15:15	4	5	2	11	1	0	0	1	3	11	0	14	4	0	1	5	31
Total Volume	9	22	3	34	1	0	4	5	7	29	0	36	11	0	3	14	89
% App. Total	26.5	64.7	8.8		20	0	80		19.4	80.6	0		78.6	0	21.4		
PHF	.563	.611	.375	.773	.250	.000	.500	.625	.583	.659	.000	.643	.688	.000	.375	.700	.718

Accurate Counts
978-664-2565

N/S Street : Route 1A
E/W Street: Tomasello Way
City/State : Boston, MA
Weather : Clear

File Name : 10271002
Site Code : 10271002
Start Date : 6/11/2010

Groups Printed- Cars - Trucks

	Route 1A From North			Tomasello Way From East			Route 1A From South					
Start Time	Left	Thru	U-Turn	Left	Right	Peds	Thru	Right	U-Turn	Exclu. Total	Inclu. Total	Int. Total
15:30	5	405	2	2	5	0	489	60	5	0	973	973
15:45	3	417	3	7	2	0	495	45	4	0	976	976
Total	8	822	5	9	7	0	984	105	9	0	1949	1949
16:00	7	433	4	6	3	0	475	47	7	0	982	982
16:15	4	435	2	4	3	0	489	46	3	0	986	986
16:30	6	364	5	5	4	0	489	68	2	0	943	943
16:45	7	369	3	5	2	0	467	51	3	0	907	907
Total	24	1601	14	20	12	0	1920	212	15	0	3818	3818
17:00	6	367	4	4	16	0	466	56	1	0	920	920
17:15	7	401	8	3	2	0	502	72	4	0	999	999
17:30	5	403	6	4	7	0	482	76	2	0	985	985
17:45	5	311	2	6	7	0	498	75	3	0	907	907
Total	23	1482	20	17	32	0	1948	279	10	0	3811	3811
18:00	3	368	6	0	4	0	518	50	4	0	953	953
18:15	6	357	6	3	4	0	491	65	6	0	938	938
Grand Total	64	4630	51	49	59	0	5861	711	44	0	11469	11469
Apprch %	1.3	97.6	1.1	45.4	54.6		88.6	10.7	0.7			
Total %	0.6	40.4	0.4	0.4	0.5		51.1	6.2	0.4	0	100	
Cars	61	4396	51	47	57		5594	693	43	0	0	10942
% Cars	95.3	94.9	100	95.9	96.6	0	95.4	97.5	97.7	0	0	95.4
Trucks	3	234	0	2	2		267	18	1	0	0	527
% Trucks	4.7	5.1	0	4.1	3.4	0	4.6	2.5	2.3	0	0	4.6

	Route 1A From North				Tomasello Way From East			Route 1A From South				
Start Time	Left	Thru	U-Turn	App. Total	Left	Right	App. Total	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1												
Peak Hour for Entire Intersection Begins at 15:30												
15:30	5	405	2	412	2	5	7	489	60	5	554	973
15:45	3	417	3	423	7	2	9	495	45	4	544	976
16:00	7	433	4	444	6	3	9	475	47	7	529	982
16:15	4	435	2	441	4	3	7	489	46	3	538	986
Total Volume	19	1690	11	1720	19	13	32	1948	198	19	2165	3917
% App. Total	1.1	98.3	0.6		59.4	40.6		90	9.1	0.9		
PHF	.679	.971	.688	.968	.679	.650	.889	.984	.825	.679	.977	.993
Cars	18	1599	11	1628	17	12	29	1841	194	19	2054	3711
% Cars	94.7	94.6	100	94.7	89.5	92.3	90.6	94.5	98.0	100	94.9	94.7
Trucks	1	91	0	92	2	1	3	107	4	0	111	206
% Trucks	5.3	5.4	0	5.3	10.5	7.7	9.4	5.5	2.0	0	5.1	5.3

Accurate Counts
978-664-2565

N/S Street : Route 1A
E/W Street: Tomasello Way
City/State : Boston, MA
Weather : Clear

File Name : 10271002
Site Code : 10271002
Start Date : 6/11/2010
Page No : 1

Groups Printed- Trucks

	Route 1A From North			Tomasello Way From East			Route 1A From South					
Start Time	Left	Thru	U-Turn	Left	Right	Peds	Thru	Right	U-Turn	Exclu. Total	Inclu. Total	Int. Total
15:30	0	31	0	0	1	0	29	2	0	0	63	63
15:45	0	21	0	1	0	0	31	0	0	0	53	53
Total	0	52	0	1	1	0	60	2	0	0	116	116
16:00	1	21	0	0	0	0	27	2	0	0	51	51
16:15	0	18	0	1	0	0	20	0	0	0	39	39
16:30	0	26	0	0	0	0	23	1	0	0	50	50
16:45	0	16	0	0	0	0	14	1	0	0	31	31
Total	1	81	0	1	0	0	84	4	0	0	171	171
17:00	1	21	0	0	1	0	21	2	0	0	46	46
17:15	1	16	0	0	0	0	20	2	0	0	39	39
17:30	0	20	0	0	0	0	17	2	1	0	40	40
17:45	0	20	0	0	0	0	21	2	0	0	43	43
Total	2	77	0	0	1	0	79	8	1	0	168	168
18:00	0	13	0	0	0	0	25	2	0	0	40	40
18:15	0	11	0	0	0	0	19	2	0	0	32	32
Grand Total	3	234	0	2	2	0	267	18	1	0	527	527
Apprch %	1.3	98.7	0	50	50		93.4	6.3	0.3			
Total %	0.6	44.4	0	0.4	0.4		50.7	3.4	0.2	0	100	

	Route 1A From North				Tomasello Way From East			Route 1A From South				
Start Time	Left	Thru	U-Turn	App. Total	Left	Right	App. Total	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1												
Peak Hour for Entire Intersection Begins at 15:30												
15:30	0	31	0	31	0	1	1	29	2	0	31	63
15:45	0	21	0	21	1	0	1	31	0	0	31	53
16:00	1	21	0	22	0	0	0	27	2	0	29	51
16:15	0	18	0	18	1	0	1	20	0	0	20	39
Total Volume	1	91	0	92	2	1	3	107	4	0	111	206
% App. Total	1.1	98.9	0		66.7	33.3		96.4	3.6	0		
PHF	.250	.734	.000	.742	.500	.250	.750	.863	.500	.000	.895	.817

Accurate Counts
978-664-2565

N/S Street : Route 1A
E/W Street: Tomasello Way
City/State : Boston, MA
Weather : Clear

File Name : 102710A2
Site Code : 10271002
Start Date : 6/12/2010
Page No : 1

Groups Printed- Cars - Trucks

	Route 1A From North			Tomasello Way From East			Route 1A From South					
Start Time	Left	Thru	U-Turns	Left	Right	Peds	Thru	Right	U-Turns	Exclu. Total	Inclu. Total	Int. Total
14:30	9	406	1	1	4	0	384	48	7	8	852	860
14:45	7	375	4	9	10	0	416	48	8	12	865	877
Total	16	781	5	10	14	0	800	96	15	20	1717	1737
15:00	11	376	1	10	6	0	374	40	8	9	817	826
15:15	11	374	3	9	20	0	363	39	9	12	816	828
15:30	6	416	3	9	19	0	356	50	4	7	856	863
15:45	5	359	3	5	7	0	388	41	6	9	805	814
Total	33	1525	10	33	52	0	1481	170	27	37	3294	3331
16:00	8	395	4	22	33	0	330	42	11	15	830	845
16:15	10	402	1	11	20	0	399	38	2	3	880	883
16:30	4	399	1	11	17	0	392	46	11	12	869	881
16:45	6	366	2	9	15	0	429	37	1	3	862	865
Total	28	1562	8	53	85	0	1550	163	25	33	3441	3474
17:00	2	352	0	10	6	0	444	42	3	3	856	859
17:15	6	351	0	7	11	0	440	35	3	3	850	853
Grand Total	85	4571	23	113	168	0	4715	506	73	96	10158	10254
Apprch %	1.8	98.2		40.2	59.8		90.3	9.7				
Total %	0.8	45		1.1	1.7		46.4	5		0.9	99.1	
Cars	85	4473		111	166		4610	498		0	0	10039
% Cars	100	97.9	100	98.2	98.8	0	97.8	98.4	100	0	0	97.9
Trucks	0	98		2	2		105	8		0	0	215
% Trucks	0	2.1	0	1.8	1.2	0	2.2	1.6	0	0	0	2.1

	Route 1A From North			Tomasello Way From East			Route 1A From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 17:15 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 16:15										
16:15	10	402	412	11	20	31	399	38	437	880
16:30	4	399	403	11	17	28	392	46	438	869
16:45	6	366	372	9	15	24	429	37	466	862
17:00	2	352	354	10	6	16	444	42	486	856
Total Volume	22	1519	1541	41	58	99	1664	163	1827	3467
% App. Total	1.4	98.6		41.4	58.6		91.1	8.9		
PHF	.550	.945	.935	.932	.725	.798	.937	.886	.940	.985
Cars	22	1480	1502	40	58	98	1636	160	1796	3396
% Cars	100	97.4	97.5	97.6	100	99.0	98.3	98.2	98.3	98.0
Trucks	0	39	39	1	0	1	28	3	31	71
% Trucks	0	2.6	2.5	2.4	0	1.0	1.7	1.8	1.7	2.0

Accurate Counts
978-664-2565

N/S Street : Route 1A
E/W Street: Tomasello Way
City/State : Boston, MA
Weather : Clear

File Name : 102710A2
Site Code : 10271002
Start Date : 6/12/2010

Groups Printed- Trucks

	Route 1A From North			Tomasello Way From East			Route 1A From South					
Start Time	Left	Thru	U-Turns	Left	Right	Peds	Thru	Right	U-Turns	Exclu. Total	Inclu. Total	Int. Total
14:30	0	10	0	0	0	0	10	1	0	0	21	21
14:45	0	6	0	0	0	0	10	1	0	0	17	17
Total	0	16	0	0	0	0	20	2	0	0	38	38
15:00	0	7	0	0	0	0	6	0	0	0	13	13
15:15	0	11	0	0	0	0	15	0	0	0	26	26
15:30	0	5	0	0	2	0	11	0	0	0	18	18
15:45	0	10	0	0	0	0	7	0	0	0	17	17
Total	0	33	0	0	2	0	39	0	0	0	74	74
16:00	0	6	0	0	0	0	6	2	0	0	14	14
16:15	0	15	0	0	0	0	6	1	0	0	22	22
16:30	0	11	0	0	0	0	5	1	0	0	17	17
16:45	0	2	0	0	0	0	10	1	0	0	13	13
Total	0	34	0	0	0	0	27	5	0	0	66	66
17:00	0	11	0	1	0	0	7	0	0	0	19	19
17:15	0	4	0	1	0	0	12	1	0	0	18	18
Grand Total	0	98	0	2	2	0	105	8	0	0	215	215
Apprch %	0	100		50	50		92.9	7.1				
Total %	0	45.6		0.9	0.9		48.8	3.7		0	100	

	Route 1A From North			Tomasello Way From East			Route 1A From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 17:15 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 14:30										
14:30	0	10	10	0	0	0	10	1	11	21
14:45	0	6	6	0	0	0	10	1	11	17
15:00	0	7	7	0	0	0	6	0	6	13
15:15	0	11	11	0	0	0	15	0	15	26
Total Volume	0	34	34	0	0	0	41	2	43	77
% App. Total	0	100		0	0		95.3	4.7		
PHF	.000	.773	.773	.000	.000	.000	.683	.500	.717	.740

Accurate Counts
978-664-2565

N/S Street : Route 1A
E/W Street: Jughandle Turn
City/State : Boston, MA
Weather : Clear

File Name : 10271003
Site Code : 10271003
Start Date : 6/11/2010
Page No : 1

Groups Printed- Cars - Trucks

	Route 1A From North				Driveway From East				Route 1A From South				Jughandle From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
15:30	0	407	0	0	0	0	0	0	0	488	0	0	23	1	2	0	0	921	921
15:45	0	425	0	0	0	0	0	0	0	504	0	0	28	3	3	0	0	963	963
Total	0	832	0	0	0	0	0	0	0	992	0	0	51	4	5	0	0	1884	1884
16:00	0	442	0	0	0	0	0	0	0	482	0	0	23	3	2	0	0	952	952
16:15	0	438	0	0	0	0	0	0	0	494	0	0	25	0	1	0	0	958	958
16:30	0	379	0	0	0	0	0	0	0	494	0	0	18	0	0	0	0	891	891
16:45	0	383	0	0	0	0	0	0	0	464	0	0	13	1	3	0	0	864	864
Total	0	1642	0	0	0	0	0	0	0	1934	0	0	79	4	6	0	0	3665	3665
17:00	0	382	0	0	0	0	0	0	0	504	0	0	39	2	0	0	0	927	927
17:15	0	412	0	0	0	0	0	0	0	479	0	0	12	1	0	0	0	904	904
17:30	0	409	0	0	0	0	0	0	0	497	0	0	23	0	0	0	0	929	929
17:45	0	314	1	0	0	0	0	0	0	499	0	0	28	1	0	0	0	843	843
Total	0	1517	1	0	0	0	0	0	0	1979	0	0	102	4	0	0	0	3603	3603
18:00	0	371	1	0	0	0	0	0	0	516	0	0	15	4	0	0	0	907	907
18:15	0	370	1	0	0	0	0	0	0	506	0	0	9	1	1	0	0	888	888
Grand Total	0	4732	3	0	0	0	0	0	0	5927	0	0	256	17	12	0	0	10947	10947
Apprch %	0	99.9	0.1		0	0	0		0	100	0		89.8	6	4.2				
Total %	0	43.2	0		0	0	0		0	54.1	0		2.3	0.2	0.1		0	100	
Cars	0	4493	3		0	0	0		0	5659	0		228	5	10		0	0	10398
% Cars	0	94.9	100	0	0	0	0	0	0	95.5	0	0	89.1	29.4	83.3	0	0	0	95
Trucks	0	239	0		0	0	0		0	268	0		28	12	2		0	0	549
% Trucks	0	5.1	0	0	0	0	0	0	0	4.5	0	0	10.9	70.6	16.7	0	0	0	5

	Route 1A From North				Driveway From East				Route 1A From South				Jughandle From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 15:30																	
15:30	0	407	0	407	0	0	0	0	0	488	0	488	23	1	2	26	921
15:45	0	425	0	425	0	0	0	0	0	504	0	504	28	3	3	34	963
16:00	0	442	0	442	0	0	0	0	0	482	0	482	23	3	2	28	952
16:15	0	438	0	438	0	0	0	0	0	494	0	494	25	0	1	26	958
Total Volume	0	1712	0	1712	0	0	0	0	0	1968	0	1968	99	7	8	114	3794
% App. Total	0	100	0		0	0	0		0	100	0		86.8	6.1	7		
PHF	.000	.968	.000	.968	.000	.000	.000	.000	.000	.976	.000	.976	.884	.583	.667	.838	.985
Cars	0	1618	0	1618	0	0	0	0	0	1860	0	1860	79	1	7	87	3565
% Cars	0	94.5	0	94.5	0	0	0	0	0	94.5	0	94.5	79.8	14.3	87.5	76.3	94.0
Trucks	0	94	0	94	0	0	0	0	0	108	0	108	20	6	1	27	229
% Trucks	0	5.5	0	5.5	0	0	0	0	0	5.5	0	5.5	20.2	85.7	12.5	23.7	6.0

Accurate Counts
978-664-2565

N/S Street : Route 1A
E/W Street: Jughandle Turn
City/State : Boston, MA
Weather : Clear

File Name : 10271003
Site Code : 10271003
Start Date : 6/11/2010
Page No : 1

Groups Printed- Trucks

	Route 1A From North				Driveway From East				Route 1A From South				Jughandle From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
15:30	0	29	0	0	0	0	0	0	0	29	0	0	7	1	0	0	0	66	66
15:45	0	23	0	0	0	0	0	0	0	32	0	0	7	3	0	0	0	65	65
Total	0	52	0	0	0	0	0	0	0	61	0	0	14	4	0	0	0	131	131
16:00	0	23	0	0	0	0	0	0	0	29	0	0	1	2	0	0	0	55	55
16:15	0	19	0	0	0	0	0	0	0	18	0	0	5	0	1	0	0	43	43
16:30	0	26	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0	51	51
16:45	0	16	0	0	0	0	0	0	0	11	0	0	0	1	0	0	0	28	28
Total	0	84	0	0	0	0	0	0	0	83	0	0	6	3	1	0	0	177	177
17:00	0	21	0	0	0	0	0	0	0	21	0	0	5	1	0	0	0	48	48
17:15	0	19	0	0	0	0	0	0	0	20	0	0	0	1	0	0	0	40	40
17:30	0	18	0	0	0	0	0	0	0	15	0	0	1	0	0	0	0	34	34
17:45	0	20	0	0	0	0	0	0	0	20	0	0	1	1	0	0	0	42	42
Total	0	78	0	0	0	0	0	0	0	76	0	0	7	3	0	0	0	164	164
18:00	0	12	0	0	0	0	0	0	0	25	0	0	1	2	0	0	0	40	40
18:15	0	13	0	0	0	0	0	0	0	23	0	0	0	0	1	0	0	37	37
Grand Total	0	239	0	0	0	0	0	0	0	268	0	0	28	12	2	0	0	549	549
Apprch %	0	100	0		0	0	0		0	100	0		66.7	28.6	4.8				
Total %	0	43.5	0		0	0	0		0	48.8	0		5.1	2.2	0.4		0	100	

	Route 1A From North				Driveway From East				Route 1A From South				Jughandle From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 15:30																	
15:30	0	29	0	29	0	0	0	0	0	29	0	29	7	1	0	8	66
15:45	0	23	0	23	0	0	0	0	0	32	0	32	7	3	0	10	65
16:00	0	23	0	23	0	0	0	0	0	29	0	29	1	2	0	3	55
16:15	0	19	0	19	0	0	0	0	0	18	0	18	5	0	1	6	43
Total Volume	0	94	0	94	0	0	0	0	0	108	0	108	20	6	1	27	229
% App. Total	0	100	0		0	0	0		0	100	0		74.1	22.2	3.7		
PHF	.000	.810	.000	.810	.000	.000	.000	.000	.000	.844	.000	.844	.714	.500	.250	.675	.867

Accurate Counts
978-664-2565

N/S Street : Route 1A
E/W Street: Jughandle Turn
City/State : Boston, MA
Weather : Clear

File Name : 102710A3
Site Code : 10271003
Start Date : 6/12/2010
Page No : 1

Groups Printed- Cars - Trucks

	Route 1A From North				Driveway From East				Route 1A From South				Jughandle From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
14:30	0	413	0	0	0	0	0	0	0	385	3	1	16	0	1	0	1	818	819
14:45	0	387	0	0	0	0	0	0	0	429	0	0	7	1	3	0	0	827	827
Total	0	800	0	0	0	0	0	0	0	814	3	1	23	1	4	0	1	1645	1646
15:00	0	382	0	0	0	0	2	0	0	382	0	0	13	2	2	0	0	783	783
15:15	0	386	0	0	0	0	2	0	0	379	2	0	10	0	1	0	0	780	780
15:30	0	425	0	0	0	0	0	0	0	378	3	0	11	1	1	0	0	819	819
15:45	0	363	0	0	0	0	0	0	0	395	0	1	15	1	1	0	1	775	776
Total	0	1556	0	0	0	0	4	0	0	1534	5	1	49	4	5	0	1	3157	3158
16:00	0	403	0	0	1	0	1	0	0	360	0	0	13	1	4	0	0	783	783
16:15	0	405	0	0	0	0	1	0	0	427	1	0	17	0	2	0	0	853	853
16:30	0	403	0	0	0	0	2	0	0	419	1	0	15	3	0	0	0	843	843
16:45	0	374	0	0	0	0	3	0	0	438	0	0	7	2	1	0	0	825	825
Total	0	1585	0	0	1	0	7	0	0	1644	2	0	52	6	7	0	0	3304	3304
17:00	0	353	0	0	0	0	0	0	0	451	0	1	10	3	4	0	1	821	822
17:15	0	357	0	0	0	0	0	0	0	446	0	0	10	1	0	0	0	814	814
Grand Total	0	4651	0	0	1	0	11	0	0	4889	10	3	144	15	20	0	3	9741	9744
Apprch %	0	100	0		8.3	0	91.7		0	99.8	0.2		80.4	8.4	11.2				
Total %	0	47.7	0		0	0	0.1		0	50.2	0.1		1.5	0.2	0.2		0	100	
Cars	0	4554	0		1	0	11		0	4790	5		135	7	20		0	0	9526
% Cars	0	97.9	0	0	100	0	100	0	0	98	50	100	93.8	46.7	100	0	0	0	97.8
Trucks	0	97	0		0	0	0		0	99	5		9	8	0		0	0	218
% Trucks	0	2.1	0	0	0	0	0	0	0	2	50	0	6.2	53.3	0	0	0	0	2.2

	Route 1A From North				Driveway From East				Route 1A From South				Jughandle From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 17:15 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 16:15																	
16:15	0	405	0	405	0	0	1	1	0	427	1	428	17	0	2	19	853
16:30	0	403	0	403	0	0	2	2	0	419	1	420	15	3	0	18	843
16:45	0	374	0	374	0	0	3	3	0	438	0	438	7	2	1	10	825
17:00	0	353	0	353	0	0	0	0	0	451	0	451	10	3	4	17	821
Total Volume	0	1535	0	1535	0	0	6	6	0	1735	2	1737	49	8	7	64	3342
% App. Total	0	100	0		0	0	100		0	99.9	0.1		76.6	12.5	10.9		
PHF	.000	.948	.000	.948	.000	.000	.500	.500	.000	.962	.500	.963	.721	.667	.438	.842	.979
Cars	0	1496	0	1496	0	0	6	6	0	1709	1	1710	45	3	7	55	3267
% Cars	0	97.5	0	97.5	0	0	100	100	0	98.5	50.0	98.4	91.8	37.5	100	85.9	97.8
Trucks	0	39	0	39	0	0	0	0	0	26	1	27	4	5	0	9	75
% Trucks	0	2.5	0	2.5	0	0	0	0	0	1.5	50.0	1.6	8.2	62.5	0	14.1	2.2

Accurate Counts
978-664-2565

N/S Street : Route 1A
E/W Street: Jughandle Turn
City/State : Boston, MA
Weather : Clear

File Name : 102710A3
Site Code : 10271003
Start Date : 6/12/2010
Page No : 1

Groups Printed- Trucks

	Route 1A From North				Driveway From East				Route 1A From South				Jughandle From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
14:30	0	10	0	0	0	0	0	0	0	8	2	0	1	0	0	0	0	21	21
14:45	0	6	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	16	16
Total	0	16	0	0	0	0	0	0	0	18	2	0	1	0	0	0	0	37	37
15:00	0	7	0	0	0	0	0	0	0	6	0	0	2	2	0	0	0	17	17
15:15	0	10	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	25	25
15:30	0	6	0	0	0	0	0	0	0	9	2	0	1	0	0	0	0	18	18
15:45	0	9	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	16	16
Total	0	32	0	0	0	0	0	0	0	37	2	0	3	2	0	0	0	76	76
16:00	0	6	0	0	0	0	0	0	0	6	0	0	1	1	0	0	0	14	14
16:15	0	14	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	20	20
16:30	0	11	0	0	0	0	0	0	0	3	1	0	2	3	0	0	0	20	20
16:45	0	3	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	12	12
Total	0	34	0	0	0	0	0	0	0	24	1	0	3	4	0	0	0	66	66
17:00	0	11	0	0	0	0	0	0	0	8	0	0	2	2	0	0	0	23	23
17:15	0	4	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	16	16
Grand Total	0	97	0	0	0	0	0	0	0	99	5	0	9	8	0	0	0	218	218
Apprch %	0	100	0		0	0	0		0	95.2	4.8		52.9	47.1	0				
Total %	0	44.5	0		0	0	0		0	45.4	2.3		4.1	3.7	0		0	100	

	Route 1A From North				Driveway From East				Route 1A From South				Jughandle From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 17:15 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 14:30																	
14:30	0	10	0	10	0	0	0	0	0	8	2	10	1	0	0	1	21
14:45	0	6	0	6	0	0	0	0	0	10	0	10	0	0	0	0	16
15:00	0	7	0	7	0	0	0	0	0	6	0	6	2	2	0	4	17
15:15	0	10	0	10	0	0	0	0	0	15	0	15	0	0	0	0	25
Total Volume	0	33	0	33	0	0	0	0	0	39	2	41	3	2	0	5	79
% App. Total	0	100	0		0	0	0		0	95.1	4.9		60	40	0		
PHF	.000	.825	.000	.825	.000	.000	.000	.000	.000	.650	.250	.683	.375	.250	.000	.313	.790

Accurate Counts
978-664-2565

N/S Street : Bennington Street
E/W Street: Saratoga Street
City/State : Boston, MA
Weather : Clear

File Name : 10271004
Site Code : 10271004
Start Date : 6/11/2010
Page No : 1

Groups Printed- Cars - Trucks

	Bennington St From North				Saratoga St From East				Bennington St From South				Saratoga St From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
15:30	32	57	15	32	80	75	32	0	13	84	131	0	24	68	3	13	45	614	659
15:45	30	51	15	29	72	54	21	2	5	86	118	0	19	60	5	16	47	536	583
Total	62	108	30	61	152	129	53	2	18	170	249	0	43	128	8	29	92	1150	1242
16:00	30	50	10	30	60	52	27	3	6	82	98	2	26	77	4	9	44	522	566
16:15	38	72	25	37	74	60	26	5	8	96	116	0	23	75	4	12	54	617	671
16:30	24	89	15	24	68	59	19	2	9	70	114	0	18	60	5	17	43	550	593
16:45	26	65	15	26	78	33	23	0	6	74	93	1	29	70	4	16	43	516	559
Total	118	276	65	117	280	204	95	10	29	322	421	3	96	282	17	54	184	2205	2389
17:00	34	58	6	34	65	53	20	1	5	84	103	2	30	65	9	10	47	532	579
17:15	27	60	18	27	78	49	27	1	13	76	114	5	13	62	2	21	54	539	593
17:30	30	55	15	30	76	44	27	1	3	116	120	2	11	81	5	19	52	583	635
17:45	33	59	13	33	77	46	26	1	4	110	116	2	14	76	3	16	52	577	629
Total	124	232	52	124	296	192	100	4	25	386	453	11	68	284	19	66	205	2231	2436
18:00	25	42	13	24	79	59	25	2	4	73	117	2	12	58	3	20	48	510	558
18:15	45	53	18	45	63	50	26	5	13	82	119	1	12	82	7	22	73	570	643
Grand Total	374	711	178	371	870	634	299	23	89	1033	1359	17	231	834	54	191	602	6666	7268
Apprch %	29.6	56.3	14.1		48.3	35.2	16.6		3.6	41.6	54.8		20.6	74.5	4.8				
Total %	5.6	10.7	2.7		13.1	9.5	4.5		1.3	15.5	20.4		3.5	12.5	0.8		8.3	91.7	
Cars	371	680	161		863	623	286		86	1019	1346		229	825	53		0	0	7144
% Cars	99.2	95.6	90.4	100	99.2	98.3	95.7	100	96.6	98.6	99	100	99.1	98.9	98.1	100	0	0	98.3
Trucks	3	31	17		7	11	13		3	14	13		2	9	1		0	0	124
% Trucks	0.8	4.4	9.6	0	0.8	1.7	4.3	0	3.4	1.4	1	0	0.9	1.1	1.9	0	0	0	1.7

	Bennington St From North				Saratoga St From East				Bennington St From South				Saratoga St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 15:30																	
15:30	32	57	15	104	80	75	32	187	13	84	131	228	24	68	3	95	614
15:45	30	51	15	96	72	54	21	147	5	86	118	209	19	60	5	84	536
16:00	30	50	10	90	60	52	27	139	6	82	98	186	26	77	4	107	522
16:15	38	72	25	135	74	60	26	160	8	96	116	220	23	75	4	102	617
Total Volume	130	230	65	425	286	241	106	633	32	348	463	843	92	280	16	388	2289
% App. Total	30.6	54.1	15.3		45.2	38.1	16.7		3.8	41.3	54.9		23.7	72.2	4.1		
PHF	.855	.799	.650	.787	.894	.803	.828	.846	.615	.906	.884	.924	.885	.909	.800	.907	.927
Cars	128	217	54	399	282	233	96	611	31	340	458	829	90	275	15	380	2219
% Cars	98.5	94.3	83.1	93.9	98.6	96.7	90.6	96.5	96.9	97.7	98.9	98.3	97.8	98.2	93.8	97.9	96.9
Trucks	2	13	11	26	4	8	10	22	1	8	5	14	2	5	1	8	70
% Trucks	1.5	5.7	16.9	6.1	1.4	3.3	9.4	3.5	3.1	2.3	1.1	1.7	2.2	1.8	6.3	2.1	3.1

Accurate Counts
978-664-2565

N/S Street : Bennington Street
E/W Street: Saratoga Street
City/State : Boston, MA
Weather : Clear

File Name : 10271004
Site Code : 10271004
Start Date : 6/11/2010
Page No : 1

Groups Printed- Trucks

	Bennington St From North				Saratoga St From East				Bennington St From South				Saratoga St From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
15:30	0	5	2	0	0	5	5	0	1	4	2	0	1	2	0	0	0	27	27
15:45	1	4	4	0	1	0	3	0	0	1	0	0	0	3	0	0	0	17	17
Total	1	9	6	0	1	5	8	0	1	5	2	0	1	5	0	0	0	44	44
16:00	0	2	1	0	2	3	2	0	0	0	1	0	1	0	1	0	0	13	13
16:15	1	2	4	0	1	0	0	0	0	3	2	0	0	0	0	0	0	13	13
16:30	0	3	1	0	1	0	1	0	1	0	2	0	0	1	0	0	0	10	10
16:45	0	1	1	0	0	1	0	0	0	1	1	0	0	1	0	0	0	6	6
Total	1	8	7	0	4	4	3	0	1	4	6	0	1	2	1	0	0	42	42
17:00	0	3	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0	7	7
17:15	0	3	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	5	5
17:30	0	2	1	0	0	0	1	0	0	1	1	0	0	1	0	0	0	7	7
17:45	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	4	4
Total	0	11	1	0	1	0	2	0	1	3	3	0	0	1	0	0	0	23	23
18:00	1	3	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	6	6
18:15	0	0	2	0	1	1	0	0	0	2	2	0	0	1	0	0	0	9	9
Grand Total	3	31	17	0	7	11	13	0	3	14	13	0	2	9	1	0	0	124	124
Apprch %	5.9	60.8	33.3		22.6	35.5	41.9		10	46.7	43.3		16.7	75	8.3				
Total %	2.4	25	13.7		5.6	8.9	10.5		2.4	11.3	10.5		1.6	7.3	0.8		0	100	

	Bennington St From North				Saratoga St From East				Bennington St From South				Saratoga St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 15:30																	
15:30	0	5	2	7	0	5	5	10	1	4	2	7	1	2	0	3	27
15:45	1	4	4	9	1	0	3	4	0	1	0	1	0	3	0	3	17
16:00	0	2	1	3	2	3	2	7	0	0	1	1	1	0	1	2	13
16:15	1	2	4	7	1	0	0	1	0	3	2	5	0	0	0	0	13
Total Volume	2	13	11	26	4	8	10	22	1	8	5	14	2	5	1	8	70
% App. Total	7.7	50	42.3		18.2	36.4	45.5		7.1	57.1	35.7		25	62.5	12.5		
PHF	.500	.650	.688	.722	.500	.400	.500	.550	.250	.500	.625	.500	.500	.417	.250	.667	.648

Accurate Counts
978-664-2565

N/S Street : Bennington Street
E/W Street: Saratoga Street
City/State : Boston, MA
Weather : Clear

File Name : 102710a4
Site Code : 10271004
Start Date : 6/12/2010
Page No : 1

Groups Printed- Cars - Trucks

	Bennington St From North				Saratoga St From East				Bennington St From South				Saratoga St From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
02:30 PM	11	69	1	4	25	64	20	78	87	69	37	7	11	41	92	8	97	527	624
02:45 PM	13	53	0	4	25	55	13	9	63	71	32	6	9	40	81	1	20	455	475
Total	24	122	1	8	50	119	33	87	150	140	69	13	20	81	173	9	117	982	1099
03:00 PM	13	82	1	8	32	58	19	6	80	71	39	4	11	50	77	1	19	533	552
03:15 PM	4	62	0	3	34	48	17	4	69	69	38	8	8	35	79	0	15	463	478
03:30 PM	14	76	2	1	27	74	17	4	81	58	40	4	7	49	98	0	9	543	552
03:45 PM	4	73	0	0	35	60	18	9	68	71	38	3	9	43	89	0	12	508	520
Total	35	293	3	12	128	240	71	23	298	269	155	19	35	177	343	1	55	2047	2102
04:00 PM	10	63	1	3	25	48	16	5	69	68	45	5	1	37	99	6	19	482	501
04:15 PM	8	58	1	1	24	54	17	9	69	55	33	6	9	35	72	1	17	435	452
04:30 PM	11	73	3	0	22	67	13	1	81	81	33	6	7	50	80	1	8	521	529
04:45 PM	10	62	2	1	25	51	20	9	74	67	32	11	11	39	82	1	22	475	497
Total	39	256	7	5	96	220	66	24	293	271	143	28	28	161	333	9	66	1913	1979
05:00 PM	14	75	1	1	35	58	9	3	71	66	33	5	7	47	100	10	19	516	535
05:15 PM	8	51	1	0	20	27	11	2	69	50	25	7	5	37	79	7	16	383	399
Grand Total	120	797	13	26	329	664	190	139	881	796	425	72	95	503	1028	36	273	5841	6114
Apprch %	12.9	85.7	1.4		27.8	56.1	16.1		41.9	37.9	20.2		5.8	30.9	63.2				
Total %	2.1	13.6	0.2		5.6	11.4	3.3		15.1	13.6	7.3		1.6	8.6	17.6		4.5	95.5	
Cars	119	795	13		326	653	182		881	794	424		95	495	1027		0	0	6077
% Cars	99.2	99.7	100	100	99.1	98.3	95.8	100	100	99.7	99.8	100	100	98.4	99.9	100	0	0	99.4
Trucks	1	2	0		3	11	8		0	2	1		0	8	1		0	0	37
% Trucks	0.8	0.3	0	0	0.9	1.7	4.2	0	0	0.3	0.2	0	0	1.6	0.1	0	0	0	0.6

	Bennington St From North				Saratoga St From East				Bennington St From South				Saratoga St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:00 PM																	
03:00 PM	13	82	1	96	32	58	19	109	80	71	39	190	11	50	77	138	533
03:15 PM	4	62	0	66	34	48	17	99	69	69	38	176	8	35	79	122	463
03:30 PM	14	76	2	92	27	74	17	118	81	58	40	179	7	49	98	154	543
03:45 PM	4	73	0	77	35	60	18	113	68	71	38	177	9	43	89	141	508
Total Volume	35	293	3	331	128	240	71	439	298	269	155	722	35	177	343	555	2047
% App. Total	10.6	88.5	0.9		29.2	54.7	16.2		41.3	37.3	21.5		6.3	31.9	61.8		
PHF	.625	.893	.375	.862	.914	.811	.934	.930	.920	.947	.969	.950	.795	.885	.875	.901	.942
Cars	34	291	3	328	127	235	67	429	298	268	155	721	35	175	342	552	2030
% Cars	97.1	99.3	100	99.1	99.2	97.9	94.4	97.7	100	99.6	100	99.9	100	98.9	99.7	99.5	99.2
Trucks	1	2	0	3	1	5	4	10	0	1	0	1	0	2	1	3	17
% Trucks	2.9	0.7	0	0.9	0.8	2.1	5.6	2.3	0	0.4	0	0.1	0	1.1	0.3	0.5	0.8

Accurate Counts
978-664-2565

N/S Street : Bennington Street
E/W Street: Saratoga Street
City/State : Boston, MA
Weather : Clear

File Name : 102710a4
Site Code : 10271004
Start Date : 6/12/2010

Groups Printed- Trucks

	Bennington St From North				Saratoga St From East				Bennington St From South				Saratoga St From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
02:30 PM	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	2	2
02:45 PM	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	2	2
Total	0	0	0	0	0	1	1	0	0	1	0	0	0	1	0	0	0	4	4
03:00 PM	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	4	4
03:15 PM	0	0	0	0	0	1	2	0	0	0	0	0	0	1	0	0	0	4	4
03:30 PM	0	2	0	0	0	2	0	0	0	1	0	0	0	0	1	0	0	6	6
03:45 PM	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	3	3
Total	1	2	0	0	1	5	4	0	0	1	0	0	0	2	1	0	0	17	17
04:00 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1
04:15 PM	0	0	0	0	1	0	1	0	0	0	1	0	0	1	0	0	0	4	4
04:30 PM	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	2
04:45 PM	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0	3	3
Total	0	0	0	0	1	3	2	0	0	0	1	0	0	3	0	0	0	10	10
05:00 PM	0	0	0	0	1	2	0	0	0	0	0	0	0	1	0	0	0	4	4
05:15 PM	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	2	2
Grand Total	1	2	0	0	3	11	8	0	0	2	1	0	0	8	1	0	0	37	37
Apprch %	33.3	66.7	0		13.6	50	36.4		0	66.7	33.3		0	88.9	11.1				
Total %	2.7	5.4	0		8.1	29.7	21.6		0	5.4	2.7		0	21.6	2.7		0	100	

	Bennington St From North				Saratoga St From East				Bennington St From South				Saratoga St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:00 PM																	
03:00 PM	1	0	0	1	1	1	1	3	0	0	0	0	0	0	0	0	4
03:15 PM	0	0	0	0	0	1	2	3	0	0	0	0	0	1	0	1	4
03:30 PM	0	2	0	2	0	2	0	2	0	1	0	1	0	0	1	1	6
03:45 PM	0	0	0	0	0	1	1	2	0	0	0	0	0	1	0	1	3
Total Volume	1	2	0	3	1	5	4	10	0	1	0	1	0	2	1	3	17
% App. Total	33.3	66.7	0		10	50	40		0	100	0		0	66.7	33.3		
PHF	.250	.250	.000	.375	.250	.625	.500	.833	.000	.250	.000	.250	.000	.500	.250	.750	.708

Accurate Counts
978-664-2565

N/S Street : Route 16
E/W Street: Winthrop avenue
City/State : Revere, MA
Weather : Clear

File Name : 10271006
Site Code : 10271006
Start Date : 6/11/2010
Page No : 1

Groups Printed- Cars - Trucks

	Route 16 From North				Winthrop Ave From East				Route 16 From South				Winthrop Ave From West				Harris St From Northwest					
Start Time	Left	Thru	Right	Hard Right	Left	Thru	Bear Right	Right	Left	Bear Left	Thru	Right	Hard Left	Left	Thru	Right	Hard Left	Bear Left	Bear Right	Hard Right	Peds	Int. Total
15:30	1	135	3	0	195	85	21	12	0	0	143	296	0	5	54	3	1	31	4	0	0	989
15:45	0	128	1	0	235	101	19	17	0	0	135	296	0	1	58	2	0	27	2	0	0	1022
Total	1	263	4	0	430	186	40	29	0	0	278	592	0	6	112	5	1	58	6	0	0	2011
16:00	0	125	2	0	206	98	26	16	0	0	156	294	0	2	41	3	0	21	3	0	0	993
16:15	0	124	4	0	199	101	25	16	1	0	128	299	0	1	49	4	0	37	6	1	0	995
16:30	0	109	0	0	224	105	23	15	0	0	113	289	0	2	52	4	0	23	1	0	0	960
16:45	0	118	2	0	198	103	21	13	0	0	150	289	0	4	55	2	0	19	2	0	0	976
Total	0	476	8	0	827	407	95	60	1	0	547	1171	0	9	197	13	0	100	12	1	0	3924
17:00	0	113	1	1	206	97	14	18	0	0	139	331	0	1	58	3	0	27	4	0	0	1013
17:15	1	123	2	0	197	106	21	21	0	0	150	297	0	2	36	6	0	25	1	1	0	989
17:30	0	126	1	0	224	106	23	24	1	0	124	334	0	1	44	7	0	15	0	0	0	1030
17:45	1	133	3	1	154	97	18	14	0	0	151	346	0	1	29	2	0	21	1	1	0	973
Total	2	495	7	2	781	406	76	77	1	0	564	1308	0	5	167	18	0	88	6	2	0	4005
18:00	0	115	2	0	200	87	18	12	0	0	138	322	0	0	45	1	0	14	2	0	0	956
18:15	0	101	3	1	200	104	13	8	0	0	111	364	0	1	43	9	0	11	2	0	0	971
Grand Total	3	1450	24	3	2438	1190	242	186	2	0	1638	3757	0	21	564	46	1	271	28	3	0	11867
Apprch %	0.2	98	1.6	0.2	60.1	29.3	6	4.6	0	0	30.4	69.6	0	3.3	89.4	7.3	0.3	89.4	9.2	1	0	
Total %	0	12.2	0.2	0	20.5	10	2	1.6	0	0	13.8	31.7	0	0.2	4.8	0.4	0	2.3	0.2	0	0	
Cars	3	1403	24	2	2409	1179	240	181	2	0	1582	3705	0	21	546	46	1	268	28	3	0	11643
% Cars	100	96.8	100	66.7	98.8	99.1	99.2	97.3	100	0	96.6	98.6	0	100	96.8	100	100	98.9	100	100	0	98.1
Trucks	0	47	0	1	29	11	2	5	0	0	56	52	0	0	18	0	0	3	0	0	0	224
% Trucks	0	3.2	0	33.3	1.2	0.9	0.8	2.7	0	0	3.4	1.4	0	0	3.2	0	0	1.1	0	0	0	1.9

	Route 16 From North					Winthrop Ave From East					Route 16 From South					Winthrop Ave From West					Harris St From Northwest						
Start Time	Left	Thru	Right	Hard Right	App. Total	Left	Thru	Bear Right	Right	App. Total	Left	Bear Left	Thru	Right	App. Total	Hard Left	Left	Thru	Right	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1																											
Peak Hour for Entire Intersection Begins at 16:45																											
16:45	0	118	2	0	120	198	103	21	13	335	0	0	150	289	439	0	4	55	2	61	0	19	2	0	0	21	976
17:00	0	113	1	1	115	206	97	14	18	335	0	0	139	331	470	0	1	58	3	62	0	27	4	0	0	31	1013
17:15	1	123	2	0	126	197	106	21	21	345	0	0	150	297	447	0	2	36	6	44	0	25	1	1	0	27	989
17:30	0	126	1	0	127	224	106	23	24	377	1	0	124	334	459	0	1	44	7	52	0	15	0	0	0	15	1030
Total Volume	1	480	6	1	488	825	412	79	76	1392	1	0	563	1251	1815	0	8	193	18	219	0	86	7	1	0	94	4008
% App. Total	0.2	98.4	1.2	0.2		59.3	29.6	5.7	5.5		0.1	0	31	68.9		0	3.7	88.1	8.2		0	91.5	7.4	1.1	0		
PHF	.250	.952	.750	.250	.961	.921	.972	.859	.792	.923	.250	.000	.938	.936	.965	.000	.500	.832	.643	.883	.000	.796	.438	.250	.000	.758	.973
Cars	1	462	6	1	470	821	409	79	74	1383	1	0	548	1231	1780	0	8	188	18	214	0	85	7	1	0	93	3940
% Cars	100	96.3	100	100	96.3	99.5	99.3	100	97.4	99.4	100	0	97.3	98.4	98.1	0	100	97.4	100	97.7	0	98.8	100	100	0	98.9	98.3
Trucks	0	18	0	0	18	4	3	0	2	9	0	0	15	20	35	0	0	5	0	5	0	1	0	0	0	1	68
% Trucks	0	3.8	0	0	3.7	0.5	0.7	0	2.6	0.6	0	0	2.7	1.6	1.9	0	0	2.6	0	2.3	0	1.2	0	0	0	1.1	1.7

Accurate Counts
978-664-2565

N/S Street : Route 16
E/W Street: Winthrop avenue
City/State : Revere, MA
Weather : Clear

File Name : 10271006
Site Code : 10271006
Start Date : 6/11/2010
Page No : 1

Groups Printed- Trucks

	Route 16 From North					Winthrop Ave From East					Route 16 From South					Winthrop Ave From West					Harris St From Northwest							
Start Time	Left	Thru	Right	Hard Right	Peds	Left	Thru	Bear Right	Right	Peds	Left	Bear Left	Thru	Right	Peds	Hard Left	Left	Thru	Right	Peds	Hard Left	Bear Left	Bear Right	Hard Right	Peds	Exclu. Total	Inclu. Total	Int. Total
15:30	0	9	0	0	0	8	1	0	0	0	0	0	11	7	0	0	0	3	0	0	0	0	0	0	0	0	39	39
15:45	0	1	0	0	0	8	1	0	1	0	0	0	4	5	0	0	0	1	0	0	0	1	0	0	0	0	22	22
Total	0	10	0	0	0	16	2	0	1	0	0	0	15	12	0	0	0	4	0	0	0	1	0	0	0	0	61	61
16:00	0	2	0	0	0	3	2	1	1	0	0	0	8	5	0	0	0	4	0	0	0	0	0	0	0	0	26	26
16:15	0	5	0	0	0	1	2	0	1	0	0	0	5	3	0	0	0	2	0	0	0	1	0	0	0	0	20	20
16:30	0	6	0	0	0	1	0	0	0	0	0	0	4	5	0	0	0	1	0	0	0	0	0	0	0	0	17	17
16:45	0	4	0	0	0	0	0	0	0	0	0	0	4	7	0	0	0	2	0	0	0	0	0	0	0	0	17	17
Total	0	17	0	0	0	5	4	1	2	0	0	0	21	20	0	0	0	9	0	0	0	1	0	0	0	0	80	80
17:00	0	5	0	0	0	2	1	0	1	0	0	0	2	4	0	0	0	1	0	0	0	0	0	0	0	0	16	16
17:15	0	2	0	0	0	1	2	0	0	0	0	0	6	6	0	0	0	1	0	0	0	1	0	0	0	0	19	19
17:30	0	7	0	0	0	1	0	0	1	0	0	0	3	3	0	0	0	1	0	0	0	0	0	0	0	0	16	16
17:45	0	2	0	1	0	1	1	1	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	14	14
Total	0	16	0	1	0	5	4	1	2	0	0	0	15	17	0	0	0	3	0	0	0	1	0	0	0	0	65	65
18:00	0	1	0	0	0	1	0	0	0	0	0	0	3	1	0	0	0	1	0	0	0	0	0	0	0	0	7	7
18:15	0	3	0	0	0	2	1	0	0	0	0	0	2	2	0	0	0	1	0	0	0	0	0	0	0	0	11	11
Grand Total	0	47	0	1	0	29	11	2	5	0	0	0	56	52	0	0	0	18	0	0	0	3	0	0	0	0	224	224
Apprch %	0	97.9	0	2.1		61.7	23.4	4.3	10.6		0	0	51.9	48.1		0	0	100	0		0	100	0	0				
Total %	0	21	0	0.4		12.9	4.9	0.9	2.2		0	0	25	23.2		0	0	8	0		0	1.3	0	0		0	100	

	Route 16 From North					Winthrop Ave From East					Route 16 From South					Winthrop Ave From West					Harris St From Northwest					
Start Time	Left	Thru	Right	Hard Right	App. Total	Left	Thru	Bear Right	Right	App. Total	Left	Bear Left	Thru	Right	App. Total	Hard Left	Left	Thru	Right	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1																										
Peak Hour for Entire Intersection Begins at 15:30																										
15:30	0	9	0	0	9	8	1	0	0	9	0	0	11	7	18	0	0	3	0	3	0	0	0	0	0	39
15:45	0	1	0	0	1	8	1	0	1	10	0	0	4	5	9	0	0	1	0	1	0	1	0	0	1	22
16:00	0	2	0	0	2	3	2	1	1	7	0	0	8	5	13	0	0	4	0	4	0	0	0	0	0	26
16:15	0	5	0	0	5	1	2	0	1	4	0	0	5	3	8	0	0	2	0	2	0	1	0	0	1	20
Total Volume	0	17	0	0	17	20	6	1	3	30	0	0	28	20	48	0	0	10	0	10	0	2	0	0	2	107
% App. Total	0	100	0	0		66.7	20	3.3	10		0	0	58.3	41.7		0	0	100	0		0	100	0	0		
PHF	.000	.472	.000	.000	.472	.625	.750	.250	.750	.750	.000	.000	.636	.714	.667	.000	.000	.625	.000	.625	.000	.500	.000	.000	.500	.686

Accurate Counts
978-664-2565

N/S Street : Route 16
E/W Street: Winthrop Avenue
City/State : Revere, MA
Weather : Clear

File Name : 102710A6
Site Code : 10271006
Start Date : 6/12/2010
Page No : 1

Groups Printed- Cars - Trucks

	Route 16 From North					Winthrop Ave From East					Route 16 From South					Winthrop Ave From West					Harris St From Northwest							
Start Time	Left	Thru	Right	Hard Right	Peds	Left	Thru	Bear Right	Right	Peds	Left	Bear Left	Thru	Right	Peds	Hard Left	Left	Thru	Right	Peds	Hard Left	Bear Left	Bear Right	Hard Right	Peds	Exclu. Total	Inclu. Total	Int. Total
14:30	1	140	1	0	0	136	60	11	23	0	0	0	129	238	0	0	1	37	1	0	5	23	0	0	0	0	806	806
14:45	3	144	0	0	0	148	55	8	12	0	0	0	140	211	0	0	2	29	3	0	5	19	0	2	0	0	781	781
Total	4	284	1	0	0	284	115	19	35	0	0	0	269	449	0	0	3	66	4	0	10	42	0	2	0	0	1587	1587
15:00	1	92	2	0	0	159	53	4	17	0	1	0	111	168	0	0	4	39	2	0	3	19	0	0	0	0	675	675
15:15	1	103	2	0	0	147	49	11	14	0	1	0	127	223	0	0	1	41	4	0	8	16	0	0	0	0	748	748
15:30	0	141	2	0	0	169	72	5	13	0	0	0	160	197	0	0	0	35	1	0	2	28	2	2	0	0	829	829
15:45	0	100	5	0	0	170	71	11	17	0	0	2	116	209	0	0	2	41	0	0	3	25	3	3	0	0	778	778
Total	2	436	11	0	0	645	245	31	61	0	2	2	514	797	0	0	7	156	7	0	16	88	5	5	0	0	3030	3030
16:00	0	104	4	0	0	182	66	4	27	0	1	0	131	218	0	0	4	56	3	0	6	15	2	2	0	0	825	825
16:15	0	101	0	0	0	158	52	13	20	0	0	0	130	184	0	0	1	36	1	0	1	11	1	2	0	0	711	711
16:30	0	108	3	0	0	166	72	12	16	0	0	0	151	178	0	0	3	47	0	0	6	26	0	1	0	0	789	789
16:45	0	116	2	0	0	163	48	17	21	0	0	0	95	198	0	0	3	38	0	0	2	22	0	1	0	0	726	726
Total	0	429	9	0	0	669	238	46	84	0	1	0	507	778	0	0	11	177	4	0	15	74	3	6	0	0	3051	3051
17:00	0	112	2	0	0	157	61	8	14	0	0	0	118	191	0	0	7	52	5	0	2	20	0	1	0	0	750	750
17:15	0	124	4	0	0	161	69	8	19	0	0	0	124	195	0	1	1	26	7	0	2	19	0	1	0	0	761	761
Grand Total	6	1385	27	0	0	1916	728	112	213	0	3	2	1532	2410	0	1	29	477	27	0	45	243	8	15	0	0	9179	9179
Apprch %	0.4	97.7	1.9	0		64.5	24.5	3.8	7.2		0.1	0.1	38.8	61.1		0.2	5.4	89.3	5.1		14.5	78.1	2.6	4.8				
Total %	0.1	15.1	0.3	0		20.9	7.9	1.2	2.3		0	0	16.7	26.3		0	0.3	5.2	0.3		0.5	2.6	0.1	0.2		0	100	
Cars	6	1364	27	0		1910	724	112	213		3	2	1510	2396		1	28	472	26		45	243	8	15		0	0	9105
% Cars	100	98.5	100	0	0	99.7	99.5	100	100	0	100	100	98.6	99.4	0	100	96.6	99	96.3	0	100	100	100	100	0	0	0	99.2
Trucks	0	21	0	0		6	4	0	0		0	0	22	14		0	1	5	1		0	0	0	0		0	0	74
% Trucks	0	1.5	0	0	0	0.3	0.5	0	0	0	0	0	1.4	0.6	0	0	3.4	1	3.7	0	0	0	0	0	0	0	0	0.8

	Route 16 From North					Winthrop Ave From East					Route 16 From South					Winthrop Ave From West					Harris St From Northwest					
Start Time	Left	Thru	Right	Hard Right	App. Total	Left	Thru	Bear Right	Right	App. Total	Left	Bear Left	Thru	Right	App. Total	Hard Left	Left	Thru	Right	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 17:15 - Peak 1 of 1																										
Peak Hour for Entire Intersection Begins at 15:15																										
15:15	1	103	2	0	106	147	49	11	14	221	1	0	127	223	351	0	1	41	4	46	8	16	0	0	24	748
15:30	0	141	2	0	143	169	72	5	13	259	0	0	160	197	357	0	0	35	1	36	2	28	2	2	34	829
15:45	0	100	5	0	105	170	71	11	17	269	0	2	116	209	327	0	2	41	0	43	3	25	3	3	34	778
16:00	0	104	4	0	108	182	66	4	27	279	1	0	131	218	350	0	4	56	3	63	6	15	2	2	25	825
Total Volume	1	448	13	0	462	668	258	31	71	1028	2	2	534	847	1385	0	7	173	8	188	19	84	7	7	117	3180
% App. Total	0.2	97	2.8	0		65	25.1	3	6.9		0.1	0.1	38.6	61.2		0	3.7	92	4.3		16.2	71.8	6	6		
PHF	.250	.794	.650	.000	.808	.918	.896	.705	.657	.921	.500	.250	.834	.950	.970	.000	.438	.772	.500	.746	.594	.750	.583	.583	.860	.959
Cars	1	443	13	0	457	668	257	31	71	1027	2	2	524	842	1370	0	6	172	8	186	19	84	7	7	117	3157
% Cars	100	98.9	100	0	98.9	100	99.6	100	100	99.9	100	100	98.1	99.4	98.9	0	85.7	99.4	100	98.9	100	100	100	100	100	99.3
Trucks	0	5	0	0	5	0	1	0	0	1	0	0	10	5	15	0	1	1	0	2	0	0	0	0	0	23
% Trucks	0	1.1	0	0	1.1	0	0.4	0	0	0.1	0	0	1.9	0.6	1.1	0	14.3	0.6	0	1.1	0	0	0	0	0	0.7

Accurate Counts
978-664-2565

N/S Street : Route 16
E/W Street: Winthrop Avenue
City/State : Revere, MA
Weather : Clear

File Name : 102710A6
Site Code : 10271006
Start Date : 6/12/2010
Page No : 1

Groups Printed- Trucks

	Route 16 From North					Winthrop Ave From East					Route 16 From South					Winthrop Ave From West					Harris St From Northwest							
Start Time	Left	Thru	Right	Hard Right	Peds	Left	Thru	Bear Right	Right	Peds	Left	Bear Left	Thru	Right	Peds	Hard Left	Left	Thru	Right	Peds	Hard Left	Bear Left	Bear Right	Hard Right	Peds	Exclu. Total	Inclu. Total	Int. Total
14:30	0	3	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	7	7
14:45	0	6	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	1	1	0	0	0	0	0	0	0	11	11
Total	0	9	0	0	0	0	0	0	0	0	0	0	6	1	0	0	0	1	1	0	0	0	0	0	0	0	18	18
15:00	0	3	0	0	0	2	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	9	9
15:15	0	2	0	0	0	0	0	0	0	0	0	0	4	3	0	0	1	1	0	0	0	0	0	0	0	0	11	11
15:30	0	0	0	0	0	0	1	0	0	0	0	0	5	1	0	0	0	0	0	0	0	0	0	0	0	0	7	7
15:45	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Total	0	6	0	0	0	2	3	0	0	0	0	0	10	6	0	0	1	1	0	0	0	0	0	0	0	0	29	29
16:00	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	3
16:15	0	0	0	0	0	1	0	0	0	0	0	0	3	1	0	0	0	1	0	0	0	0	0	0	0	0	6	6
16:30	0	3	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	5	5
16:45	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	4	4
Total	0	6	0	0	0	1	1	0	0	0	0	0	4	4	0	0	0	2	0	0	0	0	0	0	0	0	18	18
17:00	0	0	0	0	0	1	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	4	4
17:15	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	5	5
Grand Total	0	21	0	0	0	6	4	0	0	0	0	0	22	14	0	0	1	5	1	0	0	0	0	0	0	0	74	74
Apprch %	0	100	0	0		60	40	0	0		0	0	61.1	38.9		0	14.3	71.4	14.3		0	0	0	0				
Total %	0	28.4	0	0		8.1	5.4	0	0		0	0	29.7	18.9		0	1.4	6.8	1.4		0	0	0	0		0	100	

	Route 16 From North					Winthrop Ave From East					Route 16 From South					Winthrop Ave From West					Harris St From Northwest					
Start Time	Left	Thru	Right	Hard Right	App. Total	Left	Thru	Bear Right	Right	App. Total	Left	Bear Left	Thru	Right	App. Total	Hard Left	Left	Thru	Right	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 17:15 - Peak 1 of 1																										
Peak Hour for Entire Intersection Begins at 14:30																										
14:30	0	3	0	0	3	0	0	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	7
14:45	0	6	0	0	6	0	0	0	0	0	0	0	2	1	3	0	0	1	1	2	0	0	0	0	0	11
15:00	0	3	0	0	3	2	2	0	0	4	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	9
15:15	0	2	0	0	2	0	0	0	0	0	0	0	4	3	7	0	1	1	0	2	0	0	0	0	0	11
Total Volume	0	14	0	0	14	2	2	0	0	4	0	0	10	6	16	0	1	2	1	4	0	0	0	0	0	38
% App. Total	0	100	0	0		50	50	0	0		0	0	62.5	37.5		0	25	50	25		0	0	0	0		
PHF	.000	.583	.000	.000	.583	.250	.250	.000	.000	.250	.000	.000	.625	.500	.571	.000	.250	.500	.250	.500	.000	.000	.000	.000	.000	.864

Accurate Counts
978-664-2565

N/S Street : Route 1A NB Off Ramp
E/W Street: Winthrop Avenue
City/State : Revere, MA
Weather : Clear

File Name : 10271007
Site Code : 10271007
Start Date : 6/11/2010
Page No : 1

Groups Printed- Cars - Trucks

	Hillside Ave From North			Winthrop Ave From East			Route 1A NB Off Ramp From South					Winthrop Ave From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	U-Turn	Peds	Left	Thru	Right	Int. Total
15:30	0	0	1	0	379	3	0	0	69	48	1	0	333	0	834
15:45	0	0	0	0	436	0	0	0	80	57	2	0	332	0	907
Total	0	0	1	0	815	3	0	0	149	105	3	0	665	0	1741
16:00	0	0	0	0	403	0	0	0	87	50	0	0	360	0	900
16:15	0	0	0	0	399	2	0	0	84	55	3	0	332	0	875
16:30	0	0	0	0	377	0	0	0	93	70	2	0	335	0	877
16:45	0	0	0	0	373	0	0	0	86	60	4	0	348	0	871
Total	0	0	0	0	1552	2	0	0	350	235	9	0	1375	0	3523
17:00	0	0	0	0	370	0	0	0	95	56	1	0	326	0	848
17:15	0	0	0	0	375	0	0	0	67	59	2	0	314	0	817
17:30	0	0	0	0	347	0	0	0	69	48	2	0	327	0	793
17:45	0	0	0	0	325	0	0	0	75	40	0	0	276	0	716
Total	0	0	0	0	1417	0	0	0	306	203	5	0	1243	0	3174
18:00	0	0	0	0	322	1	0	0	86	46	2	0	345	0	802
18:15	0	0	0	0	251	1	0	0	105	48	0	0	237	0	642
Grand Total	0	0	1	0	4357	7	0	0	996	637	19	0	3865	0	9882
Apprch %	0	0	100	0	99.8	0.2	0	0	60.3	38.6	1.2	0	100	0	
Total %	0	0	0	0	44.1	0.1	0	0	10.1	6.4	0.2	0	39.1	0	
Cars	0	0	1	0	4357	7	0	0	984	568	19	0	3839	0	9775
% Cars	0	0	100	0	100	100	0	0	98.8	89.2	100	0	99.3	0	98.9
Trucks	0	0	0	0	0	0	0	0	12	69	0	0	26	0	107
% Trucks	0	0	0	0	0	0	0	0	1.2	10.8	0	0	0.7	0	1.1

	Hillside Ave From North				Winthrop Ave From East				Route 1A NB Off Ramp From South						Winthrop Ave From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 15:45																			
15:45	0	0	0	0	0	436	0	436	0	0	80	57	2	139	0	332	0	332	907
16:00	0	0	0	0	0	403	0	403	0	0	87	50	0	137	0	360	0	360	900
16:15	0	0	0	0	0	399	2	401	0	0	84	55	3	142	0	332	0	332	875
16:30	0	0	0	0	0	377	0	377	0	0	93	70	2	165	0	335	0	335	877
Total Volume	0	0	0	0	0	1615	2	1617	0	0	344	232	7	583	0	1359	0	1359	3559
% App. Total	0	0	0		0	99.9	0.1		0	0	59	39.8	1.2		0	100	0		
PHF	.000	.000	.000	.000	.000	.926	.250	.927	.000	.000	.925	.829	.583	.883	.000	.944	.000	.944	.981
Cars	0	0	0	0	0	1615	2	1617	0	0	340	217	7	564	0	1349	0	1349	3530
% Cars	0	0	0	0	0	100	100	100	0	0	98.8	93.5	100	96.7	0	99.3	0	99.3	99.2
Trucks	0	0	0	0	0	0	0	0	0	0	4	15	0	19	0	10	0	10	29
% Trucks	0	0	0	0	0	0	0	0	0	0	1.2	6.5	0	3.3	0	0.7	0	0.7	0.8

Accurate Counts
978-664-2565

N/S Street : Route 1A NB Off Ramp
E/W Street: Winthrop Avenue
City/State : Revere, MA
Weather : Clear

File Name : 10271007
Site Code : 10271007
Start Date : 6/11/2010

Groups Printed- Trucks

	Hillside Ave From North			Winthrop Ave From East			Route 1A NB Off Ramp From South					Winthrop Ave From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	U-Turn	Peds	Left	Thru	Right	Int. Total
15:30	0	0	0	0	0	0	0	0	0	4	0	0	6	0	10
15:45	0	0	0	0	0	0	0	0	0	3	0	0	5	0	8
Total	0	0	0	0	0	0	0	0	0	7	0	0	11	0	18
16:00	0	0	0	0	0	0	0	0	2	2	0	0	1	0	5
16:15	0	0	0	0	0	0	0	0	1	3	0	0	1	0	5
16:30	0	0	0	0	0	0	0	0	1	7	0	0	3	0	11
16:45	0	0	0	0	0	0	0	0	2	7	0	0	2	0	11
Total	0	0	0	0	0	0	0	0	6	19	0	0	7	0	32
17:00	0	0	0	0	0	0	0	0	0	9	0	0	2	0	11
17:15	0	0	0	0	0	0	0	0	1	11	0	0	0	0	12
17:30	0	0	0	0	0	0	0	0	0	5	0	0	0	0	5
17:45	0	0	0	0	0	0	0	0	0	4	0	0	1	0	5
Total	0	0	0	0	0	0	0	0	1	29	0	0	3	0	33
18:00	0	0	0	0	0	0	0	0	1	7	0	0	3	0	11
18:15	0	0	0	0	0	0	0	0	4	7	0	0	2	0	13
Grand Total	0	0	0	0	0	0	0	0	12	69	0	0	26	0	107
Apprch %	0	0	0	0	0	0	0	0	14.8	85.2	0	0	100	0	
Total %	0	0	0	0	0	0	0	0	11.2	64.5	0	0	24.3	0	

	Hillside Ave From North				Winthrop Ave From East				Route 1A NB Off Ramp From South						Winthrop Ave From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 16:30																			
16:30	0	0	0	0	0	0	0	0	0	0	1	7	0	8	0	3	0	3	11
16:45	0	0	0	0	0	0	0	0	0	0	2	7	0	9	0	2	0	2	11
17:00	0	0	0	0	0	0	0	0	0	0	0	9	0	9	0	2	0	2	11
17:15	0	0	0	0	0	0	0	0	0	0	1	11	0	12	0	0	0	0	12
Total Volume	0	0	0	0	0	0	0	0	0	0	4	34	0	38	0	7	0	7	45
% App. Total	0	0	0		0	0	0		0	0	10.5	89.5	0		0	100	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.500	.773	.000	.792	.000	.583	.000	.583	.938

Accurate Counts
978-664-2565

N/S Street : Route 1A NB Off Ramp
E/W Street: Winthrop Avenue
City/State : Revere, MA
Weather : Clear

File Name : 102710a7
Site Code : 10271007
Start Date : 6/12/2010
Page No : 1

Groups Printed- Cars - Trucks

	Hillside Ave From North				Winthrop Ave From East				Route 1A NB Off Ramp From South					Winthrop Ave From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	U-Turn	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
14:30	0	0	2	0	0	268	2	0	0	0	41	21	0	0	261	0	0	0	595	595
14:45	0	0	0	0	0	269	3	0	0	0	53	34	0	0	244	0	0	0	603	603
Total	0	0	2	0	0	537	5	0	0	0	94	55	0	0	505	0	0	0	1198	1198
15:00	0	0	2	0	0	306	2	0	0	0	41	46	0	0	208	0	0	0	605	605
15:15	0	0	2	0	0	247	0	0	0	0	47	29	0	0	257	0	0	0	582	582
15:30	0	0	3	0	0	292	2	0	0	0	45	27	0	0	243	0	0	0	612	612
15:45	0	0	1	0	0	311	1	0	0	0	39	37	0	0	251	0	0	0	640	640
Total	0	0	8	0	0	1156	5	0	0	0	172	139	0	0	959	0	0	0	2439	2439
16:00	0	0	0	0	0	327	1	0	0	0	51	28	0	0	264	0	0	0	671	671
16:15	0	0	4	0	0	279	2	0	0	0	42	25	0	0	210	0	0	0	562	562
16:30	0	0	1	0	0	318	0	0	0	0	33	18	0	0	233	0	0	0	603	603
16:45	0	0	2	0	0	295	4	0	0	0	22	34	0	0	226	0	0	0	583	583
Total	0	0	7	0	0	1219	7	0	0	0	148	105	0	0	933	0	0	0	2419	2419
17:00	0	0	2	0	0	277	1	0	0	0	19	24	0	0	229	0	0	0	552	552
17:15	0	0	1	0	0	293	3	0	0	0	32	20	0	0	213	0	0	0	562	562
Grand Total	0	0	20	0	0	3482	21	0	0	0	465	343	0	0	2839	0	0	0	7170	7170
Apprch %	0	0	100		0	99.4	0.6		0	0	57.5	42.5	0	0	100	0				
Total %	0	0	0.3		0	48.6	0.3		0	0	6.5	4.8	0	0	39.6	0		0	100	
Cars	0	0	20		0	3471	20		0	0	458	308	0	0	2825	0		0	0	7102
% Cars	0	0	100	0	0	99.7	95.2	0	0	0	98.5	89.8	0	0	99.5	0	0	0	0	99.1
Trucks	0	0	0		0	11	1		0	0	7	35	0	0	14	0		0	0	68
% Trucks	0	0	0	0	0	0.3	4.8	0	0	0	1.5	10.2	0	0	0.5	0	0	0	0	0.9

	Hillside Ave From North				Winthrop Ave From East				Route 1A NB Off Ramp From South						Winthrop Ave From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 17:15 - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 15:15																			
15:15	0	0	2	2	0	247	0	247	0	0	47	29	0	76	0	257	0	257	582
15:30	0	0	3	3	0	292	2	294	0	0	45	27	0	72	0	243	0	243	612
15:45	0	0	1	1	0	311	1	312	0	0	39	37	0	76	0	251	0	251	640
16:00	0	0	0	0	0	327	1	328	0	0	51	28	0	79	0	264	0	264	671
Total Volume	0	0	6	6	0	1177	4	1181	0	0	182	121	0	303	0	1015	0	1015	2505
% App. Total	0	0	100		0	99.7	0.3		0	0	60.1	39.9	0		0	100	0		
PHF	.000	.000	.500	.500	.000	.900	.500	.900	.000	.000	.892	.818	.000	.959	.000	.961	.000	.961	.933
Cars	0	0	6	6	0	1170	4	1174	0	0	178	104	0	282	0	1011	0	1011	2473
% Cars	0	0	100	100	0	99.4	100	99.4	0	0	97.8	86.0	0	93.1	0	99.6	0	99.6	98.7
Trucks	0	0	0	0	0	7	0	7	0	0	4	17	0	21	0	4	0	4	32
% Trucks	0	0	0	0	0	0.6	0	0.6	0	0	2.2	14.0	0	6.9	0	0.4	0	0.4	1.3

Accurate Counts
978-664-2565

N/S Street : Route 1A NB Off Ramp
E/W Street: Winthrop Avenue
City/State : Revere, MA
Weather : Clear

File Name : 102710a7
Site Code : 10271007
Start Date : 6/12/2010

Groups Printed- Trucks

	Hillside Ave From North				Winthrop Ave From East				Route 1A NB Off Ramp From South					Winthrop Ave From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	U-Turn	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
14:30	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	2
14:45	0	0	0	0	0	0	0	0	0	0	0	3	0	0	2	0	0	0	5	5
Total	0	0	0	0	0	0	0	0	0	0	0	5	0	0	2	0	0	0	7	7
15:00	0	0	0	0	0	1	0	0	0	0	2	4	0	0	1	0	0	0	8	8
15:15	0	0	0	0	0	2	0	0	0	0	1	3	0	0	2	0	0	0	8	8
15:30	0	0	0	0	0	2	0	0	0	0	2	6	0	0	1	0	0	0	11	11
15:45	0	0	0	0	0	2	0	0	0	0	1	3	0	0	0	0	0	0	6	6
Total	0	0	0	0	0	7	0	0	0	0	6	16	0	0	4	0	0	0	33	33
16:00	0	0	0	0	0	1	0	0	0	0	0	5	0	0	1	0	0	0	7	7
16:15	0	0	0	0	0	0	1	0	0	0	0	4	0	0	1	0	0	0	6	6
16:30	0	0	0	0	0	2	0	0	0	0	0	1	0	0	1	0	0	0	4	4
16:45	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	4	4
Total	0	0	0	0	0	3	1	0	0	0	0	12	0	0	5	0	0	0	21	21
17:00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2	2
17:15	0	0	0	0	0	1	0	0	0	0	1	1	0	0	2	0	0	0	5	5
Grand Total	0	0	0	0	0	11	1	0	0	0	7	35	0	0	14	0	0	0	68	68
Apprch %	0	0	0		0	91.7	8.3		0	0	16.7	83.3	0	0	100	0				
Total %	0	0	0		0	16.2	1.5		0	0	10.3	51.5	0	0	20.6	0		0	100	

	Hillside Ave From North				Winthrop Ave From East				Route 1A NB Off Ramp From South						Winthrop Ave From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 17:15 - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 15:00																			
15:00	0	0	0	0	0	1	0	1	0	0	2	4	0	6	0	1	0	1	8
15:15	0	0	0	0	0	2	0	2	0	0	1	3	0	4	0	2	0	2	8
15:30	0	0	0	0	0	2	0	2	0	0	2	6	0	8	0	1	0	1	11
15:45	0	0	0	0	0	2	0	2	0	0	1	3	0	4	0	0	0	0	6
Total Volume	0	0	0	0	0	7	0	7	0	0	6	16	0	22	0	4	0	4	33
% App. Total	0	0	0		0	100	0		0	0	27.3	72.7	0		0	100	0		
PHF	.000	.000	.000	.000	.000	.875	.000	.875	.000	.000	.750	.667	.000	.688	.000	.500	.000	.500	.750

Accurate Counts
978-664-2565

N/S Street : Route 1A SB On Ramp
E/W Street: Winthrop Avenue
City/State : Revere, MA
Weather : Clear

File Name : 10271014
Site Code : 10271014
Start Date : 6/11/2010
Page No : 1

Groups Printed- Cars - Trucks

	Winthrop Ave From East			Route 1A SB On Ramp From South		Winthrop Ave From West		
Start Time	Left	Thru	U-Turns	Left	Right	Thru	Right	Int. Total
15:30	57	321	2	0	0	333	53	766
15:45	74	369	3	0	0	332	55	833
Total	131	690	5	0	0	665	108	1599
16:00	56	351	0	0	0	361	63	831
16:15	69	335	2	0	0	333	40	779
16:30	71	310	1	0	0	333	27	742
16:45	56	318	4	0	0	344	22	744
Total	252	1314	7	0	0	1371	152	3096
17:00	62	310	2	0	0	330	37	741
17:15	64	312	3	0	0	315	36	730
17:30	59	286	4	0	0	327	30	706
17:45	62	264	1	0	0	277	35	639
Total	247	1172	10	0	0	1249	138	2816
18:00	66	260	1	0	0	242	39	608
18:15	42	209	2	0	0	236	27	516
Grand Total	738	3645	25	0	0	3763	464	8635
Apprch %	16.7	82.7	0.6	0	0	89	11	
Total %	8.5	42.2	0.3	0	0	43.6	5.4	
Cars	711	3617	25	0	0	3737	454	8544
% Cars	96.3	99.2	100	0	0	99.3	97.8	98.9
Trucks	27	28	0	0	0	26	10	91
% Trucks	3.7	0.8	0	0	0	0.7	2.2	1.1

	Winthrop Ave From East				Route 1A SB On Ramp From South			Winthrop Ave From West			
Start Time	Left	Thru	U-Turns	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1											
Peak Hour for Entire Intersection Begins at 15:30											
15:30	57	321	2	380	0	0	0	333	53	386	766
15:45	74	369	3	446	0	0	0	332	55	387	833
16:00	56	351	0	407	0	0	0	361	63	424	831
16:15	69	335	2	406	0	0	0	333	40	373	779
Total Volume	256	1376	7	1639	0	0	0	1359	211	1570	3209
% App. Total	15.6	84	0.4		0	0		86.6	13.4		
PHF	.865	.932	.583	.919	.000	.000	.000	.941	.837	.926	.963
Cars	246	1364	7	1617	0	0	0	1346	208	1554	3171
% Cars	96.1	99.1	100	98.7	0	0	0	99.0	98.6	99.0	98.8
Trucks	10	12	0	22	0	0	0	13	3	16	38
% Trucks	3.9	0.9	0	1.3	0	0	0	1.0	1.4	1.0	1.2

Accurate Counts
978-664-2565

N/S Street : Route 1A SB On Ramp
E/W Street: Winthrop Avenue
City/State : Revere, MA
Weather : Clear

File Name : 10271014
Site Code : 10271014
Start Date : 6/11/2010

Groups Printed- Trucks

	Winthrop Ave From East			Route 1A SB On Ramp From South		Winthrop Ave From West		
Start Time	Left	Thru	U-Turns	Left	Right	Thru	Right	Int. Total
15:30	4	0	0	0	0	6	0	10
15:45	4	5	0	0	0	4	1	14
Total	8	5	0	0	0	10	1	24
16:00	1	3	0	0	0	2	1	7
16:15	1	4	0	0	0	1	1	7
16:30	3	3	0	0	0	3	1	10
16:45	1	4	0	0	0	2	1	8
Total	6	14	0	0	0	8	4	32
17:00	0	4	0	0	0	1	1	6
17:15	3	2	0	0	0	1	1	7
17:30	2	0	0	0	0	0	0	2
17:45	2	0	0	0	0	1	2	5
Total	7	6	0	0	0	3	4	20
18:00	4	1	0	0	0	3	0	8
18:15	2	2	0	0	0	2	1	7
Grand Total	27	28	0	0	0	26	10	91
Apprch %	49.1	50.9	0	0	0	72.2	27.8	
Total %	29.7	30.8	0	0	0	28.6	11	

	Winthrop Ave From East				Route 1A SB On Ramp From South			Winthrop Ave From West			
Start Time	Left	Thru	U-Turns	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1											
Peak Hour for Entire Intersection Begins at 15:30											
15:30	4	0	0	4	0	0	0	6	0	6	10
15:45	4	5	0	9	0	0	0	4	1	5	14
16:00	1	3	0	4	0	0	0	2	1	3	7
16:15	1	4	0	5	0	0	0	1	1	2	7
Total Volume	10	12	0	22	0	0	0	13	3	16	38
% App. Total	45.5	54.5	0		0	0		81.2	18.8		
PHF	.625	.600	.000	.611	.000	.000	.000	.542	.750	.667	.679

Accurate Counts
978-664-2565

N/S Street : Route 1A SB On Ramp
E/W Street: Winthrop Avenue
City/State : Revere, MA
Weather : Clear

File Name : 10271a14
Site Code : 10271014
Start Date : 6/12/2010
Page No : 1

Groups Printed- Cars - Trucks

	Winthrop Ave From East			Route 1A SB On Ramp From South			Winthrop Ave From West			
Start Time	Left	Thru	U-Turn	Left	Right	Peds	Thru	Right	Peds	Int. Total
14:30	49	226	1	0	0	0	264	34	0	574
14:45	45	224	2	0	0	0	233	32	0	536
Total	94	450	3	0	0	0	497	66	0	1110
15:00	49	259	5	0	0	0	208	16	0	537
15:15	34	215	5	0	0	0	253	21	0	528
15:30	40	255	5	0	0	0	235	23	0	558
15:45	45	267	2	0	0	0	251	26	0	591
Total	168	996	17	0	0	0	947	86	0	2214
16:00	50	277	2	0	0	0	262	27	0	618
16:15	42	241	4	0	0	0	205	25	0	517
16:30	48	271	1	0	0	0	233	19	0	572
16:45	51	246	0	0	0	0	221	34	0	552
Total	191	1035	7	0	0	0	921	105	0	2259
17:00	35	244	3	0	0	0	229	26	0	537
17:15	36	258	5	0	0	0	211	33	0	543
Grand Total	524	2983	35	0	0	0	2805	316	0	6663
Apprch %	14.8	84.2	1	0	0	0	89.9	10.1	0	
Total %	7.9	44.8	0.5	0	0	0	42.1	4.7	0	
Cars	517	2979	35	0	0	0	2791	311	0	6633
% Cars	98.7	99.9	100	0	0	0	99.5	98.4	0	99.5
Trucks	7	4	0	0	0	0	14	5	0	30
% Trucks	1.3	0.1	0	0	0	0	0.5	1.6	0	0.5

	Winthrop Ave From East				Route 1A SB On Ramp From South				Winthrop Ave From West				
Start Time	Left	Thru	U-Turn	App. Total	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 17:15 - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 15:45													
15:45	45	267	2	314	0	0	0	0	251	26	0	277	591
16:00	50	277	2	329	0	0	0	0	262	27	0	289	618
16:15	42	241	4	287	0	0	0	0	205	25	0	230	517
16:30	48	271	1	320	0	0	0	0	233	19	0	252	572
Total Volume	185	1056	9	1250	0	0	0	0	951	97	0	1048	2298
% App. Total	14.8	84.5	0.7		0	0	0		90.7	9.3	0		
PHF	.925	.953	.563	.950	.000	.000	.000	.000	.907	.898	.000	.907	.930
Cars	181	1055	9	1245	0	0	0	0	948	96	0	1044	2289
% Cars	97.8	99.9	100	99.6	0	0	0	0	99.7	99.0	0	99.6	99.6
Trucks	4	1	0	5	0	0	0	0	3	1	0	4	9
% Trucks	2.2	0.1	0	0.4	0	0	0	0	0.3	1.0	0	0.4	0.4

Accurate Counts
978-664-2565

N/S Street : Route 1A SB On Ramp
E/W Street: Winthrop Avenue
City/State : Revere, MA
Weather : Clear

File Name : 10271a14
Site Code : 10271014
Start Date : 6/12/2010

Groups Printed- Trucks

	Winthrop Ave From East			Route 1A SB On Ramp From South			Winthrop Ave From West			
Start Time	Left	Thru	U-Turn	Left	Right	Peds	Thru	Right	Peds	Int. Total
14:30	0	0	0	0	0	0	0	0	0	0
14:45	0	0	0	0	0	0	2	0	0	2
Total	0	0	0	0	0	0	2	0	0	2
15:00	0	1	0	0	0	0	1	1	0	3
15:15	2	0	0	0	0	0	2	2	0	6
15:30	1	1	0	0	0	0	1	0	0	3
15:45	2	0	0	0	0	0	0	0	0	2
Total	5	2	0	0	0	0	4	3	0	14
16:00	1	0	0	0	0	0	1	0	0	2
16:15	0	0	0	0	0	0	1	1	0	2
16:30	1	1	0	0	0	0	1	0	0	3
16:45	0	0	0	0	0	0	2	0	0	2
Total	2	1	0	0	0	0	5	1	0	9
17:00	0	0	0	0	0	0	1	0	0	1
17:15	0	1	0	0	0	0	2	1	0	4
Grand Total	7	4	0	0	0	0	14	5	0	30
Apprch %	63.6	36.4	0	0	0	0	73.7	26.3	0	
Total %	23.3	13.3	0	0	0	0	46.7	16.7	0	

	Winthrop Ave From East				Route 1A SB On Ramp From South				Winthrop Ave From West				
Start Time	Left	Thru	U-Turn	App. Total	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 17:15 - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 14:45													
14:45	0	0	0	0	0	0	0	0	2	0	0	2	2
15:00	0	1	0	1	0	0	0	0	1	1	0	2	3
15:15	2	0	0	2	0	0	0	0	2	2	0	4	6
15:30	1	1	0	2	0	0	0	0	1	0	0	1	3
Total Volume	3	2	0	5	0	0	0	0	6	3	0	9	14
% App. Total	60	40	0		0	0	0		66.7	33.3	0		
PHF	.375	.500	.000	.625	.000	.000	.000	.000	.750	.375	.000	.563	.583

Accurate Counts
978-664-2565

N/S Street : North Shore Road
E/W Street: Route 145
City/State : Revere, MA
Weather : Clear

File Name : 10271008
Site Code : 10271008
Start Date : 6/11/2010
Page No : 1

Groups Printed- Cars - Trucks

	North Shore Rd From North			Route 145 From East			Route 145 From West					
Start Time	Left	Right	Peds	Thru	Right	Peds	Left	Thru	Peds	Exclu. Total	Inclu. Total	Int. Total
03:30 PM	23	94	3	237	44	0	101	268	0	3	767	770
03:45 PM	31	100	1	253	58	0	114	251	4	5	807	812
Total	54	194	4	490	102	0	215	519	4	8	1574	1582
04:00 PM	22	84	4	255	50	1	107	286	2	7	804	811
04:15 PM	26	69	6	219	53	0	93	248	0	6	708	714
04:30 PM	40	51	4	239	43	0	97	232	1	5	702	707
04:45 PM	46	100	3	226	55	0	92	343	1	4	862	866
Total	134	304	17	939	201	1	389	1109	4	22	3076	3098
05:00 PM	30	69	4	239	48	0	96	305	0	4	787	791
05:15 PM	37	72	2	277	71	0	112	289	1	3	858	861
05:30 PM	30	79	4	224	60	0	100	239	0	4	732	736
05:45 PM	36	46	3	227	57	0	101	345	0	3	812	815
Total	133	266	13	967	236	0	409	1178	1	14	3189	3203
06:00 PM	33	84	1	203	53	0	110	321	0	1	804	805
06:15 PM	31	53	1	165	39	0	67	236	2	3	591	594
Grand Total	385	901	36	2764	631	1	1190	3363	11	48	9234	9282
Apprch %	29.9	70.1		81.4	18.6		26.1	73.9				
Total %	4.2	9.8		29.9	6.8		12.9	36.4		0.5	99.5	
Cars	383	880		2749	619		1178	3352		0	0	9209
% Cars	99.5	97.7	100	99.5	98.1	100	99	99.7	100	0	0	99.2
Trucks	2	21		15	12		12	11		0	0	73
% Trucks	0.5	2.3	0	0.5	1.9	0	1	0.3	0	0	0	0.8

	North Shore Rd From North			Route 145 From East			Route 145 From West			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:45 PM										
04:45 PM	46	100	146	226	55	281	92	343	435	862
05:00 PM	30	69	99	239	48	287	96	305	401	787
05:15 PM	37	72	109	277	71	348	112	289	401	858
05:30 PM	30	79	109	224	60	284	100	239	339	732
Total Volume	143	320	463	966	234	1200	400	1176	1576	3239
% App. Total	30.9	69.1		80.5	19.5		25.4	74.6		
PHF	.777	.800	.793	.872	.824	.862	.893	.857	.906	.939
Cars	142	310	452	961	232	1193	393	1170	1563	3208
% Cars	99.3	96.9	97.6	99.5	99.1	99.4	98.3	99.5	99.2	99.0
Trucks	1	10	11	5	2	7	7	6	13	31
% Trucks	0.7	3.1	2.4	0.5	0.9	0.6	1.8	0.5	0.8	1.0

Accurate Counts
978-664-2565

N/S Street : North Shore Road
E/W Street: Route 145
City/State : Revere, MA
Weather : Clear

File Name : 10271008
Site Code : 10271008
Start Date : 6/11/2010
Page No : 1

Groups Printed- Trucks

	North Shore Rd From North			Route 145 From East			Route 145 From West					
Start Time	Left	Right	Peds	Thru	Right	Peds	Left	Thru	Peds	Exclu. Total	Inclu. Total	Int. Total
03:30 PM	0	1	0	3	2	0	1	1	0	0	8	8
03:45 PM	1	2	0	1	0	0	1	1	0	0	6	6
Total	1	3	0	4	2	0	2	2	0	0	14	14
04:00 PM	0	2	0	1	1	0	0	1	0	0	5	5
04:15 PM	0	3	0	0	1	0	1	0	0	0	5	5
04:30 PM	0	0	0	2	3	0	0	2	0	0	7	7
04:45 PM	0	2	0	2	1	0	2	2	0	0	9	9
Total	0	7	0	5	6	0	3	5	0	0	26	26
05:00 PM	1	1	0	3	0	0	0	2	0	0	7	7
05:15 PM	0	4	0	0	1	0	4	1	0	0	10	10
05:30 PM	0	3	0	0	0	0	1	1	0	0	5	5
05:45 PM	0	1	0	2	1	0	1	0	0	0	5	5
Total	1	9	0	5	2	0	6	4	0	0	27	27
06:00 PM	0	2	0	1	1	0	1	0	0	0	5	5
06:15 PM	0	0	0	0	1	0	0	0	0	0	1	1
Grand Total	2	21	0	15	12	0	12	11	0	0	73	73
Apprch %	8.7	91.3		55.6	44.4		52.2	47.8				
Total %	2.7	28.8		20.5	16.4		16.4	15.1		0	100	

	North Shore Rd From North			Route 145 From East			Route 145 From West			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:30 PM										
04:30 PM	0	0	0	2	3	5	0	2	2	7
04:45 PM	0	2	2	2	1	3	2	2	4	9
05:00 PM	1	1	2	3	0	3	0	2	2	7
05:15 PM	0	4	4	0	1	1	4	1	5	10
Total Volume	1	7	8	7	5	12	6	7	13	33
% App. Total	12.5	87.5		58.3	41.7		46.2	53.8		
PHF	.250	.438	.500	.583	.417	.600	.375	.875	.650	.825

Accurate Counts
978-664-2565

N/S Street : North Shore Road
E/W Street: Route 145
City/State : Revere, MA
Weather : Clear

File Name : 102710a8
Site Code : 10271008
Start Date : 6/12/2010
Page No : 1

Groups Printed- Cars - Trucks

	North Shore Rd From North			Route 145 From East			Route 145 From West					
Start Time	Left	Right	Peds	Thru	Right	Peds	Left	Thru	Peds	Exclu. Total	Inclu. Total	Int. Total
02:30 PM	37	50	1	193	42	0	52	165	0	1	539	540
02:45 PM	29	52	0	167	32	0	57	220	0	0	557	557
Total	66	102	1	360	74	0	109	385	0	1	1096	1097
03:00 PM	30	62	0	170	34	0	46	179	0	0	521	521
03:15 PM	26	46	2	181	32	0	49	155	0	2	489	491
03:30 PM	24	49	0	192	37	0	63	182	0	0	547	547
03:45 PM	23	44	4	205	49	0	46	203	1	5	570	575
Total	103	201	6	748	152	0	204	719	1	7	2127	2134
04:00 PM	35	47	2	247	38	0	53	152	2	4	572	576
04:15 PM	29	42	0	203	44	1	53	196	2	3	567	570
04:30 PM	38	50	4	198	38	0	53	157	0	4	534	538
04:45 PM	30	56	1	189	35	0	40	172	1	2	522	524
Total	132	195	7	837	155	1	199	677	5	13	2195	2208
05:00 PM	35	36	8	211	39	0	45	173	0	8	539	547
05:15 PM	31	32	1	199	34	0	51	169	0	1	516	517
Grand Total	367	566	23	2355	454	1	608	2123	6	30	6473	6503
Apprch %	39.3	60.7		83.8	16.2		22.3	77.7				
Total %	5.7	8.7		36.4	7		9.4	32.8		0.5	99.5	
Cars	365	564		2344	450		607	2116		0	0	6476
% Cars	99.5	99.6	100	99.5	99.1	100	99.8	99.7	100	0	0	99.6
Trucks	2	2		11	4		1	7		0	0	27
% Trucks	0.5	0.4	0	0.5	0.9	0	0.2	0.3	0	0	0	0.4

	North Shore Rd From North			Route 145 From East			Route 145 From West			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 03:30 PM										
03:30 PM	24	49	73	192	37	229	63	182	245	547
03:45 PM	23	44	67	205	49	254	46	203	249	570
04:00 PM	35	47	82	247	38	285	53	152	205	572
04:15 PM	29	42	71	203	44	247	53	196	249	567
Total Volume	111	182	293	847	168	1015	215	733	948	2256
% App. Total	37.9	62.1		83.4	16.6		22.7	77.3		
PHF	.793	.929	.893	.857	.857	.890	.853	.903	.952	.986
Cars	110	180	290	841	166	1007	214	732	946	2243
% Cars	99.1	98.9	99.0	99.3	98.8	99.2	99.5	99.9	99.8	99.4
Trucks	1	2	3	6	2	8	1	1	2	13
% Trucks	0.9	1.1	1.0	0.7	1.2	0.8	0.5	0.1	0.2	0.6

Accurate Counts
978-664-2565

N/S Street : North Shore Road
E/W Street: Route 145
City/State : Revere, MA
Weather : Clear

File Name : 102710a8
Site Code : 10271008
Start Date : 6/12/2010
Page No : 1

Groups Printed- Trucks

	North Shore Rd From North			Route 145 From East			Route 145 From West					
Start Time	Left	Right	Peds	Thru	Right	Peds	Left	Thru	Peds	Exclu. Total	Inclu. Total	Int. Total
02:30 PM	0	0	0	0	0	0	0	1	0	0	1	1
02:45 PM	0	0	0	0	1	0	0	0	0	0	1	1
Total	0	0	0	0	1	0	0	1	0	0	2	2
03:00 PM	0	0	0	1	0	0	0	1	0	0	2	2
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0
03:30 PM	1	0	0	4	0	0	0	1	0	0	6	6
03:45 PM	0	1	0	1	1	0	1	0	0	0	4	4
Total	1	1	0	6	1	0	1	2	0	0	12	12
04:00 PM	0	1	0	1	1	0	0	0	0	0	3	3
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	2	1	0	0	1	0	0	4	4
04:45 PM	1	0	0	0	0	0	0	0	0	0	1	1
Total	1	1	0	3	2	0	0	1	0	0	8	8
05:00 PM	0	0	0	1	0	0	0	2	0	0	3	3
05:15 PM	0	0	0	1	0	0	0	1	0	0	2	2
Grand Total	2	2	0	11	4	0	1	7	0	0	27	27
Apprch %	50	50		73.3	26.7		12.5	87.5				
Total %	7.4	7.4		40.7	14.8		3.7	25.9		0	100	

	North Shore Rd From North			Route 145 From East			Route 145 From West			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 03:15 PM										
03:15 PM	0	0	0	0	0	0	0	0	0	0
03:30 PM	1	0	1	4	0	4	0	1	1	6
03:45 PM	0	1	1	1	1	2	1	0	1	4
04:00 PM	0	1	1	1	1	2	0	0	0	3
Total Volume	1	2	3	6	2	8	1	1	2	13
% App. Total	33.3	66.7		75	25		50	50		
PHF	.250	.500	.750	.375	.500	.500	.250	.250	.500	.542

Accurate Counts
978-664-2565

N/S Street : Tomasello Way
E/W Street: Route 145
City/State : Boston, MA
Weather : Clear

File Name : 10271009
Site Code : 10271009
Start Date : 6/11/2010
Page No : 1

Groups Printed- Cars - Trucks

	Shaws Dr From North				Route 145 From East				Tomasello Way From South				Route 145 From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
03:30 PM	0	0	1	0	34	216	0	7	64	0	89	1	0	240	51	0	8	695	703
03:45 PM	0	0	0	0	39	249	0	7	63	0	77	0	0	232	50	0	7	710	717
Total	0	0	1	0	73	465	0	14	127	0	166	1	0	472	101	0	15	1405	1420
04:00 PM	1	0	0	0	37	234	0	14	71	1	81	0	0	263	47	0	14	735	749
04:15 PM	0	0	0	0	42	212	0	11	59	0	82	0	0	229	48	0	11	672	683
04:30 PM	0	0	0	0	48	214	0	11	67	1	98	0	0	208	65	0	11	701	712
04:45 PM	0	0	1	0	31	219	0	7	63	1	100	0	0	342	47	0	7	804	811
Total	1	0	1	0	158	879	0	43	260	3	361	0	0	1042	207	0	43	2912	2955
05:00 PM	0	1	0	0	31	224	0	9	67	1	104	0	0	275	64	0	9	767	776
05:15 PM	1	0	0	0	39	284	0	9	63	1	100	0	0	262	61	0	9	811	820
05:30 PM	0	0	1	0	45	200	0	12	83	1	105	2	0	242	33	0	14	710	724
05:45 PM	0	0	2	0	30	216	0	12	65	0	93	0	0	339	41	0	12	786	798
Total	1	1	3	0	145	924	0	42	278	3	402	2	0	1118	199	0	44	3074	3118
06:00 PM	0	0	0	0	32	164	0	0	91	0	115	0	0	304	49	0	0	755	755
06:15 PM	1	0	2	0	39	159	0	12	42	0	71	0	0	216	51	0	12	581	593
Grand Total	3	1	7	0	447	2591	0	111	798	6	1115	3	0	3152	607	0	114	8727	8841
Apprch %	27.3	9.1	63.6		14.7	85.3	0		41.6	0.3	58.1		0	83.9	16.1				
Total %	0	0	0.1		5.1	29.7	0		9.1	0.1	12.8		0	36.1	7		1.3	98.7	
Cars	3	1	6		447	2575	0		784	5	1110		0	3139	606		0	0	8790
% Cars	100	100	85.7	0	100	99.4	0	100	98.2	83.3	99.6	100	0	99.6	99.8	0	0	0	99.4
Trucks	0	0	1		0	16	0		14	1	5		0	13	1		0	0	51
% Trucks	0	0	14.3	0	0	0.6	0	0	1.8	16.7	0.4	0	0	0.4	0.2	0	0	0	0.6

	Shaws Dr From North				Route 145 From East				Tomasello Way From South				Route 145 From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	0	0	1	1	31	219	0	250	63	1	100	164	0	342	47	389	804
05:00 PM	0	1	0	1	31	224	0	255	67	1	104	172	0	275	64	339	767
05:15 PM	1	0	0	1	39	284	0	323	63	1	100	164	0	262	61	323	811
05:30 PM	0	0	1	1	45	200	0	245	83	1	105	189	0	242	33	275	710
Total Volume	1	1	2	4	146	927	0	1073	276	4	409	689	0	1121	205	1326	3092
% App. Total	25	25	50		13.6	86.4	0		40.1	0.6	59.4		0	84.5	15.5		
PHF	.250	.250	.500	1.000	.811	.816	.000	.830	.831	1.000	.974	.911	.000	.819	.801	.852	.953
Cars	1	1	2	4	146	924	0	1070	269	3	407	679	0	1114	205	1319	3072
% Cars	100	100	100	100	100	99.7	0	99.7	97.5	75.0	99.5	98.5	0	99.4	100	99.5	99.4
Trucks	0	0	0	0	0	3	0	3	7	1	2	10	0	7	0	7	20
% Trucks	0	0	0	0	0	0.3	0	0.3	2.5	25.0	0.5	1.5	0	0.6	0	0.5	0.6

Accurate Counts
978-664-2565

N/S Street : Tomasello Way
E/W Street: Route 145
City/State : Boston, MA
Weather : Clear

File Name : 10271009
Site Code : 10271009
Start Date : 6/11/2010
Page No : 1

Groups Printed- Trucks

	Shaws Dr From North				Route 145 From East				Tomasello Way From South				Route 145 From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
03:30 PM	0	0	1	0	0	1	0	0	3	0	0	0	0	0	1	0	0	6	6
03:45 PM	0	0	0	0	0	1	0	0	2	0	1	0	0	2	0	0	0	6	6
Total	0	0	1	0	0	2	0	0	5	0	1	0	0	2	1	0	0	12	12
04:00 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	3	3
04:15 PM	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1
04:30 PM	0	0	0	0	0	5	0	0	0	0	0	0	0	2	0	0	0	7	7
04:45 PM	0	0	0	0	0	1	0	0	4	0	0	0	0	2	0	0	0	7	7
Total	0	0	0	0	0	7	0	0	5	0	0	0	0	6	0	0	0	18	18
05:00 PM	0	0	0	0	0	1	0	0	2	0	2	0	0	3	0	0	0	8	8
05:15 PM	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0	0	0	4	4
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
05:45 PM	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	4	4
Total	0	0	0	0	0	5	0	0	3	1	3	0	0	5	0	0	0	17	17
06:00 PM	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	3	3
06:15 PM	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1
Grand Total	0	0	1	0	0	16	0	0	14	1	5	0	0	13	1	0	0	51	51
Apprch %	0	0	100		0	100	0		70	5	25		0	92.9	7.1				
Total %	0	0	2		0	31.4	0		27.5	2	9.8		0	25.5	2		0	100	

	Shaws Dr From North				Route 145 From East				Tomasello Way From South				Route 145 From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	0	0	0	0	0	5	0	5	0	0	0	0	0	2	0	2	7
04:45 PM	0	0	0	0	0	1	0	1	4	0	0	4	0	2	0	2	7
05:00 PM	0	0	0	0	0	1	0	1	2	0	2	4	0	3	0	3	8
05:15 PM	0	0	0	0	0	1	0	1	1	1	0	2	0	1	0	1	4
Total Volume	0	0	0	0	0	8	0	8	7	1	2	10	0	8	0	8	26
% App. Total	0	0	0		0	100	0		70	10	20		0	100	0		
PHF	.000	.000	.000	.000	.000	.400	.000	.400	.438	.250	.250	.625	.000	.667	.000	.667	.813

Accurate Counts
978-664-2565

N/S Street : Tomasello Way
E/W Street: Route 145
City/State : Boston, MA
Weather : Clear

File Name : 102710A9
Site Code : 10271009
Start Date : 6/12/2010
Page No : 1

Groups Printed- Cars - Trucks

	Shaws Dr From North				Route 145 From East				Tomasello Way From South				Route 145 From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
02:30 PM	1	0	0	0	45	162	2	6	71	1	78	0	0	142	60	0	6	562	568
02:45 PM	1	0	1	0	34	143	0	5	53	0	86	0	0	181	68	0	5	567	572
Total	2	0	1	0	79	305	2	11	124	1	164	0	0	323	128	0	11	1129	1140
03:00 PM	1	0	0	0	43	140	0	8	60	0	103	0	0	153	56	0	8	556	564
03:15 PM	0	0	4	0	36	140	0	5	69	0	95	0	0	130	51	0	5	525	530
03:30 PM	0	0	3	0	37	165	0	9	60	0	66	0	0	159	46	0	9	536	545
03:45 PM	1	0	4	0	41	154	0	11	93	0	105	0	0	182	45	0	11	625	636
Total	2	0	11	0	157	599	0	33	282	0	369	0	0	624	198	0	33	2242	2275
04:00 PM	0	1	3	4	37	192	0	12	95	0	82	0	0	132	56	0	16	598	614
04:15 PM	0	0	2	0	20	126	0	9	119	1	103	0	0	161	64	0	9	596	605
04:30 PM	0	0	2	0	34	131	0	6	103	1	99	0	0	147	48	0	6	565	571
04:45 PM	0	2	2	0	24	148	0	11	74	0	83	0	0	157	46	0	11	536	547
Total	0	3	9	4	115	597	0	38	391	2	367	0	0	597	214	0	42	2295	2337
05:00 PM	1	0	4	0	40	163	0	7	82	0	80	0	0	160	48	0	7	578	585
05:15 PM	2	0	4	0	28	159	0	6	70	0	92	0	0	150	48	0	6	553	559
Grand Total	7	3	29	4	419	1823	2	95	949	3	1072	0	0	1854	636	0	99	6797	6896
Apprch %	17.9	7.7	74.4		18.7	81.2	0.1		46.9	0.1	53		0	74.5	25.5				
Total %	0.1	0	0.4		6.2	26.8	0		14	0	15.8		0	27.3	9.4		1.4	98.6	
Cars	7	3	29		419	1813	2		944	1	1072		0	1848	633		0	0	6870
% Cars	100	100	100	100	100	99.5	100	100	99.5	33.3	100	0	0	99.7	99.5	0	0	0	99.6
Trucks	0	0	0		0	10	0		5	2	0		0	6	3		0	0	26
% Trucks	0	0	0	0	0	0.5	0	0	0.5	66.7	0	0	0	0.3	0.5	0	0	0	0.4

	Shaws Dr From North				Route 145 From East				Tomasello Way From South				Route 145 From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:45 PM																	
03:45 PM	1	0	4	5	41	154	0	195	93	0	105	198	0	182	45	227	625
04:00 PM	0	1	3	4	37	192	0	229	95	0	82	177	0	132	56	188	598
04:15 PM	0	0	2	2	20	126	0	146	119	1	103	223	0	161	64	225	596
04:30 PM	0	0	2	2	34	131	0	165	103	1	99	203	0	147	48	195	565
Total Volume	1	1	11	13	132	603	0	735	410	2	389	801	0	622	213	835	2384
% App. Total	7.7	7.7	84.6		18	82	0		51.2	0.2	48.6		0	74.5	25.5		
PHF	.250	.250	.688	.650	.805	.785	.000	.802	.861	.500	.926	.898	.000	.854	.832	.920	.954
Cars	1	1	11	13	132	599	0	731	407	1	389	797	0	621	211	832	2373
% Cars	100	100	100	100	100	99.3	0	99.5	99.3	50.0	100	99.5	0	99.8	99.1	99.6	99.5
Trucks	0	0	0	0	0	4	0	4	3	1	0	4	0	1	2	3	11
% Trucks	0	0	0	0	0	0.7	0	0.5	0.7	50.0	0	0.5	0	0.2	0.9	0.4	0.5

Accurate Counts
978-664-2565

N/S Street : Tomasello Way
E/W Street: Route 145
City/State : Boston, MA
Weather : Clear

File Name : 102710A9
Site Code : 10271009
Start Date : 6/12/2010
Page No : 1

Groups Printed- Trucks

	Shaws Dr From North				Route 145 From East				Tomasello Way From South				Route 145 From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
02:30 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	2	2
02:45 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	2	2
Total	0	0	0	0	0	1	0	0	0	1	0	0	0	1	1	0	0	4	4
03:00 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	3	0	0	1	0	0	0	0	0	0	0	0	4	4
03:45 PM	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	3	3
Total	0	0	0	0	0	5	0	0	2	0	0	0	0	0	1	0	0	8	8
04:00 PM	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	3	3
04:15 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1
04:30 PM	0	0	0	0	0	2	0	0	1	0	0	0	0	1	0	0	0	4	4
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Total	0	0	0	0	0	3	0	0	2	1	0	0	0	2	1	0	0	9	9
05:00 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	3	3
05:15 PM	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	2	2
Grand Total	0	0	0	0	0	10	0	0	5	2	0	0	0	6	3	0	0	26	26
Apprch %	0	0	0		0	100	0		71.4	28.6	0		0	66.7	33.3				
Total %	0	0	0		0	38.5	0		19.2	7.7	0		0	23.1	11.5		0	100	

	Shaws Dr From North				Route 145 From East				Tomasello Way From South				Route 145 From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:30 PM																	
03:30 PM	0	0	0	0	0	3	0	3	1	0	0	1	0	0	0	0	4
03:45 PM	0	0	0	0	0	1	0	1	1	0	0	1	0	0	1	1	3
04:00 PM	0	0	0	0	0	1	0	1	1	0	0	1	0	0	1	1	3
04:15 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
Total Volume	0	0	0	0	0	5	0	5	3	1	0	4	0	0	2	2	11
% App. Total	0	0	0		0	100	0		75	25	0		0	0	100		
PHF	.000	.000	.000	.000	.000	.417	.000	.417	.750	.250	.000	1.000	.000	.000	.500	.500	.688

Accurate Counts
978-664-2565

N/S Street : Bennington Street
E/W Street: Winthrop Avenue
City/State : Revere, MA
Weather : Clear

File Name : 10271010
Site Code : 10271010
Start Date : 6/11/2010
Page No : 1

Groups Printed- Cars - Trucks

	Bennington St From North					Unity Ave From Northeast					Winthrop Ave From East					Bennington St From South					Winthrop Ave From West							
Start Time	Hard Left	Left	Thru	Right	Peds	Hard Left	Bear Left	Bear Right	Hard Right	Peds	Left	Thru	Right	Hard Right	Peds	Left	Thru	Bear Right	Right	Peds	Left	Bear Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
15:30	0	9	42	35	6	0	0	0	0	3	0	0	0	0	3	135	102	0	25	33	15	2	76	65	5	50	506	556
15:45	0	5	33	34	15	0	0	0	0	5	0	0	0	0	5	97	69	1	19	23	14	2	74	47	6	54	395	449
Total	0	14	75	69	21	0	0	0	0	8	0	0	0	0	8	232	171	1	44	56	29	4	150	112	11	104	901	1005
16:00	0	6	37	36	34	0	0	0	0	5	0	0	0	0	8	116	98	1	28	33	21	1	56	51	14	94	451	545
16:15	0	5	46	29	12	0	0	0	0	11	0	0	0	0	12	113	106	0	16	25	19	1	55	49	3	63	439	502
16:30	2	12	47	29	14	0	0	0	0	4	0	0	0	0	8	104	92	0	20	29	18	0	57	63	8	63	444	507
16:45	0	11	50	25	12	0	0	0	0	4	0	0	0	0	5	87	103	0	24	14	23	0	73	47	4	39	443	482
Total	2	34	180	119	72	0	0	0	0	24	0	0	0	0	33	420	399	1	88	101	81	2	241	210	29	259	1777	2036
17:00	0	10	48	27	21	0	0	0	0	10	0	0	0	0	7	86	107	0	29	18	24	0	70	49	4	60	450	510
17:15	3	9	56	23	12	0	0	0	0	9	0	0	0	0	6	109	108	1	13	28	28	0	62	46	6	61	458	519
17:30	2	7	37	17	16	0	0	0	0	13	0	0	0	0	11	88	75	1	26	31	26	1	67	57	12	83	404	487
17:45	0	10	32	27	17	0	0	0	0	20	0	0	0	0	24	101	107	0	12	51	21	1	89	55	14	126	455	581
Total	5	36	173	94	66	0	0	0	0	52	0	0	0	0	48	384	397	2	80	128	99	2	288	207	36	330	1767	2097
18:00	0	10	25	20	20	0	0	0	0	18	0	0	0	0	21	103	80	1	16	18	17	0	90	66	13	90	428	518
18:15	0	12	43	18	20	0	0	0	0	10	0	0	0	0	11	105	80	1	21	16	25	0	78	70	9	66	453	519
Grand Total	7	106	496	320	199	0	0	0	0	112	0	0	0	0	121	1244	1127	6	249	319	251	8	847	665	98	849	5326	6175
Apprch %	0.8	11.4	53.4	34.4		0	0	0	0		0	0	0	0		47.4	42.9	0.2	9.5		14.2	0.5	47.8	37.5				
Total %	0.1	2	9.3	6		0	0	0	0		0	0	0	0		23.4	21.2	0.1	4.7		4.7	0.2	15.9	12.5		13.7	86.3	
Cars	7	105	493	311		0	0	0	0		0	0	0	0		1231	1120	4	249		249	8	836	656		0	0	6118
% Cars	100	99.1	99.4	97.2	100	0	0	0	0	100	0	0	0	0	100	99	99.4	66.7	100	100	99.2	100	98.7	98.6	100	0	0	99.1
Trucks	0	1	3	9		0	0	0	0		0	0	0	0		13	7	2	0		2	0	11	9		0	0	57
% Trucks	0	0.9	0.6	2.8	0	0	0	0	0	0	0	0	0	0	0	1	0.6	33.3	0	0	0.8	0	1.3	1.4	0	0	0	0.9

	Bennington St From North					Unity Ave From Northeast					Winthrop Ave From East					Bennington St From South					Winthrop Ave From West					
Start Time	Hard Left	Left	Thru	Right	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	App. Total	Left	Thru	Right	Hard Right	App. Total	Left	Thru	Bear Right	Right	App. Total	Left	Bear Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1																										
Peak Hour for Entire Intersection Begins at 16:30																										
16:30	2	12	47	29	90	0	0	0	0	0	0	0	0	0	0	104	92	0	20	216	18	0	57	63	138	444
16:45	0	11	50	25	86	0	0	0	0	0	0	0	0	0	0	87	103	0	24	214	23	0	73	47	143	443
17:00	0	10	48	27	85	0	0	0	0	0	0	0	0	0	0	86	107	0	29	222	24	0	70	49	143	450
17:15	3	9	56	23	91	0	0	0	0	0	0	0	0	0	0	109	108	1	13	231	28	0	62	46	136	458
Total Volume	5	42	201	104	352	0	0	0	0	0	0	0	0	0	0	386	410	1	86	883	93	0	262	205	560	1795
% App. Total	1.4	11.9	57.1	29.5		0	0	0	0		0	0	0	0		43.7	46.4	0.1	9.7		16.6	0	46.8	36.6		
PHF	.417	.875	.897	.897	.967	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.885	.949	.250	.741	.956	.830	.000	.897	.813	.979	.980
Cars	5	41	199	102	347	0	0	0	0	0	0	0	0	0	0	382	407	1	86	876	93	0	255	203	551	1774
% Cars	100	97.6	99.0	98.1	98.6	0	0	0	0	0	0	0	0	0	0	99.0	99.3	100	100	99.2	100	0	97.3	99.0	98.4	98.8
Trucks	0	1	2	2	5	0	0	0	0	0	0	0	0	0	0	4	3	0	0	7	0	0	7	2	9	21
% Trucks	0	2.4	1.0	1.9	1.4	0	0	0	0	0	0	0	0	0	0	1.0	0.7	0	0	0.8	0	0	2.7	1.0	1.6	1.2

Accurate Counts
978-664-2565

N/S Street : Bennington Street
E/W Street: Winthrop Avenue
City/State : Revere, MA
Weather : Clear

File Name : 10271010
Site Code : 10271010
Start Date : 6/11/2010
Page No : 1

Groups Printed- Trucks

	Bennington St From North					Unity Ave From Northeast					Winthrop Ave From East					Bennington St From South					Winthrop Ave From West							
Start Time	Hard Left	Left	Thru	Right	Peds	Hard Left	Bear Left	Bear Right	Hard Right	Peds	Left	Thru	Right	Hard Right	Peds	Left	Thru	Bear Right	Right	Peds	Left	Bear Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
15:30	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	7	1	0	0	0	0	0	1	1	0	0	12	12
15:45	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	2	0	0	6	6
Total	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	7	2	1	0	0	0	0	2	3	0	0	18	18
16:00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	2	0	1	2	0	0	10	10
16:15	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	4	4
16:30	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	1	0	0	5	5
16:45	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	3	3
Total	0	0	2	3	0	0	0	0	0	0	0	0	0	0	0	4	4	1	0	0	2	0	2	4	0	0	22	22
17:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	4	0	0	0	7	7
17:15	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	1	0	0	6	6
17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	6	1	0	0	13	13
18:00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	2
18:15	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	2
Grand Total	0	1	3	9	0	0	0	0	0	0	0	0	0	0	0	13	7	2	0	0	2	0	11	9	0	0	57	57
Apprch %	0	7.7	23.1	69.2		0	0	0	0		0	0	0	0		59.1	31.8	9.1	0		9.1	0	50	40.9			
Total %	0	1.8	5.3	15.8		0	0	0	0		0	0	0	0		22.8	12.3	3.5	0		3.5	0	19.3	15.8		0	100	

	Bennington St From North					Unity Ave From Northeast					Winthrop Ave From East					Bennington St From South					Winthrop Ave From West					
Start Time	Hard Left	Left	Thru	Right	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	App. Total	Left	Thru	Right	Hard Right	App. Total	Left	Thru	Bear Right	Right	App. Total	Left	Bear Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1																										
Peak Hour for Entire Intersection Begins at 15:30																										
15:30	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	7	1	0	0	8	0	0	1	1	2	12
15:45	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	0	0	1	2	3	6
16:00	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	2	1	0	4	2	0	1	2	5	10
16:15	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	1	4
Total Volume	0	0	1	5	6	0	0	0	0	0	0	0	0	0	0	9	4	2	0	15	2	0	3	6	11	32
% App. Total	0	0	16.7	83.3		0	0	0	0		0	0	0	0		60	26.7	13.3	0		18.2	0	27.3	54.5		
PHF	.000	.000	.250	.625	.750	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.321	.500	.500	.000	.469	.250	.000	.750	.750	.550	.667

Accurate Counts
978-664-2565

N/S Street : Bennington Street
E/W Street: Winthrop Avenue
City/State : Revere, MA
Weather : Clear

File Name : 10271A10
Site Code : 10271010
Start Date : 6/12/2010
Page No : 1

Groups Printed- Cars - Trucks

	Bennington St From North					Unity Ave From Northeast					Winthrop Ave From East					Bennington St From South					Winthrop Ave From West							
Start Time	Hard Left	Left	Thru	Right	Peds	Hard Left	Bear Left	Bear Right	Hard Right	Peds	Left	Thru	Right	Hard Right	Peds	Left	Thru	Bear Right	Right	Peds	Left	Bear Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
14:30	0	9	33	23	20	0	0	1	0	5	0	0	0	0	4	68	32	0	12	16	18	0	79	59	6	51	334	385
14:45	0	8	24	36	17	0	0	0	0	9	0	0	0	0	5	69	44	0	21	18	23	0	72	64	6	55	361	416
Total	0	17	57	59	37	0	0	1	0	14	0	0	0	0	9	137	76	0	33	34	41	0	151	123	12	106	695	801
15:00	0	10	39	24	16	0	0	0	1	11	0	0	0	0	11	77	43	0	19	27	15	0	60	60	7	72	348	420
15:15	0	11	30	37	16	0	0	0	1	7	0	0	0	0	7	78	32	0	23	13	26	0	65	51	14	57	354	411
15:30	0	9	35	29	13	0	0	2	0	9	0	0	0	0	6	87	39	0	17	20	18	0	78	65	6	54	379	433
15:45	0	8	25	27	9	0	0	1	0	11	0	0	0	0	7	74	33	0	10	14	21	0	52	47	8	49	298	347
Total	0	38	129	117	54	0	0	3	2	38	0	0	0	0	31	316	147	0	69	74	80	0	255	223	35	232	1379	1611
16:00	0	10	26	27	9	0	0	0	0	16	0	0	0	0	9	62	24	0	17	25	13	0	71	63	7	66	313	379
16:15	0	8	31	25	17	0	0	1	0	8	0	0	0	0	7	65	40	0	14	19	15	0	65	47	6	57	311	368
16:30	0	10	29	35	15	0	0	1	0	5	0	0	0	0	4	63	40	0	14	10	17	0	67	35	4	38	311	349
16:45	0	11	39	39	18	0	0	0	0	9	0	0	0	0	11	77	39	0	16	25	21	0	64	53	5	68	359	427
Total	0	39	125	126	59	0	0	2	0	38	0	0	0	0	31	267	143	0	61	79	66	0	267	198	22	229	1294	1523
17:00	0	10	32	24	18	0	0	0	0	21	0	0	0	0	20	58	42	0	16	29	18	0	69	41	12	100	310	410
17:15	0	12	36	35	17	0	0	0	0	10	0	0	0	0	9	55	41	0	17	12	22	0	57	44	14	62	319	381
Grand Total	0	116	379	361	185	0	0	6	2	121	0	0	0	0	100	833	449	0	196	228	227	0	799	629	95	729	3997	4726
Apprch %	0	13.6	44.3	42.2		0	0	75	25		0	0	0	0		56.4	30.4	0	13.3		13.7	0	48.3	38				
Total %	0	2.9	9.5	9		0	0	0.2	0.1		0	0	0	0		20.8	11.2	0	4.9		5.7	0	20	15.7		15.4	84.6	
Cars	0	116	379	354		0	0	6	2		0	0	0	0		825	448	0	194		225	0	791	625		0	0	4694
% Cars	0	100	100	98.1	100	0	0	100	100	100	0	0	0	0	100	99	99.8	0	99	100	99.1	0	99	99.4	100	0	0	99.3
Trucks	0	0	0	7		0	0	0	0		0	0	0	0		8	1	0	2		2	0	8	4		0	0	32
% Trucks	0	0	0	1.9	0	0	0	0	0	0	0	0	0	0	0	1	0.2	0	1	0	0.9	0	1	0.6	0	0	0	0.7

	Bennington St From North					Unity Ave From Northeast					Winthrop Ave From East					Bennington St From South					Winthrop Ave From West					
Start Time	Hard Left	Left	Thru	Right	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	App. Total	Left	Thru	Right	Hard Right	App. Total	Left	Thru	Bear Right	Right	App. Total	Left	Bear Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 17:15 - Peak 1 of 1																										
Peak Hour for Entire Intersection Begins at 14:45																										
14:45	0	8	24	36	68	0	0	0	0	0	0	0	0	0	0	69	44	0	21	134	23	0	72	64	159	361
15:00	0	10	39	24	73	0	0	0	1	1	0	0	0	0	0	77	43	0	19	139	15	0	60	60	135	348
15:15	0	11	30	37	78	0	0	0	1	1	0	0	0	0	0	78	32	0	23	133	26	0	65	51	142	354
15:30	0	9	35	29	73	0	0	2	0	2	0	0	0	0	0	87	39	0	17	143	18	0	78	65	161	379
Total Volume	0	38	128	126	292	0	0	2	2	4	0	0	0	0	0	311	158	0	80	549	82	0	275	240	597	1442
% App. Total	0	13	43.8	43.2		0	0	50	50		0	0	0	0		56.6	28.8	0	14.6		13.7	0	46.1	40.2		
PHF	.000	.864	.821	.851	.936	.000	.000	.250	.500	.500	.000	.000	.000	.000	.000	.894	.898	.000	.870	.960	.788	.000	.881	.923	.927	.951
Cars	0	38	128	124	290	0	0	2	2	4	0	0	0	0	0	306	157	0	80	543	82	0	272	239	593	1430
% Cars	0	100	100	98.4	99.3	0	0	100	100	100	0	0	0	0	0	98.4	99.4	0	100	98.9	100	0	98.9	99.6	99.3	99.2
Trucks	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	5	1	0	0	6	0	0	3	1	4	12
% Trucks	0	0	0	1.6	0.7	0	0	0	0	0	0	0	0	0	0	1.6	0.6	0	0	1.1	0	0	1.1	0.4	0.7	0.8

Accurate Counts
978-664-2565

N/S Street : Bennington Street
E/W Street: Winthrop Avenue
City/State : Revere, MA
Weather : Clear

File Name : 10271A10
Site Code : 10271010
Start Date : 6/12/2010
Page No : 1

Groups Printed- Trucks

	Bennington St From North					Unity Ave From Northeast					Winthrop Ave From East					Bennington St From South					Winthrop Ave From West							
Start Time	Hard Left	Left	Thru	Right	Peds	Hard Left	Bear Left	Bear Right	Hard Right	Peds	Left	Thru	Right	Hard Right	Peds	Left	Thru	Bear Right	Right	Peds	Left	Bear Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
14:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
14:45	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	1	1	0	0	6	6
Total	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	2	1	0	0	7	7
15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	3	3
15:15	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	3	3
15:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:45	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Total	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	2	0	0	0	7	7
16:00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	4	4
16:15	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0	4	4
16:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	1	0	0	4	4
16:45	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	3	3
Total	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3	0	0	1	0	2	0	3	3	0	0	15	15
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	3	3
Grand Total	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	8	1	0	2	0	2	0	8	4	0	0	32	32
Apprch %	0	0	0	100		0	0	0	0		0	0	0	0		72.7	9.1	0	18.2		14.3	0	57.1	28.6				
Total %	0	0	0	21.9		0	0	0	0		0	0	0	0		25	3.1	0	6.2		6.2	0	25	12.5		0	100	

	Bennington St From North					Unity Ave From Northeast					Winthrop Ave From East					Bennington St From South					Winthrop Ave From West					
Start Time	Hard Left	Left	Thru	Right	App. Total	Hard Left	Bear Left	Bear Right	Hard Right	App. Total	Left	Thru	Right	Hard Right	App. Total	Left	Thru	Bear Right	Right	App. Total	Left	Bear Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 17:15 - Peak 1 of 1																										
Peak Hour for Entire Intersection Begins at 16:00																										
16:00	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	2	2	4
16:15	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2	0	2	4
16:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2	0	0	1	1	2	4
16:45	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	3
Total Volume	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	3	0	0	1	4	2	0	3	3	8	15
% App. Total	0	0	0	100		0	0	0	0		0	0	0	0		75	0	0	25		25	0	37.5	37.5		
PHF	.000	.000	.000	.750	.750	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.750	.000	.000	.250	.500	.250	.000	.375	.375	1.000	.938

Accurate Counts
978-664-2565

N/S Street : Route 60 North Leg
E/W Street: Brown Circle
City/State : Revere, MA
Weather : Clear

File Name : 10271013A
Site Code : 10271013
Start Date : 6/11/2010

Groups Printed- Cars - Trucks

	Route 60 N. Leg From North			Brown Circle From East			Brown Circle From West					
Start Time	Left	Right	Peds	Thru	Right	Peds	Left	Thru	Peds	Exclu. Total	Inclu. Total	Int. Total
15:30	0	297	0	218	0	0	0	0	0	0	515	515
15:45	0	421	0	181	0	0	0	0	0	0	602	602
Total	0	718	0	399	0	0	0	0	0	0	1117	1117
16:00	0	406	0	241	0	0	0	0	0	0	647	647
16:15	0	356	0	208	0	0	0	0	0	0	564	564
16:30	0	417	0	223	0	0	0	0	0	0	640	640
16:45	0	395	0	232	0	0	0	0	0	0	627	627
Total	0	1574	0	904	0	0	0	0	0	0	2478	2478
17:00	0	360	0	211	0	0	0	0	0	0	571	571
17:15	0	424	0	214	0	0	0	0	0	0	638	638
17:30	0	372	0	208	0	0	0	0	0	0	580	580
17:45	0	344	0	203	0	0	0	0	0	0	547	547
Total	0	1500	0	836	0	0	0	0	0	0	2336	2336
18:00	0	363	0	203	0	0	0	0	0	0	566	566
18:15	0	166	0	86	0	0	0	0	0	0	252	252
Grand Total	0	4321	0	2428	0	0	0	0	0	0	6749	6749
Apprch %	0	100		100	0		0	0				
Total %	0	64		36	0		0	0		0	100	
Cars	0	4237		2363	0		0	0		0	0	6600
% Cars	0	98.1	0	97.3	0	0	0	0	0	0	0	97.8
Trucks	0	84		65	0		0	0		0	0	149
% Trucks	0	1.9	0	2.7	0	0	0	0	0	0	0	2.2

	Route 60 N. Leg From North			Brown Circle From East			Brown Circle From West			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 16:00										
16:00	0	406	406	241	0	241	0	0	0	647
16:15	0	356	356	208	0	208	0	0	0	564
16:30	0	417	417	223	0	223	0	0	0	640
16:45	0	395	395	232	0	232	0	0	0	627
Total Volume	0	1574	1574	904	0	904	0	0	0	2478
% App. Total	0	100		100	0		0	0		
PHF	.000	.944	.944	.938	.000	.938	.000	.000	.000	.957
Cars	0	1546	1546	874	0	874	0	0	0	2420
% Cars	0	98.2	98.2	96.7	0	96.7	0	0	0	97.7
Trucks	0	28	28	30	0	30	0	0	0	58
% Trucks	0	1.8	1.8	3.3	0	3.3	0	0	0	2.3

Accurate Counts
978-664-2565

N/S Street : Route 60 North Leg
E/W Street: Brown Circle
City/State : Revere, MA
Weather : Clear

File Name : 10271013A
Site Code : 10271013
Start Date : 6/11/2010

Groups Printed- Trucks

	Route 60 N. Leg From North			Brown Circle From East			Brown Circle From West					
Start Time	Left	Right	Peds	Thru	Right	Peds	Left	Thru	Peds	Exclu. Total	Inclu. Total	Int. Total
15:30	0	11	0	8	0	0	0	0	0	0	19	19
15:45	0	7	0	4	0	0	0	0	0	0	11	11
Total	0	18	0	12	0	0	0	0	0	0	30	30
16:00	0	10	0	10	0	0	0	0	0	0	20	20
16:15	0	7	0	8	0	0	0	0	0	0	15	15
16:30	0	3	0	4	0	0	0	0	0	0	7	7
16:45	0	8	0	8	0	0	0	0	0	0	16	16
Total	0	28	0	30	0	0	0	0	0	0	58	58
17:00	0	9	0	3	0	0	0	0	0	0	12	12
17:15	0	7	0	4	0	0	0	0	0	0	11	11
17:30	0	7	0	6	0	0	0	0	0	0	13	13
17:45	0	2	0	3	0	0	0	0	0	0	5	5
Total	0	25	0	16	0	0	0	0	0	0	41	41
18:00	0	6	0	6	0	0	0	0	0	0	12	12
18:15	0	7	0	1	0	0	0	0	0	0	8	8
Grand Total	0	84	0	65	0	0	0	0	0	0	149	149
Apprch %	0	100		100	0		0	0				
Total %	0	56.4		43.6	0		0	0		0	100	

	Route 60 N. Leg From North			Brown Circle From East			Brown Circle From West			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 15:30										
15:30	0	11	11	8	0	8	0	0	0	19
15:45	0	7	7	4	0	4	0	0	0	11
16:00	0	10	10	10	0	10	0	0	0	20
16:15	0	7	7	8	0	8	0	0	0	15
Total Volume	0	35	35	30	0	30	0	0	0	65
% App. Total	0	100		100	0		0	0		
PHF	.000	.795	.795	.750	.000	.750	.000	.000	.000	.813

Accurate Counts
978-664-2565

N/S Street : Brown Circle
E/W Street: Route 107 West Leg
City/State : Revere, MA
Weather : Clear

File Name : 10271013B
Site Code : 10271013
Start Date : 6/11/2010

Groups Printed- Cars - Trucks

	Brown Circle From North			Brown Circle From South			Route 107 West Leg From West					
Start Time	Thru	Right	Peds	Left	Thru	Peds	Left	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
15:30	428	0	0	0	0	0	0	152	0	0	580	580
15:45	476	0	0	0	0	0	0	149	0	0	625	625
Total	904	0	0	0	0	0	0	301	0	0	1205	1205
16:00	508	0	0	0	0	0	0	108	0	0	616	616
16:15	426	0	0	0	0	0	0	145	0	0	571	571
16:30	486	0	0	0	0	0	0	141	0	0	627	627
16:45	490	0	0	0	0	0	0	154	0	0	644	644
Total	1910	0	0	0	0	0	0	548	0	0	2458	2458
17:00	433	0	0	0	0	0	0	111	0	0	544	544
17:15	498	0	0	0	0	0	0	147	0	0	645	645
17:30	442	0	0	0	0	0	0	150	0	0	592	592
17:45	443	0	0	0	0	0	0	149	0	0	592	592
Total	1816	0	0	0	0	0	0	557	0	0	2373	2373
18:00	433	0	0	0	0	0	0	134	0	0	567	567
18:15	397	0	0	0	0	0	0	121	0	0	518	518
Grand Total	5460	0	0	0	0	0	0	1661	0	0	7121	7121
Apprch %	100	0		0	0		0	100				
Total %	76.7	0		0	0		0	23.3		0	100	
Cars	5335	0		0	0		0	1652		0	0	6987
% Cars	97.7	0	0	0	0	0	0	99.5	0	0	0	98.1
Trucks	125	0		0	0		0	9		0	0	134
% Trucks	2.3	0	0	0	0	0	0	0.5	0	0	0	1.9

	Brown Circle From North			Brown Circle From South			Route 107 West Leg From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 16:30										
16:30	486	0	486	0	0	0	0	141	141	627
16:45	490	0	490	0	0	0	0	154	154	644
17:00	433	0	433	0	0	0	0	111	111	544
17:15	498	0	498	0	0	0	0	147	147	645
Total Volume	1907	0	1907	0	0	0	0	553	553	2460
% App. Total	100	0		0	0		0	100		
PHF	.957	.000	.957	.000	.000	.000	.000	.898	.898	.953
Cars	1868	0	1868	0	0	0	0	550	550	2418
% Cars	98.0	0	98.0	0	0	0	0	99.5	99.5	98.3
Trucks	39	0	39	0	0	0	0	3	3	42
% Trucks	2.0	0	2.0	0	0	0	0	0.5	0.5	1.7

Accurate Counts
978-664-2565

N/S Street : Brown Circle
E/W Street: Route 107 West Leg
City/State : Revere, MA
Weather : Clear

File Name : 10271013B
Site Code : 10271013
Start Date : 6/11/2010

Groups Printed- Trucks

	Brown Circle From North			Brown Circle From South			Route 107 West Leg From West					
Start Time	Thru	Right	Peds	Left	Thru	Peds	Left	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
15:30	16	0	0	0	0	0	0	1	0	0	17	17
15:45	7	0	0	0	0	0	0	1	0	0	8	8
Total	23	0	0	0	0	0	0	2	0	0	25	25
16:00	19	0	0	0	0	0	0	0	0	0	19	19
16:15	12	0	0	0	0	0	0	3	0	0	15	15
16:30	5	0	0	0	0	0	0	0	0	0	5	5
16:45	12	0	0	0	0	0	0	2	0	0	14	14
Total	48	0	0	0	0	0	0	5	0	0	53	53
17:00	12	0	0	0	0	0	0	1	0	0	13	13
17:15	10	0	0	0	0	0	0	0	0	0	10	10
17:30	11	0	0	0	0	0	0	0	0	0	11	11
17:45	3	0	0	0	0	0	0	0	0	0	3	3
Total	36	0	0	0	0	0	0	1	0	0	37	37
18:00	10	0	0	0	0	0	0	1	0	0	11	11
18:15	8	0	0	0	0	0	0	0	0	0	8	8
Grand Total	125	0	0	0	0	0	0	9	0	0	134	134
Apprch %	100	0		0	0		0	100				
Total %	93.3	0		0	0		0	6.7		0	100	

	Brown Circle From North			Brown Circle From South			Route 107 West Leg From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 15:30										
15:30	16	0	16	0	0	0	0	1	1	17
15:45	7	0	7	0	0	0	0	1	1	8
16:00	19	0	19	0	0	0	0	0	0	19
16:15	12	0	12	0	0	0	0	3	3	15
Total Volume	54	0	54	0	0	0	0	5	5	59
% App. Total	100	0		0	0		0	100		
PHF	.711	.000	.711	.000	.000	.000	.000	.417	.417	.776

Accurate Counts
978-664-2565

N/S Street : Route 60 South Leg
E/W Street: Brown Circle
City/State : Revere, MA
Weather : Clear

File Name : 10271013c
Site Code : 10271013
Start Date : 6/11/2010

Groups Printed- Cars - Trucks

	Brown Circle From East			Route 60 South Leg From South			Brown Circle From West					
Start Time	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
15:30	0	0	0	0	390	0	210	0	0	0	600	600
15:45	0	0	0	0	393	0	290	0	0	0	683	683
Total	0	0	0	0	783	0	500	0	0	0	1283	1283
16:00	0	0	0	0	439	0	228	0	0	0	667	667
16:15	0	0	0	0	411	0	255	0	0	0	666	666
16:30	0	0	0	0	416	0	274	0	0	0	690	690
16:45	0	0	0	0	411	0	268	0	0	0	679	679
Total	0	0	0	0	1677	0	1025	0	0	0	2702	2702
17:00	0	0	0	0	429	0	236	0	0	0	665	665
17:15	0	0	0	0	416	0	273	0	0	0	689	689
17:30	0	0	0	0	422	0	265	0	0	0	687	687
17:45	0	0	0	0	432	1	254	0	0	1	686	687
Total	0	0	0	0	1699	1	1028	0	0	1	2727	2728
18:00	0	0	0	0	394	0	262	0	0	0	656	656
18:15	0	0	0	0	328	0	240	0	0	0	568	568
Grand Total	0	0	0	0	4881	1	3055	0	0	1	7936	7937
Apprch %	0	0		0	100		100	0				
Total %	0	0		0	61.5		38.5	0		0	100	
Cars	0	0		0	4772		3026	0		0	0	7799
% Cars	0	0	0	0	97.8	100	99.1	0	0	0	0	98.3
Trucks	0	0		0	109		29	0		0	0	138
% Trucks	0	0	0	0	2.2	0	0.9	0	0	0	0	1.7

	Brown Circle From East			Route 60 South Leg From South			Brown Circle From West			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 17:00										
17:00	0	0	0	0	429	429	236	0	236	665
17:15	0	0	0	0	416	416	273	0	273	689
17:30	0	0	0	0	422	422	265	0	265	687
17:45	0	0	0	0	432	432	254	0	254	686
Total Volume	0	0	0	0	1699	1699	1028	0	1028	2727
% App. Total	0	0		0	100		100	0		
PHF	.000	.000	.000	.000	.983	.983	.941	.000	.941	.989
Cars	0	0	0	0	1672	1672	1022	0	1022	2694
% Cars	0	0	0	0	98.4	98.4	99.4	0	99.4	98.8
Trucks	0	0	0	0	27	27	6	0	6	33
% Trucks	0	0	0	0	1.6	1.6	0.6	0	0.6	1.2

Accurate Counts
978-664-2565

N/S Street : Route 60 South Leg
E/W Street: Brown Circle
City/State : Revere, MA
Weather : Clear

File Name : 10271013c
Site Code : 10271013
Start Date : 6/11/2010

Groups Printed- Trucks

	Brown Circle From East			Route 60 South Leg From South			Brown Circle From West					
Start Time	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
15:30	0	0	0	0	14	0	4	0	0	0	18	18
15:45	0	0	0	0	15	0	4	0	0	0	19	19
Total	0	0	0	0	29	0	8	0	0	0	37	37
16:00	0	0	0	0	16	0	2	0	0	0	18	18
16:15	0	0	0	0	7	0	6	0	0	0	13	13
16:30	0	0	0	0	6	0	1	0	0	0	7	7
16:45	0	0	0	0	8	0	5	0	0	0	13	13
Total	0	0	0	0	37	0	14	0	0	0	51	51
17:00	0	0	0	0	8	0	1	0	0	0	9	9
17:15	0	0	0	0	6	0	3	0	0	0	9	9
17:30	0	0	0	0	5	0	1	0	0	0	6	6
17:45	0	0	0	0	8	0	1	0	0	0	9	9
Total	0	0	0	0	27	0	6	0	0	0	33	33
18:00	0	0	0	0	10	0	0	0	0	0	10	10
18:15	0	0	0	0	6	0	1	0	0	0	7	7
Grand Total	0	0	0	0	109	0	29	0	0	0	138	138
Apprch %	0	0		0	100		100	0				
Total %	0	0		0	79		21	0		0	100	

	Brown Circle From East			Route 60 South Leg From South			Brown Circle From West			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 15:30										
15:30	0	0	0	0	14	14	4	0	4	18
15:45	0	0	0	0	15	15	4	0	4	19
16:00	0	0	0	0	16	16	2	0	2	18
16:15	0	0	0	0	7	7	6	0	6	13
Total Volume	0	0	0	0	52	52	16	0	16	68
% App. Total	0	0		0	100		100	0		
PHF	.000	.000	.000	.000	.813	.813	.667	.000	.667	.895

Accurate Counts
978-664-2565

N/S Street : Brown Circle
E/W Street: Route 107 East Leg
City/State : Revere, MA
Weather : Clear

File Name : 10271013D
Site Code : 10271013
Start Date : 6/11/2010

Groups Printed- Cars - Trucks

	Brown Circle From North			Route 107 East Leg From East			Brown Circle From South					
Start Time	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
15:30	0	0	0	0	231	0	370	0	0	0	601	601
15:45	0	0	0	0	167	0	392	0	0	0	559	559
Total	0	0	0	0	398	0	762	0	0	0	1160	1160
16:00	0	0	0	0	284	0	370	0	0	0	654	654
16:15	0	0	0	0	218	0	400	0	0	0	618	618
16:30	0	0	0	0	249	0	386	0	0	0	635	635
16:45	0	0	0	0	238	0	368	0	0	0	606	606
Total	0	0	0	0	989	0	1524	0	0	0	2513	2513
17:00	0	0	0	0	221	0	373	0	0	0	594	594
17:15	0	0	0	0	251	0	369	0	0	0	620	620
17:30	0	0	0	0	223	0	373	0	0	0	596	596
17:45	0	0	0	0	217	0	389	0	1	1	606	607
Total	0	0	0	0	912	0	1504	0	1	1	2416	2417
18:00	0	0	0	0	233	0	360	0	0	0	593	593
18:15	0	0	0	0	163	0	371	0	0	0	534	534
Grand Total	0	0	0	0	2695	0	4521	0	1	1	7216	7217
Apprch %	0	0		0	100		100	0				
Total %	0	0		0	37.3		62.7	0		0	100	
Cars	0	0		0	2627		4437	0		0	0	7065
% Cars	0	0	0	0	97.5	0	98.1	0	100	0	0	97.9
Trucks	0	0		0	68		84	0		0	0	152
% Trucks	0	0	0	0	2.5	0	1.9	0	0	0	0	2.1

	Brown Circle From North			Route 107 East Leg From East			Brown Circle From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 16:00										
16:00	0	0	0	0	284	284	370	0	370	654
16:15	0	0	0	0	218	218	400	0	400	618
16:30	0	0	0	0	249	249	386	0	386	635
16:45	0	0	0	0	238	238	368	0	368	606
Total Volume	0	0	0	0	989	989	1524	0	1524	2513
% App. Total	0	0		0	100		100	0		
PHF	.000	.000	.000	.000	.871	.871	.953	.000	.953	.961
Cars	0	0	0	0	958	958	1491	0	1491	2449
% Cars	0	0	0	0	96.9	96.9	97.8	0	97.8	97.5
Trucks	0	0	0	0	31	31	33	0	33	64
% Trucks	0	0	0	0	3.1	3.1	2.2	0	2.2	2.5

Accurate Counts
978-664-2565

N/S Street : Brown Circle
E/W Street: Route 107 East Leg
City/State : Revere, MA
Weather : Clear

File Name : 10271013D
Site Code : 10271013
Start Date : 6/11/2010

Groups Printed- Trucks

	Brown Circle From North			Route 107 East Leg From East			Brown Circle From South					
Start Time	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
15:30	0	0	0	0	6	0	11	0	0	0	17	17
15:45	0	0	0	0	5	0	14	0	0	0	19	19
Total	0	0	0	0	11	0	25	0	0	0	36	36
16:00	0	0	0	0	10	0	12	0	0	0	22	22
16:15	0	0	0	0	9	0	11	0	0	0	20	20
16:30	0	0	0	0	6	0	3	0	0	0	9	9
16:45	0	0	0	0	6	0	7	0	0	0	13	13
Total	0	0	0	0	31	0	33	0	0	0	64	64
17:00	0	0	0	0	4	0	6	0	0	0	10	10
17:15	0	0	0	0	4	0	5	0	0	0	9	9
17:30	0	0	0	0	7	0	2	0	0	0	9	9
17:45	0	0	0	0	3	0	4	0	0	0	7	7
Total	0	0	0	0	18	0	17	0	0	0	35	35
18:00	0	0	0	0	6	0	3	0	0	0	9	9
18:15	0	0	0	0	2	0	6	0	0	0	8	8
Grand Total	0	0	0	0	68	0	84	0	0	0	152	152
Apprch %	0	0		0	100		100	0				
Total %	0	0		0	44.7		55.3	0		0	100	

	Brown Circle From North			Route 107 East Leg From East			Brown Circle From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 15:30										
15:30	0	0	0	0	6	6	11	0	11	17
15:45	0	0	0	0	5	5	14	0	14	19
16:00	0	0	0	0	10	10	12	0	12	22
16:15	0	0	0	0	9	9	11	0	11	20
Total Volume	0	0	0	0	30	30	48	0	48	78
% App. Total	0	0		0	100		100	0		
PHF	.000	.000	.000	.000	.750	.750	.857	.000	.857	.886

Accurate Counts
978-664-2565

N/S Street : Route 60 North Leg
E/W Street: Brown Circle
City/State : Revere, MA
Weather : Clear

File Name : 10271A13A
Site Code : 10271013
Start Date : 6/12/2010

Groups Printed- Cars - Trucks

	Route 60 N. Leg From North			Brown Circle From East			Brown Circle From West					
Start Time	Left	Right	Peds	Thru	Right	Peds	Left	Thru	Peds	Exclu. Total	Inclu. Total	Int. Total
14:30	0	358	0	230	0	0	0	0	0	0	588	588
14:45	0	329	0	204	0	0	0	0	0	0	533	533
Total	0	687	0	434	0	0	0	0	0	0	1121	1121
15:00	0	336	0	227	0	0	0	0	0	0	563	563
15:15	0	364	0	205	0	0	0	0	0	0	569	569
15:30	0	384	0	212	0	0	0	0	0	0	596	596
15:45	0	360	0	205	0	0	0	0	0	0	565	565
Total	0	1444	0	849	0	0	0	0	0	0	2293	2293
16:00	0	341	0	194	0	0	0	0	0	0	535	535
16:15	0	326	0	180	0	0	0	0	0	0	506	506
16:30	0	337	0	215	0	0	0	0	0	0	552	552
16:45	0	380	0	204	0	0	0	0	0	0	584	584
Total	0	1384	0	793	0	0	0	0	0	0	2177	2177
17:00	0	379	0	212	0	0	0	0	0	0	591	591
17:15	0	353	0	190	0	0	0	0	0	0	543	543
Grand Total	0	4247	0	2478	0	0	0	0	0	0	6725	6725
Apprch %	0	100		100	0		0	0				
Total %	0	63.2		36.8	0		0	0		0	100	
Cars	0	4186		2448	0		0	0		0	0	6634
% Cars	0	98.6	0	98.8	0	0	0	0	0	0	0	98.6
Trucks	0	61		30	0		0	0		0	0	91
% Trucks	0	1.4	0	1.2	0	0	0	0	0	0	0	1.4

	Route 60 N. Leg From North			Brown Circle From East			Brown Circle From West			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 17:15 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 15:00										
15:00	0	336	336	227	0	227	0	0	0	563
15:15	0	364	364	205	0	205	0	0	0	569
15:30	0	384	384	212	0	212	0	0	0	596
15:45	0	360	360	205	0	205	0	0	0	565
Total Volume	0	1444	1444	849	0	849	0	0	0	2293
% App. Total	0	100		100	0		0	0		
PHF	.000	.940	.940	.935	.000	.935	.000	.000	.000	.962
Cars	0	1426	1426	837	0	837	0	0	0	2263
% Cars	0	98.8	98.8	98.6	0	98.6	0	0	0	98.7
Trucks	0	18	18	12	0	12	0	0	0	30
% Trucks	0	1.2	1.2	1.4	0	1.4	0	0	0	1.3

Accurate Counts
978-664-2565

N/S Street : Route 60 North Leg
E/W Street: Brown Circle
City/State : Revere, MA
Weather : Clear

File Name : 10271A13A
Site Code : 10271013
Start Date : 6/12/2010

Groups Printed- Trucks

	Route 60 N. Leg From North			Brown Circle From East			Brown Circle From West					
Start Time	Left	Right	Peds	Thru	Right	Peds	Left	Thru	Peds	Exclu. Total	Inclu. Total	Int. Total
14:30	0	7	0	2	0	0	0	0	0	0	9	9
14:45	0	5	0	5	0	0	0	0	0	0	10	10
Total	0	12	0	7	0	0	0	0	0	0	19	19
15:00	0	5	0	6	0	0	0	0	0	0	11	11
15:15	0	8	0	2	0	0	0	0	0	0	10	10
15:30	0	4	0	2	0	0	0	0	0	0	6	6
15:45	0	1	0	2	0	0	0	0	0	0	3	3
Total	0	18	0	12	0	0	0	0	0	0	30	30
16:00	0	5	0	4	0	0	0	0	0	0	9	9
16:15	0	6	0	1	0	0	0	0	0	0	7	7
16:30	0	3	0	3	0	0	0	0	0	0	6	6
16:45	0	7	0	1	0	0	0	0	0	0	8	8
Total	0	21	0	9	0	0	0	0	0	0	30	30
17:00	0	6	0	1	0	0	0	0	0	0	7	7
17:15	0	4	0	1	0	0	0	0	0	0	5	5
Grand Total	0	61	0	30	0	0	0	0	0	0	91	91
Apprch %	0	100		100	0		0	0				
Total %	0	67		33	0		0	0		0	100	

	Route 60 N. Leg From North			Brown Circle From East			Brown Circle From West			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 17:15 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 14:30										
14:30	0	7	7	2	0	2	0	0	0	9
14:45	0	5	5	5	0	5	0	0	0	10
15:00	0	5	5	6	0	6	0	0	0	11
15:15	0	8	8	2	0	2	0	0	0	10
Total Volume	0	25	25	15	0	15	0	0	0	40
% App. Total	0	100		100	0		0	0		
PHF	.000	.781	.781	.625	.000	.625	.000	.000	.000	.909

Accurate Counts
978-664-2565

N/S Street : Brown Circle
E/W Street: Route 107 West Leg
City/State : Revere, MA
Weather : Clear

File Name : 10271A13b
Site Code : 10271013
Start Date : 6/12/2010
Page No : 1

Groups Printed- Cars - Trucks

	Brown Circle From North				Brown Circle From South				Route 107 West Leg From West						
Start Time	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Exclu. Total	Inclu. Total	Int. Total
14:30	435	0	0	435	0	0	0	0	0	122	0	122	0	557	557
14:45	402	0	0	402	0	0	0	0	0	101	0	101	0	503	503
Total	837	0	0	837	0	0	0	0	0	223	0	223	0	1060	1060
15:00	429	0	0	429	0	0	0	0	0	106	0	106	0	535	535
15:15	445	0	0	445	0	0	0	0	0	114	0	114	0	559	559
15:30	466	0	0	466	0	0	0	0	0	110	0	110	0	576	576
15:45	433	0	0	433	0	0	0	0	0	94	0	94	0	527	527
Total	1773	0	0	1773	0	0	0	0	0	424	0	424	0	2197	2197
16:00	395	0	0	395	0	0	0	0	0	118	0	118	0	513	513
16:15	383	0	0	383	0	0	0	0	0	92	0	92	0	475	475
16:30	399	0	0	399	0	0	0	0	0	97	0	97	0	496	496
16:45	435	0	0	435	0	0	0	0	0	114	0	114	0	549	549
Total	1612	0	0	1612	0	0	0	0	0	421	0	421	0	2033	2033
17:00	438	0	0	438	0	0	0	0	0	112	0	112	0	550	550
17:15	145	0	0	145	0	0	0	0	0	52	0	52	0	197	197
Grand Total	4805	0	0	4805	0	0	0	0	0	1232	0	1232	0	6037	6037
Apprch %	100	0			0	0			0	100					
Total %	79.6	0		79.6	0	0		0	0	20.4		20.4	0	100	
Cars	4723	0		4723	0	0		0	0	1229		1229	0	0	5952
% Cars	98.3	0	0	98.3	0	0	0	0	0	99.8	0	99.8	0	0	98.6
Trucks	82	0		82	0	0		0	0	3		3	0	0	85
% Trucks	1.7	0	0	1.7	0	0	0	0	0	0.2	0	0.2	0	0	1.4

	Brown Circle From North			Brown Circle From South			Route 107 West Leg From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 17:15 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 15:00										
15:00	429	0	429	0	0	0	0	106	106	535
15:15	445	0	445	0	0	0	0	114	114	559
15:30	466	0	466	0	0	0	0	110	110	576
15:45	433	0	433	0	0	0	0	94	94	527
Total Volume	1773	0	1773	0	0	0	0	424	424	2197
% App. Total	100	0		0	0		0	100		
PHF	.951	.000	.951	.000	.000	.000	.000	.930	.930	.954
Cars	1745	0	1745	0	0	0	0	422	422	2167
% Cars	98.4	0	98.4	0	0	0	0	99.5	99.5	98.6
Trucks	28	0	28	0	0	0	0	2	2	30
% Trucks	1.6	0	1.6	0	0	0	0	0.5	0.5	1.4

Accurate Counts
978-664-2565

N/S Street : Brown Circle
E/W Street: Route 107 West Leg
City/State : Revere, MA
Weather : Clear

File Name : 10271A13b
Site Code : 10271013
Start Date : 6/12/2010
Page No : 1

Groups Printed- Trucks

	Brown Circle From North				Brown Circle From South				Route 107 West Leg From West						
Start Time	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Exclu. Total	Inclu. Total	Int. Total
14:30	8	0	0	8	0	0	0	0	0	0	0	0	0	8	8
14:45	9	0	0	9	0	0	0	0	0	0	0	0	0	9	9
Total	17	0	0	17	0	0	0	0	0	0	0	0	0	17	17
15:00	9	0	0	9	0	0	0	0	0	1	0	1	0	10	10
15:15	10	0	0	10	0	0	0	0	0	0	0	0	0	10	10
15:30	6	0	0	6	0	0	0	0	0	1	0	1	0	7	7
15:45	3	0	0	3	0	0	0	0	0	0	0	0	0	3	3
Total	28	0	0	28	0	0	0	0	0	2	0	2	0	30	30
16:00	8	0	0	8	0	0	0	0	0	1	0	1	0	9	9
16:15	7	0	0	7	0	0	0	0	0	0	0	0	0	7	7
16:30	6	0	0	6	0	0	0	0	0	0	0	0	0	6	6
16:45	8	0	0	8	0	0	0	0	0	0	0	0	0	8	8
Total	29	0	0	29	0	0	0	0	0	1	0	1	0	30	30
17:00	7	0	0	7	0	0	0	0	0	0	0	0	0	7	7
17:15	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1
Grand Total	82	0	0	82	0	0	0	0	0	3	0	3	0	85	85
Apprch %	100	0			0	0			0	100					
Total %	96.5	0		96.5	0	0		0	0	3.5		3.5	0	100	

	Brown Circle From North			Brown Circle From South			Route 107 West Leg From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 17:15 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 14:30										
14:30	8	0	8	0	0	0	0	0	0	8
14:45	9	0	9	0	0	0	0	0	0	9
15:00	9	0	9	0	0	0	0	1	1	10
15:15	10	0	10	0	0	0	0	0	0	10
Total Volume	36	0	36	0	0	0	0	1	1	37
% App. Total	100	0		0	0		0	100		
PHF	.900	.000	.900	.000	.000	.000	.000	.250	.250	.925

Accurate Counts
978-664-2565

N/S Street : Route 60 South Leg
E/W Street: Brown Circle
City/State : Revere, MA
Weather : Clear

File Name : 10271A13c
Site Code : 10271013
Start Date : 6/12/2010
Page No : 1

Groups Printed- Cars - Trucks

	Brown Circle From East			Route 60 South Leg From South			Brown Circle From West					
Start Time	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
14:30	0	0	0	0	387	0	206	1	0	0	594	594
14:45	0	0	0	0	390	0	210	2	0	0	602	602
Total	0	0	0	0	777	0	416	3	0	0	1196	1196
15:00	0	0	0	0	387	0	189	2	0	0	578	578
15:15	0	0	0	0	360	0	206	1	0	0	567	567
15:30	0	0	0	0	367	0	202	3	0	0	572	572
15:45	0	0	0	0	334	0	182	0	0	0	516	516
Total	0	0	0	0	1448	0	779	6	0	0	2233	2233
16:00	0	0	0	0	347	0	209	2	0	0	558	558
16:15	0	0	0	0	334	0	177	0	0	0	511	511
16:30	0	0	0	0	344	0	188	0	0	0	532	532
16:45	0	0	0	0	382	0	195	2	0	0	579	579
Total	0	0	0	0	1407	0	769	4	0	0	2180	2180
17:00	0	0	0	0	396	0	192	0	0	0	588	588
17:15	0	0	0	0	351	0	186	0	0	0	537	537
Grand Total	0	0	0	0	4379	0	2342	13	0	0	6734	6734
Apprch %	0	0		0	100		99.4	0.6				
Total %	0	0		0	65		34.8	0.2		0	100	
Cars	0	0		0	4306		2342	0		0	0	6648
% Cars	0	0	0	0	98.3	0	100	0	0	0	0	98.7
Trucks	0	0		0	73		0	13		0	0	86
% Trucks	0	0	0	0	1.7	0	0	100	0	0	0	1.3

	Brown Circle From East			Route 60 South Leg From South			Brown Circle From West			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 17:15 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 14:30										
14:30	0	0	0	0	387	387	206	1	207	594
14:45	0	0	0	0	390	390	210	2	212	602
15:00	0	0	0	0	387	387	189	2	191	578
15:15	0	0	0	0	360	360	206	1	207	567
Total Volume	0	0	0	0	1524	1524	811	6	817	2341
% App. Total	0	0		0	100		99.3	0.7		
PHF	.000	.000	.000	.000	.977	.977	.965	.750	.963	.972
Cars	0	0	0	0	1500	1500	811	0	811	2311
% Cars	0	0	0	0	98.4	98.4	100	0	99.3	98.7
Trucks	0	0	0	0	24	24	0	6	6	30
% Trucks	0	0	0	0	1.6	1.6	0	100	0.7	1.3

Accurate Counts
978-664-2565

N/S Street : Route 60 South Leg
E/W Street: Brown Circle
City/State : Revere, MA
Weather : Clear

File Name : 10271A13c
Site Code : 10271013
Start Date : 6/12/2010

Groups Printed- Trucks

	Brown Circle From East			Route 60 South Leg From South			Brown Circle From West					
Start Time	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
14:30	0	0	0	0	4	0	0	1	0	0	5	5
14:45	0	0	0	0	6	0	0	2	0	0	8	8
Total	0	0	0	0	10	0	0	3	0	0	13	13
15:00	0	0	0	0	6	0	0	2	0	0	8	8
15:15	0	0	0	0	8	0	0	1	0	0	9	9
15:30	0	0	0	0	13	0	0	3	0	0	16	16
15:45	0	0	0	0	6	0	0	0	0	0	6	6
Total	0	0	0	0	33	0	0	6	0	0	39	39
16:00	0	0	0	0	6	0	0	2	0	0	8	8
16:15	0	0	0	0	4	0	0	0	0	0	4	4
16:30	0	0	0	0	6	0	0	0	0	0	6	6
16:45	0	0	0	0	5	0	0	2	0	0	7	7
Total	0	0	0	0	21	0	0	4	0	0	25	25
17:00	0	0	0	0	4	0	0	0	0	0	4	4
17:15	0	0	0	0	5	0	0	0	0	0	5	5
Grand Total	0	0	0	0	73	0	0	13	0	0	86	86
Apprch %	0	0		0	100		0	100				
Total %	0	0		0	84.9		0	15.1		0	100	

	Brown Circle From East			Route 60 South Leg From South			Brown Circle From West			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 17:15 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 14:45										
14:45	0	0	0	0	6	6	0	2	2	8
15:00	0	0	0	0	6	6	0	2	2	8
15:15	0	0	0	0	8	8	0	1	1	9
15:30	0	0	0	0	13	13	0	3	3	16
Total Volume	0	0	0	0	33	33	0	8	8	41
% App. Total	0	0		0	100		0	100		
PHF	.000	.000	.000	.000	.635	.635	.000	.667	.667	.641

Accurate Counts
978-664-2565

N/S Street : Brown Circle
E/W Street: Route 107 East Leg
City/State : Revere, MA
Weather : Clear

File Name : 10271A13D
Site Code : 10271013
Start Date : 6/12/2010

Groups Printed- Cars - Trucks

	Brown Circle From North			Route 107 East Leg From East			Brown Circle From South					
Start Time	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
14:30	0	0	0	0	236	0	411	0	0	0	647	647
14:45	0	0	0	0	207	2	411	0	0	2	618	620
Total	0	0	0	0	443	2	822	0	0	2	1265	1267
15:00	0	0	0	0	244	0	383	0	0	0	627	627
15:15	0	0	0	0	219	0	371	0	0	0	590	590
15:30	0	0	0	0	242	0	375	0	0	0	617	617
15:45	0	0	0	0	233	2	336	0	0	2	569	571
Total	0	0	0	0	938	2	1465	0	0	2	2403	2405
16:00	0	0	0	0	217	5	376	0	0	5	593	598
16:15	0	0	0	0	213	2	352	0	0	2	565	567
16:30	0	0	0	0	250	1	378	0	0	1	628	629
16:45	0	0	0	0	216	3	393	0	0	3	609	612
Total	0	0	0	0	896	11	1499	0	0	11	2395	2406
17:00	0	0	0	0	242	0	409	0	0	0	651	651
17:15	0	0	0	0	200	0	369	0	0	0	569	569
Grand Total	0	0	0	0	2719	15	4564	0	0	15	7283	7298
Apprch %	0	0		0	100		100	0				
Total %	0	0		0	37.3		62.7	0		0.2	99.8	
Cars	0	0		0	2689		4506	0		0	0	7210
% Cars	0	0	0	0	98.9	100	98.7	0	0	0	0	98.8
Trucks	0	0		0	30		58	0		0	0	88
% Trucks	0	0	0	0	1.1	0	1.3	0	0	0	0	1.2

	Brown Circle From North			Route 107 East Leg From East			Brown Circle From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 17:15 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 14:30										
14:30	0	0	0	0	236	236	411	0	411	647
14:45	0	0	0	0	207	207	411	0	411	618
15:00	0	0	0	0	244	244	383	0	383	627
15:15	0	0	0	0	219	219	371	0	371	590
Total Volume	0	0	0	0	906	906	1576	0	1576	2482
% App. Total	0	0		0	100		100	0		
PHF	.000	.000	.000	.000	.928	.928	.959	.000	.959	.959
Cars	0	0	0	0	893	893	1555	0	1555	2448
% Cars	0	0	0	0	98.6	98.6	98.7	0	98.7	98.6
Trucks	0	0	0	0	13	13	21	0	21	34
% Trucks	0	0	0	0	1.4	1.4	1.3	0	1.3	1.4

Accurate Counts
978-664-2565

N/S Street : Brown Circle
E/W Street: Route 107 East Leg
City/State : Revere, MA
Weather : Clear

File Name : 10271A13D
Site Code : 10271013
Start Date : 6/12/2010
Page No : 1

Groups Printed- Trucks

	Brown Circle From North			Route 107 East Leg From East			Brown Circle From South					
Start Time	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
14:30	0	0	0	0	2	0	5	0	0	0	7	7
14:45	0	0	0	0	4	0	4	0	0	0	8	8
Total	0	0	0	0	6	0	9	0	0	0	15	15
15:00	0	0	0	0	6	0	3	0	0	0	9	9
15:15	0	0	0	0	1	0	9	0	0	0	10	10
15:30	0	0	0	0	3	0	9	0	0	0	12	12
15:45	0	0	0	0	2	0	3	0	0	0	5	5
Total	0	0	0	0	12	0	24	0	0	0	36	36
16:00	0	0	0	0	4	0	7	0	0	0	11	11
16:15	0	0	0	0	1	0	2	0	0	0	3	3
16:30	0	0	0	0	3	0	5	0	0	0	8	8
16:45	0	0	0	0	1	0	4	0	0	0	5	5
Total	0	0	0	0	9	0	18	0	0	0	27	27
17:00	0	0	0	0	1	0	3	0	0	0	4	4
17:15	0	0	0	0	2	0	4	0	0	0	6	6
Grand Total	0	0	0	0	30	0	58	0	0	0	88	88
Apprch %	0	0		0	100		100	0				
Total %	0	0		0	34.1		65.9	0		0	100	

	Brown Circle From North			Route 107 East Leg From East			Brown Circle From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 17:15 - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 14:45										
14:45	0	0	0	0	4	4	4	0	4	8
15:00	0	0	0	0	6	6	3	0	3	9
15:15	0	0	0	0	1	1	9	0	9	10
15:30	0	0	0	0	3	3	9	0	9	12
Total Volume	0	0	0	0	14	14	25	0	25	39
% App. Total	0	0		0	100		100	0		
PHF	.000	.000	.000	.000	.583	.583	.694	.000	.694	.813

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

N/S: Bennington Street
E/W/SE: Neptune Road/ Route 1A SB Onramp
City, State: East Boston, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 AA-1
Site Code : 10271
Start Date : 6/11/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Bennington Street From North					Neptune Road From East					Route 1A SB Onramp From Southeast				Bennington Street From South					Neptune Road From West				
Start Time	Right	Thru	Bear Left	Left	U-Turn	Right	Thru	Left	Hard Left	U-Turn	Hard Right	Bear Right	Bear Left	Hard Left	Hard Right	Right	Thru	Left	U-Turn	Right	Bear Right	Thru	Left	Int. Total
03:30 PM	13	75	88	8	0	0	79	50	17	0	0	0	0	0	36	5	131	4	0	1	20	14	11	552
03:45 PM	7	88	69	12	0	3	91	46	7	0	0	0	0	0	35	8	120	3	0	1	23	11	6	530
Total	20	163	157	20	0	3	170	96	24	0	0	0	0	0	71	13	251	7	0	2	43	25	17	1082
04:00 PM	15	72	68	6	1	1	74	44	7	0	0	0	0	0	29	2	112	0	0	1	25	6	7	470
04:15 PM	15	82	62	8	0	6	66	50	8	0	0	0	0	0	28	3	109	3	0	1	25	3	7	476
04:30 PM	14	103	67	10	1	1	76	49	10	0	0	0	0	0	47	3	145	5	0	17	22	7	5	582
04:45 PM	9	93	89	12	0	1	72	67	11	0	0	0	0	0	34	2	142	10	0	21	23	4	6	596
Total	53	350	286	36	2	9	288	210	36	0	0	0	0	0	138	10	508	18	0	40	95	20	25	2124
05:00 PM	14	96	63	4	0	3	80	55	10	1	0	0	0	0	36	3	138	2	0	18	18	3	6	550
05:15 PM	18	91	78	8	1	3	74	71	12	0	0	0	0	0	25	2	117	3	0	7	21	2	6	539
05:30 PM	9	63	76	10	0	1	64	62	11	0	0	0	0	0	15	2	110	3	0	4	25	2	3	460
05:45 PM	15	78	70	8	0	1	68	53	9	0	0	0	0	0	27	4	113	4	0	0	13	2	6	471
Total	56	328	287	30	1	8	286	241	42	1	0	0	0	0	103	11	478	12	0	29	77	9	21	2020
06:00 PM	13	72	56	4	0	0	80	70	8	0	0	0	0	0	22	2	118	5	0	2	13	3	5	473
06:15 PM	16	74	59	4	0	0	64	47	8	0	0	0	0	0	25	0	130	3	0	1	17	2	5	455
Grand Total	158	987	845	94	3	20	888	664	118	1	0	0	0	0	359	36	1485	45	0	74	245	59	73	6154
Apprch %	7.6	47.3	40.5	4.5	0.1	1.2	52.5	39.3	7	0.1	0	0	0	0	18.6	1.9	77.1	2.3	0	16.4	54.3	13.1	16.2	
Total %	2.6	16	13.7	1.5	0	0.3	14.4	10.8	1.9	0	0	0	0	0	5.8	0.6	24.1	0.7	0	1.2	4	1	1.2	
Cars	152	950	814	80	3	20	814	587	109	1	0	0	0	0	338	36	1448	45	0	74	228	56	65	5820
% Cars	96.2	96.3	96.3	85.1	100	100	91.7	88.4	92.4	100	0	0	0	0	94.2	100	97.5	100	0	100	93.1	94.9	89	94.6
Heavy Vehicles	6	37	31	14	0	0	74	77	9	0	0	0	0	0	21	0	37	0	0	0	17	3	8	334
% Heavy Vehicles	3.8	3.7	3.7	14.9	0	0	8.3	11.6	7.6	0	0	0	0	0	5.8	0	2.5	0	0	0	6.9	5.1	11	5.4

	Bennington Street From North						Neptune Road From East						Route 1A SB Onramp From Southeast					Bennington Street From South						Neptune Road From West					
Start Time	Right	Thru	Bear Left	Left	U-Turn	App. Total	Right	Thru	Left	Hard Left	U-Turn	App. Total	Hard Right	Bear Right	Bear Left	Hard Left	App. Total	Hard Right	Right	Thru	Left	U-Turn	App. Total	Right	Bear Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak 1 of 1																													
Peak Hour for Entire Intersection Begins at 04:30 PM																													
04:30 PM	14	**103**	67	10	**1**	195	1	76	49	10	0	136	0	0	0	0	0	**47**	**3**	**145**	5	0	**200**	17	22	**7**	5	51	582
04:45 PM	9	93	**89**	**12**	0	**203**	1	72	67	11	0	151	0	0	0	0	0	34	2	142	**10**	0	188	**21**	**23**	4	**6**	**54**	**596**
05:00 PM	14	96	63	4	0	177	**3**	**80**	55	10	**1**	149	0	0	0	0	0	36	3	138	2	0	179	18	18	3	6	45	550
05:15 PM	**18**	91	78	8	1	196	3	74	**71**	**12**	0	**160**	0	0	0	0	0	25	2	117	3	0	147	7	21	2	6	36	539
Total Volume	55	383	297	34	2	771	8	302	242	43	1	596	0	0	0	0	0	142	10	542	20	0	714	63	84	16	23	186	2267
% App. Total	7.1	49.7	38.5	4.4	0.3		1.3	50.7	40.6	7.2	0.2		0	0	0	0		19.9	1.4	75.9	2.8	0		33.9	45.2	8.6	12.4		
PHF	.764	.930	.834	.708	.500	.950	.667	.944	.852	.896	.250	.931	.000	.000	.000	.000	.000	.755	.833	.934	.500	.000	.893	.750	.913	.571	.958	.861	.951
Cars	53	373	282	29	2	739	8	278	222	40	1	549	0	0	0	0	0	138	10	530	20	0	698	63	80	16	20	179	2165
% Cars	96.4	97.4	94.9	85.3	100	95.8	100	92.1	91.7	93.0	100	92.1	0	0	0	0	0	97.2	100	97.8	100	0	97.8	100	95.2	100	87.0	96.2	95.5
Heavy Vehicles	2	10	15	5	0	32	0	24	20	3	0	47	0	0	0	0	0	4	0	12	0	0	16	0	4	0	3	7	102
% Heavy Vehicles	3.6	2.6	5.1	14.7	0	4.2	0	7.9	8.3	7.0	0	7.9	0	0	0	0	0	2.8	0	2.2	0	0	2.2	0	4.8	0	13.0	3.8	4.5

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

N/S: Bennington Street
E/W/SE: Neptune Road/ Route 1A SB Onramp
City, State: East Boston, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 AA-1
Site Code : 10271
Start Date : 6/11/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Bennington Street From North					Neptune Road From East					Route 1A SB Onramp From Southeast				Bennington Street From South					Neptune Road From West				
Start Time	Right	Thru	Bear Left	Left	U-Turn	Right	Thru	Left	Hard Left	U-Turn	Hard Right	Bear Right	Bear Left	Hard Left	Hard Right	Right	Thru	Left	U-Turn	Right	Bear Right	Thru	Left	Int. Total
03:30 PM	1	3	2	1	0	0	5	5	2	0	0	0	0	0	3	0	9	0	0	0	3	1	0	35
03:45 PM	1	7	1	0	0	0	3	6	0	0	0	0	0	0	5	0	2	0	0	0	2	1	2	30
Total	2	10	3	1	0	0	8	11	2	0	0	0	0	0	8	0	11	0	0	0	5	2	2	65
04:00 PM	0	4	4	1	0	0	7	5	0	0	0	0	0	0	1	0	4	0	0	0	3	1	1	31
04:15 PM	0	0	2	2	0	0	6	9	1	0	0	0	0	0	1	0	4	0	0	0	1	0	0	26
04:30 PM	1	3	5	2	0	0	4	1	1	0	0	0	0	0	3	0	4	0	0	0	3	0	1	28
04:45 PM	0	2	4	2	0	0	6	7	0	0	0	0	0	0	1	0	6	0	0	0	0	0	0	28
Total	1	9	15	7	0	0	23	22	2	0	0	0	0	0	6	0	18	0	0	0	7	1	2	113
05:00 PM	1	2	2	0	0	0	6	6	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	20
05:15 PM	0	3	4	1	0	0	8	6	2	0	0	0	0	0	0	0	1	0	0	0	0	0	1	26
05:30 PM	1	1	3	2	0	0	4	8	1	0	0	0	0	0	1	0	1	0	0	0	2	0	0	24
05:45 PM	0	4	1	0	0	0	10	4	2	0	0	0	0	0	3	0	1	0	0	0	0	0	1	26
Total	2	10	10	3	0	0	28	24	5	0	0	0	0	0	4	0	4	0	0	0	3	0	3	96
06:00 PM	0	0	2	2	0	0	10	12	0	0	0	0	0	0	2	0	2	0	0	0	0	0	1	31
06:15 PM	1	8	1	1	0	0	5	8	0	0	0	0	0	0	1	0	2	0	0	0	2	0	0	29
Grand Total	6	37	31	14	0	0	74	77	9	0	0	0	0	0	21	0	37	0	0	0	17	3	8	334
Apprch %	6.8	42	35.2	15.9	0	0	46.2	48.1	5.6	0	0	0	0	0	36.2	0	63.8	0	0	0	60.7	10.7	28.6	
Total %	1.8	11.1	9.3	4.2	0	0	22.2	23.1	2.7	0	0	0	0	0	6.3	0	11.1	0	0	0	5.1	0.9	2.4	

	Bennington Street From North						Neptune Road From East						Route 1A SB Onramp From Southeast					Bennington Street From South						Neptune Road From West					
Start Time	Right	Thru	Bear Left	Left	U-Turn	App. Total	Right	Thru	Left	Hard Left	U-Turn	App. Total	Hard Right	Bear Right	Bear Left	Hard Left	App. Total	Hard Right	Right	Thru	Left	U-Turn	App. Total	Right	Bear Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak 1 of 1																													
Peak Hour for Entire Intersection Begins at 03:30 PM																													
03:30 PM	**1**	3	2	1	0	7	0	5	5	**2**	0	12	0	0	0	0	0	3	0	**9**	0	0	**12**	0	**3**	**1**	0	4	**35**
03:45 PM	1	**7**	1	0	0	**9**	0	3	6	0	0	9	0	0	0	0	0	**5**	0	2	0	0	7	0	2	1	**2**	**5**	30
04:00 PM	0	4	**4**	1	0	9	0	**7**	5	0	0	12	0	0	0	0	0	1	0	4	0	0	5	0	3	1	1	5	31
04:15 PM	0	0	2	**2**	0	4	0	6	**9**	1	0	**16**	0	0	0	0	0	1	0	4	0	0	5	0	1	0	0	1	26
Total Volume	2	14	9	4	0	29	0	21	25	3	0	49	0	0	0	0	0	10	0	19	0	0	29	0	9	3	3	15	122
% App. Total	6.9	48.3	31	13.8	0		0	42.9	51	6.1	0		0	0	0	0		34.5	0	65.5	0	0		0	60	20	20		
PHF	.500	.500	.563	.500	.000	.806	.000	.750	.694	.375	.000	.766	.000	.000	.000	.000	.000	.500	.000	.528	.000	.000	.604	.000	.750	.750	.375	.750	.871

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
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N/S: Vienna Street/ Route 1A NB Offramp
E/W: Neptune Road
City, State: East Boston, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 AA-2
Site Code : 10271
Start Date : 6/11/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Vienna Street From North			Neptune Road From East				Route 1A NB Offramp From South				Neptune Road From West				
Start Time	Right	Thru	Left	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn to Rte 1A SB	Right	Thru	Left	U-Turn	Int. Total
03:30 PM	0	0	0	42	45	0	1	5	83	103	14	0	28	0	0	321
03:45 PM	0	0	0	72	41	0	0	5	84	98	18	0	31	1	0	350
Total	0	0	0	114	86	0	1	10	167	201	32	0	59	1	0	671
04:00 PM	0	0	0	70	35	0	0	2	84	89	21	0	13	1	0	315
04:15 PM	0	0	0	97	36	0	0	7	98	93	11	0	13	0	0	355
04:30 PM	0	0	0	71	37	0	0	3	101	103	13	0	21	0	0	349
04:45 PM	0	0	0	85	32	0	0	2	105	114	23	0	20	0	0	381
Total	0	0	0	323	140	0	0	14	388	399	68	0	67	1	0	1400
05:00 PM	0	0	0	78	42	0	0	3	109	114	9	0	10	0	0	365
05:15 PM	0	0	0	72	40	0	0	5	96	117	11	0	12	0	0	353
05:30 PM	0	0	0	102	27	0	0	5	103	112	23	0	16	1	0	389
05:45 PM	0	0	0	81	31	0	0	1	71	101	15	0	14	0	0	314
Total	0	0	0	333	140	0	0	14	379	444	58	0	52	1	0	1421
06:00 PM	0	0	0	76	27	0	0	1	70	136	17	0	8	1	0	336
06:15 PM	0	0	0	64	23	0	0	3	79	98	16	0	6	1	0	290
Grand Total	0	0	0	910	416	0	1	42	1083	1278	191	0	192	5	0	4118
Apprch %	0	0	0	68.6	31.3	0	0.1	1.6	41.8	49.3	7.4	0	97.5	2.5	0	
Total %	0	0	0	22.1	10.1	0	0	1	26.3	31	4.6	0	4.7	0.1	0	
Cars	0	0	0	890	343	0	1	40	1066	1187	187	0	172	5	0	3891
% Cars	0	0	0	97.8	82.5	0	100	95.2	98.4	92.9	97.9	0	89.6	100	0	94.5
Heavy Vehicles	0	0	0	20	73	0	0	2	17	91	4	0	20	0	0	227
% Heavy Vehicles	0	0	0	2.2	17.5	0	0	4.8	1.6	7.1	2.1	0	10.4	0	0	5.5

	Vienna Street From North				Neptune Road From East					Route 1A NB Offramp From South					Neptune Road From West					
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn to Rte 1A SB	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak 1 of 1																				
Peak Hour for Entire Intersection Begins at 04:15 PM																				
04:15 PM	0	0	0	0	**97**	36	0	0	**133**	**7**	98	93	11	209	0	13	0	0	13	355
04:30 PM	0	0	0	0	71	37	0	0	108	3	101	103	13	220	0	**21**	0	0	**21**	349
04:45 PM	0	0	0	0	85	32	0	0	117	2	105	**114**	**23**	**244**	0	20	0	0	20	**381**
05:00 PM	0	0	0	0	78	**42**	0	0	120	3	**109**	114	9	235	0	10	0	0	10	365
Total Volume	0	0	0	0	331	147	0	0	478	15	413	424	56	908	0	64	0	0	64	1450
% App. Total	0	0	0		69.2	30.8	0	0		1.7	45.5	46.7	6.2		0	100	0	0		
PHF	.000	.000	.000	.000	.853	.875	.000	.000	.898	.536	.947	.930	.609	.930	.000	.762	.000	.000	.762	.951
Cars	0	0	0	0	321	127	0	0	448	15	406	396	55	872	0	58	0	0	58	1378
% Cars	0	0	0	0	97.0	86.4	0	0	93.7	100	98.3	93.4	98.2	96.0	0	90.6	0	0	90.6	95.0
Heavy Vehicles	0	0	0	0	10	20	0	0	30	0	7	28	1	36	0	6	0	0	6	72
% Heavy Vehicles	0	0	0	0	3.0	13.6	0	0	6.3	0	1.7	6.6	1.8	4.0	0	9.4	0	0	9.4	5.0

PRECISION
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N/S: Vienna Street/ Route 1A NB Offramp
E/W: Neptune Road
City, State: East Boston, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 AA-2
Site Code : 10271
Start Date : 6/11/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Vienna Street From North			Neptune Road From East				Route 1A NB Offramp From South				Neptune Road From West				
Start Time	Right	Thru	Left	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn to Rte 1A SB	Right	Thru	Left	U-Turn	Int. Total
03:30 PM	0	0	0	1	8	0	0	0	3	5	1	0	3	0	0	21
03:45 PM	0	0	0	1	6	0	0	1	2	2	1	0	1	0	0	14
Total	0	0	0	2	14	0	0	1	5	7	2	0	4	0	0	35
04:00 PM	0	0	0	0	5	0	0	0	1	8	0	0	2	0	0	16
04:15 PM	0	0	0	3	7	0	0	0	3	9	0	0	2	0	0	24
04:30 PM	0	0	0	3	2	0	0	0	2	3	0	0	2	0	0	12
04:45 PM	0	0	0	3	6	0	0	0	2	8	1	0	2	0	0	22
Total	0	0	0	9	20	0	0	0	8	28	1	0	8	0	0	74
05:00 PM	0	0	0	1	5	0	0	0	0	8	0	0	0	0	0	14
05:15 PM	0	0	0	1	9	0	0	0	0	8	0	0	1	0	0	19
05:30 PM	0	0	0	3	5	0	0	0	1	7	1	0	3	0	0	20
05:45 PM	0	0	0	0	8	0	0	0	1	7	0	0	0	0	0	16
Total	0	0	0	5	27	0	0	0	2	30	1	0	4	0	0	69
06:00 PM	0	0	0	1	6	0	0	0	2	17	0	0	2	0	0	28
06:15 PM	0	0	0	3	6	0	0	1	0	9	0	0	2	0	0	21
Grand Total	0	0	0	20	73	0	0	2	17	91	4	0	20	0	0	227
Apprch %	0	0	0	21.5	78.5	0	0	1.8	14.9	79.8	3.5	0	100	0	0	
Total %	0	0	0	8.8	32.2	0	0	0.9	7.5	40.1	1.8	0	8.8	0	0	

	Vienna Street From North				Neptune Road From East					Route 1A NB Offramp From South					Neptune Road From West					
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn to Rte 1A SB	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak 1 of 1																				
Peak Hour for Entire Intersection Begins at 03:30 PM																				
03:30 PM	0	0	0	0	1	**8**	0	0	9	0	**3**	5	**1**	9	0	**3**	0	0	**3**	21
03:45 PM	0	0	0	0	1	6	0	0	7	**1**	2	2	1	6	0	1	0	0	1	14
04:00 PM	0	0	0	0	0	5	0	0	5	0	1	8	0	9	0	2	0	0	2	16
04:15 PM	0	0	0	0	**3**	7	0	0	**10**	0	3	**9**	0	**12**	0	2	0	0	2	**24**
Total Volume	0	0	0	0	5	26	0	0	31	1	9	24	2	36	0	8	0	0	8	75
% App. Total	0	0	0		16.1	83.9	0	0		2.8	25	66.7	5.6		0	100	0	0		
PHF	.000	.000	.000	.000	.417	.813	.000	.000	.775	.250	.750	.667	.500	.750	.000	.667	.000	.000	.667	.781

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N/S: Bennington Street
E/W/SE: Neptune Road/ Route 1A SB Onramp
City, State: East Boston, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 AAA-1
Site Code : 10271
Start Date : 6/12/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Bennington Street From North					Neptune Road From East					Route 1A SB Onramp From Southeast				Bennington Street From South					Neptune Road From West				
Start Time	Right	Thru	Bear Left	Left	U-Turn	Right	Thru	Left	Hard Left	U-Turn	Hard Right	Bear Right	Bear Left	Hard Left	Hard Right	Right	Thru	Left	U-Turn	Right	Bear Right	Thru	Left	Int. Total
02:30 PM	9	72	65	9	0	2	54	31	17	0	0	0	0	0	28	4	76	0	0	35	24	6	1	433
02:45 PM	14	61	86	13	0	1	51	25	8	0	0	0	0	0	26	2	72	6	0	32	14	3	5	419
Total	23	133	151	22	0	3	105	56	25	0	0	0	0	0	54	6	148	6	0	67	38	9	6	852
03:00 PM	10	47	84	8	0	0	52	28	9	0	0	0	0	0	25	1	67	1	0	21	14	1	2	370
03:15 PM	15	61	70	13	0	0	56	37	8	0	0	0	0	0	27	3	65	0	1	12	9	2	5	384
03:30 PM	9	80	85	7	0	3	49	38	4	0	0	0	0	0	11	1	71	3	0	21	15	6	3	406
03:45 PM	17	69	47	6	0	1	51	29	4	0	0	0	0	0	13	6	61	3	0	22	23	7	0	359
Total	51	257	286	34	0	4	208	132	25	0	0	0	0	0	76	11	264	7	1	76	61	16	10	1519
04:00 PM	13	67	68	3	1	0	43	20	3	0	0	0	0	0	24	1	82	0	0	25	17	1	9	377
04:15 PM	12	62	67	7	0	0	47	18	1	0	0	0	0	0	18	3	85	1	0	20	12	4	3	360
04:30 PM	10	75	74	7	0	2	51	25	8	0	0	0	0	0	22	4	94	4	0	24	16	3	3	422
04:45 PM	18	54	83	5	0	1	52	24	6	0	0	0	0	0	20	4	93	4	0	32	15	8	3	422
Total	53	258	292	22	1	3	193	87	18	0	0	0	0	0	84	12	354	9	0	101	60	16	18	1581
05:00 PM	16	57	58	4	1	0	53	31	8	1	0	0	0	0	18	1	88	1	1	19	15	5	4	381
05:15 PM	11	53	66	7	0	0	47	32	7	0	0	0	0	0	24	4	74	5	0	40	17	7	5	399
Grand Total	154	758	853	89	2	10	606	338	83	1	0	0	0	0	256	34	928	28	2	303	191	53	43	4732
Apprch %	8.3	40.8	46	4.8	0.1	1	58.4	32.6	8	0.1	0	0	0	0	20.5	2.7	74.4	2.2	0.2	51.4	32.4	9	7.3	
Total %	3.3	16	18	1.9	0	0.2	12.8	7.1	1.8	0	0	0	0	0	5.4	0.7	19.6	0.6	0	6.4	4	1.1	0.9	
Cars	152	743	844	80	2	10	557	306	78	1	0	0	0	0	248	32	921	28	2	300	189	47	38	4578
% Cars	98.7	98	98.9	89.9	100	100	91.9	90.5	94	100	0	0	0	0	96.9	94.1	99.2	100	100	99	99	88.7	88.4	96.7
Heavy Vehicles	2	15	9	9	0	0	49	32	5	0	0	0	0	0	8	2	7	0	0	3	2	6	5	154
% Heavy Vehicles	1.3	2	1.1	10.1	0	0	8.1	9.5	6	0	0	0	0	0	3.1	5.9	0.8	0	0	1	1	11.3	11.6	3.3

	Bennington Street From North						Neptune Road From East						Route 1A SB Onramp From Southeast					Bennington Street From South						Neptune Road From West					
Start Time	Right	Thru	Bear Left	Left	U-Turn	App. Total	Right	Thru	Left	Hard Left	U-Turn	App. Total	Hard Right	Bear Right	Bear Left	Hard Left	App. Total	Hard Right	Right	Thru	Left	U-Turn	App. Total	Right	Bear Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 04:15 PM - Peak 1 of 1																													
Peak Hour for Entire Intersection Begins at 02:30 PM																													
02:30 PM	9	**72**	65	9	0	155	**2**	54	31	**17**	0	**104**	0	0	0	0	0	**28**	**4**	**76**	0	0	**108**	**35**	**24**	**6**	1	**66**	**433**
02:45 PM	14	61	**86**	**13**	0	**174**	1	51	25	8	0	85	0	0	0	0	0	26	2	72	**6**	0	106	32	14	3	**5**	54	419
03:00 PM	10	47	84	8	0	149	0	52	28	9	0	89	0	0	0	0	0	25	1	67	1	0	94	21	14	1	2	38	370
03:15 PM	**15**	61	70	13	0	159	0	**56**	**37**	8	0	101	0	0	0	0	0	27	3	65	0	**1**	96	12	9	2	5	28	384
Total Volume	48	241	305	43	0	637	3	213	121	42	0	379	0	0	0	0	0	106	10	280	7	1	404	100	61	12	13	186	1606
% App. Total	7.5	37.8	47.9	6.8	0		0.8	56.2	31.9	11.1	0		0	0	0	0		26.2	2.5	69.3	1.7	0.2		53.8	32.8	6.5	7		
PHF	.800	.837	.887	.827	.000	.915	.375	.951	.818	.618	.000	.911	.000	.000	.000	.000	.000	.946	.625	.921	.292	.250	.935	.714	.635	.500	.650	.705	.927
Cars	47	235	305	39	0	626	3	196	107	41	0	347	0	0	0	0	0	102	9	278	7	1	397	99	61	8	11	179	1549
% Cars	97.9	97.5	100	90.7	0	98.3	100	92.0	88.4	97.6	0	91.6	0	0	0	0	0	96.2	90.0	99.3	100	100	98.3	99.0	100	66.7	84.6	96.2	96.5
Heavy Vehicles	1	6	0	4	0	11	0	17	14	1	0	32	0	0	0	0	0	4	1	2	0	0	7	1	0	4	2	7	57
% Heavy Vehicles	2.1	2.5	0	9.3	0	1.7	0	8.0	11.6	2.4	0	8.4	0	0	0	0	0	3.8	10.0	0.7	0	0	1.7	1.0	0	33.3	15.4	3.8	3.5

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N/S: Bennington Street
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City, State: East Boston, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 AAA-1
Site Code : 10271
Start Date : 6/12/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Bennington Street From North					Neptune Road From East					Route 1A SB Onramp From Southeast				Bennington Street From South					Neptune Road From West				
Start Time	Right	Thru	Bear Left	Left	U-Turn	Right	Thru	Left	Hard Left	U-Turn	Hard Right	Bear Right	Bear Left	Hard Left	Hard Right	Right	Thru	Left	U-Turn	Right	Bear Right	Thru	Left	Int. Total
02:30 PM	0	2	0	1	0	0	3	5	1	0	0	0	0	0	3	0	1	0	0	0	0	1	0	17
02:45 PM	0	3	0	0	0	0	5	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	14
Total	0	5	0	1	0	0	8	9	1	0	0	0	0	0	3	0	1	0	0	0	0	2	1	31
03:00 PM	0	1	0	2	0	0	4	3	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	13
03:15 PM	1	0	0	1	0	0	5	2	0	0	0	0	0	0	0	1	0	0	0	1	0	2	0	13
03:30 PM	0	1	5	1	0	0	5	3	1	0	0	0	0	0	0	0	1	0	0	1	0	0	0	18
03:45 PM	0	0	1	0	0	0	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
Total	1	2	6	4	0	0	16	10	2	0	0	0	0	0	1	1	2	0	0	2	0	2	1	50
04:00 PM	0	2	0	0	0	0	4	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	10
04:15 PM	0	0	1	0	0	0	5	2	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	11
04:30 PM	0	3	0	3	0	0	1	3	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	13
04:45 PM	1	0	1	0	0	0	6	3	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	13
Total	1	5	2	3	0	0	16	9	2	0	0	0	0	0	2	1	2	0	0	1	1	0	2	47
05:00 PM	0	1	0	0	0	0	4	1	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	10
05:15 PM	0	2	1	1	0	0	5	3	0	0	0	0	0	0	2	0	1	0	0	0	0	1	0	16
Grand Total	2	15	9	9	0	0	49	32	5	0	0	0	0	0	8	2	7	0	0	3	2	6	5	154
Apprch %	5.7	42.9	25.7	25.7	0	0	57	37.2	5.8	0	0	0	0	0	47.1	11.8	41.2	0	0	18.8	12.5	37.5	31.2	
Total %	1.3	9.7	5.8	5.8	0	0	31.8	20.8	3.2	0	0	0	0	0	5.2	1.3	4.5	0	0	1.9	1.3	3.9	3.2	

	Bennington Street From North						Neptune Road From East						Route 1A SB Onramp From Southeast					Bennington Street From South						Neptune Road From West					
Start Time	Right	Thru	Bear Left	Left	U-Turn	App. Total	Right	Thru	Left	Hard Left	U-Turn	App. Total	Hard Right	Bear Right	Bear Left	Hard Left	App. Total	Hard Right	Right	Thru	Left	U-Turn	App. Total	Right	Bear Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 04:15 PM - Peak 1 of 1																													
Peak Hour for Entire Intersection Begins at 02:45 PM																													
02:45 PM	0	**3**	0	0	0	3	0	**5**	**4**	0	0	**9**	0	0	0	0	0	0	0	0	0	0	0	0	0	1	**1**	2	14
03:00 PM	0	1	0	**2**	0	3	0	4	3	0	0	7	0	0	0	0	0	**1**	0	**1**	0	0	**2**	0	0	0	1	1	13
03:15 PM	**1**	0	0	1	0	2	0	5	2	0	0	7	0	0	0	0	0	0	**1**	0	0	0	1	**1**	0	**2**	0	**3**	13
03:30 PM	0	1	**5**	1	0	**7**	0	5	3	**1**	0	9	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	**18**
Total Volume	1	5	5	4	0	15	0	19	12	1	0	32	0	0	0	0	0	1	1	2	0	0	4	2	0	3	2	7	58
% App. Total	6.7	33.3	33.3	26.7	0		0	59.4	37.5	3.1	0		0	0	0	0		25	25	50	0	0		28.6	0	42.9	28.6		
PHF	.250	.417	.250	.500	.000	.536	.000	.950	.750	.250	.000	.889	.000	.000	.000	.000	.000	.250	.250	.500	.000	.000	.500	.500	.000	.375	.500	.583	.806

PRECISION
D A T A
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N/S: Vienna Street/ Route 1A NB Offramp
E/W: Neptune Road
City, State: East Boston, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 AAA-2
Site Code : 10271
Start Date : 6/12/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Vienna Street From North			Neptune Road From East				Route 1A NB Offramp From South				Neptune Road From West				
Start Time	Right	Thru	Left	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn to Rte 1A SB	Right	Thru	Left	U-Turn	Int. Total
02:30 PM	0	0	0	35	42	0	0	4	36	63	11	0	18	0	0	209
02:45 PM	0	0	0	39	26	0	0	2	46	58	9	0	17	0	0	197
Total	0	0	0	74	68	0	0	6	82	121	20	0	35	0	0	406
03:00 PM	0	0	0	43	25	0	0	0	39	65	9	0	13	0	0	194
03:15 PM	0	0	0	30	21	0	0	4	39	78	3	0	16	1	0	192
03:30 PM	0	0	0	34	26	0	0	0	48	78	9	0	14	0	0	209
03:45 PM	0	0	0	44	18	0	0	1	37	57	10	0	18	1	0	186
Total	0	0	0	151	90	0	0	5	163	278	31	0	61	2	0	781
04:00 PM	0	0	0	29	14	0	0	1	38	50	20	0	6	0	0	158
04:15 PM	0	0	0	43	9	0	0	1	34	60	12	0	13	0	1	173
04:30 PM	0	0	0	30	31	0	0	2	49	57	12	0	14	0	0	195
04:45 PM	0	0	0	36	16	0	0	1	47	69	17	0	15	3	0	204
Total	0	0	0	138	70	0	0	5	168	236	61	0	48	3	1	730
05:00 PM	0	0	0	49	16	0	0	3	36	76	10	0	8	3	0	201
05:15 PM	0	0	0	48	22	0	0	1	41	62	11	0	16	0	0	201
Grand Total	0	0	0	460	266	0	0	20	490	773	133	0	168	8	1	2319
Apprch %	0	0	0	63.4	36.6	0	0	1.4	34.6	54.6	9.4	0	94.9	4.5	0.6	
Total %	0	0	0	19.8	11.5	0	0	0.9	21.1	33.3	5.7	0	7.2	0.3	0	
Cars	0	0	0	445	232	0	0	20	486	720	132	0	151	7	1	2194
% Cars	0	0	0	96.7	87.2	0	0	100	99.2	93.1	99.2	0	89.9	87.5	100	94.6
Heavy Vehicles	0	0	0	15	34	0	0	0	4	53	1	0	17	1	0	125
% Heavy Vehicles	0	0	0	3.3	12.8	0	0	0	0.8	6.9	0.8	0	10.1	12.5	0	5.4

	Vienna Street From North				Neptune Road From East					Route 1A NB Offramp From South					Neptune Road From West					
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn to Rte 1A SB	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 04:15 PM - Peak 1 of 1																				
Peak Hour for Entire Intersection Begins at 02:30 PM																				
02:30 PM	0	0	0	0	35	**42**	0	0	**77**	**4**	36	63	**11**	114	0	**18**	0	0	**18**	**209**
02:45 PM	0	0	0	0	39	26	0	0	65	2	**46**	58	9	115	0	17	0	0	17	197
03:00 PM	0	0	0	0	**43**	25	0	0	68	0	39	65	9	113	0	13	0	0	13	194
03:15 PM	0	0	0	0	30	21	0	0	51	4	39	**78**	3	**124**	0	16	**1**	0	17	192
Total Volume	0	0	0	0	147	114	0	0	261	10	160	264	32	466	0	64	1	0	65	792
% App. Total	0	0	0		56.3	43.7	0	0		2.1	34.3	56.7	6.9		0	98.5	1.5	0		
PHF	.000	.000	.000	.000	.855	.679	.000	.000	.847	.625	.870	.846	.727	.940	.000	.889	.250	.000	.903	.947
Cars	0	0	0	0	139	99	0	0	238	10	159	245	32	446	0	54	1	0	55	739
% Cars	0	0	0	0	94.6	86.8	0	0	91.2	100	99.4	92.8	100	95.7	0	84.4	100	0	84.6	93.3
Heavy Vehicles	0	0	0	0	8	15	0	0	23	0	1	19	0	20	0	10	0	0	10	53
% Heavy Vehicles	0	0	0	0	5.4	13.2	0	0	8.8	0	0.6	7.2	0	4.3	0	15.6	0	0	15.4	6.7

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N/S: Vienna Street/ Route 1A NB Offramp
E/W: Neptune Road
City, State: East Boston, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 AAA-2
Site Code : 10271
Start Date : 6/12/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Vienna Street From North			Neptune Road From East				Route 1A NB Offramp From South				Neptune Road From West				
Start Time	Right	Thru	Left	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn to Rte 1A SB	Right	Thru	Left	U-Turn	Int. Total
02:30 PM	0	0	0	2	5	0	0	0	0	5	0	0	2	0	0	14
02:45 PM	0	0	0	3	3	0	0	0	0	6	0	0	2	0	0	14
Total	0	0	0	5	8	0	0	0	0	11	0	0	4	0	0	28
03:00 PM	0	0	0	2	5	0	0	0	0	3	0	0	2	0	0	12
03:15 PM	0	0	0	1	2	0	0	0	1	5	0	0	4	0	0	13
03:30 PM	0	0	0	0	4	0	0	0	2	4	0	0	1	0	0	11
03:45 PM	0	0	0	0	3	0	0	0	0	2	0	0	0	0	0	5
Total	0	0	0	3	14	0	0	0	3	14	0	0	7	0	0	41
04:00 PM	0	0	0	0	1	0	0	0	0	4	0	0	0	0	0	5
04:15 PM	0	0	0	0	2	0	0	0	0	7	0	0	1	0	0	10
04:30 PM	0	0	0	2	2	0	0	0	1	2	1	0	3	0	0	11
04:45 PM	0	0	0	1	4	0	0	0	0	6	0	0	0	0	0	11
Total	0	0	0	3	9	0	0	0	1	19	1	0	4	0	0	37
05:00 PM	0	0	0	1	1	0	0	0	0	3	0	0	0	1	0	6
05:15 PM	0	0	0	3	2	0	0	0	0	6	0	0	2	0	0	13
Grand Total	0	0	0	15	34	0	0	0	4	53	1	0	17	1	0	125
Apprch %	0	0	0	30.6	69.4	0	0	0	6.9	91.4	1.7	0	94.4	5.6	0	
Total %	0	0	0	12	27.2	0	0	0	3.2	42.4	0.8	0	13.6	0.8	0	

	Vienna Street From North				Neptune Road From East					Route 1A NB Offramp From South					Neptune Road From West					
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn to Rte 1A SB	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 04:15 PM - Peak 1 of 1																				
Peak Hour for Entire Intersection Begins at 02:30 PM																				
02:30 PM	0	0	0	0	2	**5**	0	0	**7**	0	0	5	0	5	0	2	0	0	2	**14**
02:45 PM	0	0	0	0	**3**	3	0	0	6	0	0	**6**	0	**6**	0	2	0	0	2	14
03:00 PM	0	0	0	0	2	5	0	0	7	0	0	3	0	3	0	2	0	0	2	12
03:15 PM	0	0	0	0	1	2	0	0	3	0	**1**	5	0	6	0	**4**	0	0	**4**	13
Total Volume	0	0	0	0	8	15	0	0	23	0	1	19	0	20	0	10	0	0	10	53
% App. Total	0	0	0		34.8	65.2	0	0		0	5	95	0		0	100	0	0		
PHF	.000	.000	.000	.000	.667	.750	.000	.000	.821	.000	.250	.792	.000	.833	.000	.625	.000	.000	.625	.946

PRECISION
D A T A
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N/S: Route 1 SB Offramp/ Rotary
E/W: Rotary/ Squire Road (Route 60)
City, State: Revere, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 CC
Site Code : 10271
Start Date : 6/11/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Route 1 SB Offramp From North			Rotary From East					Rotary From South			Squire Road (Route 60) From West			
Start Time	Right	Thru	Left	Right	Thru (Right Lane)	Thru (Left Lane)	Left (Right Lane)	Left (Left Lane)	Right	Thru	Left	Right	Thru	Left	Int. Total
03:30 PM	19	186	0	0	188	28	7	62	0	0	0	0	0	0	490
03:45 PM	26	199	0	0	222	21	6	41	0	0	0	0	0	0	515
Total	45	385	0	0	410	49	13	103	0	0	0	0	0	0	1005
04:00 PM	15	207	0	0	191	28	11	61	0	0	0	0	0	0	513
04:15 PM	24	159	0	0	243	27	7	49	0	0	0	0	0	0	509
04:30 PM	11	187	0	0	235	21	6	61	0	0	0	0	0	0	521
04:45 PM	18	177	0	0	234	11	4	70	0	0	0	0	0	0	514
Total	68	730	0	0	903	87	28	241	0	0	0	0	0	0	2057
05:00 PM	11	225	0	0	215	18	7	62	0	0	0	0	0	0	538
05:15 PM	13	199	0	0	194	13	3	55	0	0	0	0	0	0	477
05:30 PM	16	167	0	0	238	26	8	54	0	0	0	0	0	0	509
05:45 PM	24	208	0	0	224	11	11	46	0	0	0	0	0	0	524
Total	64	799	0	0	871	68	29	217	0	0	0	0	0	0	2048
06:00 PM	25	170	0	0	268	17	4	65	0	0	0	0	0	0	549
06:15 PM	30	203	0	0	209	25	9	55	0	0	0	0	0	0	531
Grand Total	232	2287	0	0	2661	246	83	681	0	0	0	0	0	0	6190
Apprch %	9.2	90.8	0	0	72.5	6.7	2.3	18.6	0	0	0	0	0	0	
Total %	3.7	36.9	0	0	43	4	1.3	11	0	0	0	0	0	0	
Cars	231	2211	0	0	2600	240	82	672	0	0	0	0	0	0	6036
% Cars	99.6	96.7	0	0	97.7	97.6	98.8	98.7	0	0	0	0	0	0	97.5
Heavy Vehicles	1	76	0	0	61	6	1	9	0	0	0	0	0	0	154
% Heavy Vehicles	0.4	3.3	0	0	2.3	2.4	1.2	1.3	0	0	0	0	0	0	2.5

	Route 1 SB Offramp From North				Rotary From East						Rotary From South				Squire Road (Route 60) From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru (Right Lane)	Thru (Left Lane)	Left (Right Lane)	Left (Left Lane)	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 05:30 PM																			
05:30 PM	16	167	0	183	0	238	**26**	8	54	326	0	0	0	0	0	0	0	0	509
05:45 PM	24	**208**	0	232	0	224	11	**11**	46	292	0	0	0	0	0	0	0	0	524
06:00 PM	25	170	0	195	0	**268**	17	4	**65**	**354**	0	0	0	0	0	0	0	0	**549**
06:15 PM	**30**	203	0	**233**	0	209	25	9	55	298	0	0	0	0	0	0	0	0	531
Total Volume	95	748	0	843	0	939	79	32	220	1270	0	0	0	0	0	0	0	0	2113
% App. Total	11.3	88.7	0		0	73.9	6.2	2.5	17.3		0	0	0		0	0	0		
PHF	.792	.899	.000	.905	.000	.876	.760	.727	.846	.897	.000	.000	.000	.000	.000	.000	.000	.000	.962
Cars	94	721	0	815	0	922	77	32	219	1250	0	0	0	0	0	0	0	0	2065
% Cars	98.9	96.4	0	96.7	0	98.2	97.5	100	99.5	98.4	0	0	0	0	0	0	0	0	97.7
Heavy Vehicles	1	27	0	28	0	17	2	0	1	20	0	0	0	0	0	0	0	0	48
% Heavy Vehicles	1.1	3.6	0	3.3	0	1.8	2.5	0	0.5	1.6	0	0	0	0	0	0	0	0	2.3

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N/S: Route 1 SB Offramp/ Rotary
E/W: Rotary/ Squire Road (Route 60)
City, State: Revere, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 CC
Site Code : 10271
Start Date : 6/11/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Route 1 SB Offramp From North			Rotary From East					Rotary From South			Squire Road (Route 60) From West			
Start Time	Right	Thru	Left	Right	Thru (Right Lane)	Thru (Left Lane)	Left (Right Lane)	Left (Left Lane)	Right	Thru	Left	Right	Thru	Left	Int. Total
03:30 PM	0	11	0	0	4	1	1	4	0	0	0	0	0	0	21
03:45 PM	0	4	0	0	9	0	0	0	0	0	0	0	0	0	13
Total	0	15	0	0	13	1	1	4	0	0	0	0	0	0	34
04:00 PM	0	9	0	0	8	3	0	1	0	0	0	0	0	0	21
04:15 PM	0	2	0	0	6	0	0	0	0	0	0	0	0	0	8
04:30 PM	0	6	0	0	5	0	0	1	0	0	0	0	0	0	12
04:45 PM	0	6	0	0	4	0	0	0	0	0	0	0	0	0	10
Total	0	23	0	0	23	3	0	2	0	0	0	0	0	0	51
05:00 PM	0	7	0	0	3	0	0	2	0	0	0	0	0	0	12
05:15 PM	0	4	0	0	5	0	0	0	0	0	0	0	0	0	9
05:30 PM	0	5	0	0	7	1	0	0	0	0	0	0	0	0	13
05:45 PM	1	2	0	0	4	0	0	0	0	0	0	0	0	0	7
Total	1	18	0	0	19	1	0	2	0	0	0	0	0	0	41
06:00 PM	0	10	0	0	5	0	0	0	0	0	0	0	0	0	15
06:15 PM	0	10	0	0	1	1	0	1	0	0	0	0	0	0	13
Grand Total	1	76	0	0	61	6	1	9	0	0	0	0	0	0	154
Apprch %	1.3	98.7	0	0	79.2	7.8	1.3	11.7	0	0	0	0	0	0	
Total %	0.6	49.4	0	0	39.6	3.9	0.6	5.8	0	0	0	0	0	0	

	Route 1 SB Offramp From North				Rotary From East						Rotary From South				Squire Road (Route 60) From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru (Right Lane)	Thru (Left Lane)	Left (Right Lane)	Left (Left Lane)	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 03:30 PM																			
03:30 PM	0	**11**	0	**11**	0	4	1	**1**	**4**	10	0	0	0	0	0	0	0	0	**21**
03:45 PM	0	4	0	4	0	**9**	0	0	0	9	0	0	0	0	0	0	0	0	13
04:00 PM	0	9	0	9	0	8	**3**	0	1	**12**	0	0	0	0	0	0	0	0	21
04:15 PM	0	2	0	2	0	6	0	0	0	6	0	0	0	0	0	0	0	0	8
Total Volume	0	26	0	26	0	27	4	1	5	37	0	0	0	0	0	0	0	0	63
% App. Total	0	100	0		0	73	10.8	2.7	13.5		0	0	0		0	0	0		
PHF	.000	.591	.000	.591	.000	.750	.333	.250	.313	.771	.000	.000	.000	.000	.000	.000	.000	.000	.750

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City, State: Revere, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 CCC
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Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Route 1 SB Offramp From North			Rotary From East					Rotary From South			Squire Road (Route 60) From West			
Start Time	Right	Thru	Left	Right	Thru (Right Lane)	Thru (Left Lane)	Left (Right Lane)	Left (Left Lane)	Right	Thru	Left	Right	Thru	Left	Int. Total
02:30 PM	23	133	0	0	106	89	0	50	0	0	0	0	0	0	401
02:45 PM	14	119	0	0	146	109	2	46	0	0	0	0	0	0	436
Total	37	252	0	0	252	198	2	96	0	0	0	0	0	0	837
03:00 PM	22	150	0	0	138	81	2	56	0	0	0	0	0	0	449
03:15 PM	19	168	0	0	137	71	6	64	0	0	0	0	0	0	465
03:30 PM	30	170	0	0	97	79	10	38	0	0	0	0	0	0	424
03:45 PM	28	160	0	0	101	64	8	35	0	0	0	0	0	0	396
Total	99	648	0	0	473	295	26	193	0	0	0	0	0	0	1734
04:00 PM	25	185	0	0	110	64	10	37	0	0	0	0	0	0	431
04:15 PM	18	210	0	0	72	50	9	53	0	0	0	0	0	0	412
04:30 PM	19	186	0	0	80	53	4	47	0	0	0	0	0	0	389
04:45 PM	23	217	0	0	87	71	8	28	0	0	0	0	0	0	434
Total	85	798	0	0	349	238	31	165	0	0	0	0	0	0	1666
05:00 PM	26	188	0	0	90	39	7	42	0	0	0	0	0	0	392
05:15 PM	16	171	0	0	97	53	13	43	0	0	0	0	0	0	393
Grand Total	263	2057	0	0	1261	823	79	539	0	0	0	0	0	0	5022
Apprch %	11.3	88.7	0	0	46.7	30.5	2.9	19.9	0	0	0	0	0	0	
Total %	5.2	41	0	0	25.1	16.4	1.6	10.7	0	0	0	0	0	0	
Cars	260	1995	0	0	1243	814	79	530	0	0	0	0	0	0	4921
% Cars	98.9	97	0	0	98.6	98.9	100	98.3	0	0	0	0	0	0	98
Heavy Vehicles	3	62	0	0	18	9	0	9	0	0	0	0	0	0	101
% Heavy Vehicles	1.1	3	0	0	1.4	1.1	0	1.7	0	0	0	0	0	0	2

	Route 1 SB Offramp From North				Rotary From East						Rotary From South				Squire Road (Route 60) From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru (Right Lane)	Thru (Left Lane)	Left (Right Lane)	Left (Left Lane)	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 02:45 PM																			
02:45 PM	14	119	0	133	0	**146**	**109**	2	46	**303**	0	0	0	0	0	0	0	0	436
03:00 PM	22	150	0	172	0	138	81	2	56	277	0	0	0	0	0	0	0	0	449
03:15 PM	19	168	0	187	0	137	71	6	**64**	278	0	0	0	0	0	0	0	0	**465**
03:30 PM	**30**	**170**	0	**200**	0	97	79	**10**	38	224	0	0	0	0	0	0	0	0	424
Total Volume	85	607	0	692	0	518	340	20	204	1082	0	0	0	0	0	0	0	0	1774
% App. Total	12.3	87.7	0		0	47.9	31.4	1.8	18.9		0	0	0		0	0	0		
PHF	.708	.893	.000	.865	.000	.887	.780	.500	.797	.893	.000	.000	.000	.000	.000	.000	.000	.000	.954
Cars	85	587	0	672	0	513	335	20	200	1068	0	0	0	0	0	0	0	0	1740
% Cars	100	96.7	0	97.1	0	99.0	98.5	100	98.0	98.7	0	0	0	0	0	0	0	0	98.1
Heavy Vehicles	0	20	0	20	0	5	5	0	4	14	0	0	0	0	0	0	0	0	34
% Heavy Vehicles	0	3.3	0	2.9	0	1.0	1.5	0	2.0	1.3	0	0	0	0	0	0	0	0	1.9

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N/S: Route 1 SB Offramp/ Rotary
E/W: Rotary/ Squire Road (Route 60)
City, State: Revere, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 CCC
Site Code : 10271
Start Date : 6/12/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Route 1 SB Offramp From North			Rotary From East					Rotary From South			Squire Road (Route 60) From West			
Start Time	Right	Thru	Left	Right	Thru (Right Lane)	Thru (Left Lane)	Left (Right Lane)	Left (Left Lane)	Right	Thru	Left	Right	Thru	Left	Int. Total
02:30 PM	2	9	0	0	0	1	0	2	0	0	0	0	0	0	14
02:45 PM	0	3	0	0	1	0	0	1	0	0	0	0	0	0	5
Total	2	12	0	0	1	1	0	3	0	0	0	0	0	0	19
03:00 PM	0	9	0	0	4	1	0	1	0	0	0	0	0	0	15
03:15 PM	0	6	0	0	0	1	0	1	0	0	0	0	0	0	8
03:30 PM	0	2	0	0	0	3	0	1	0	0	0	0	0	0	6
03:45 PM	1	2	0	0	1	1	0	0	0	0	0	0	0	0	5
Total	1	19	0	0	5	6	0	3	0	0	0	0	0	0	34
04:00 PM	0	7	0	0	3	0	0	2	0	0	0	0	0	0	12
04:15 PM	0	6	0	0	1	0	0	1	0	0	0	0	0	0	8
04:30 PM	0	5	0	0	2	1	0	0	0	0	0	0	0	0	8
04:45 PM	0	6	0	0	1	1	0	0	0	0	0	0	0	0	8
Total	0	24	0	0	7	2	0	3	0	0	0	0	0	0	36
05:00 PM	0	5	0	0	3	0	0	0	0	0	0	0	0	0	8
05:15 PM	0	2	0	0	2	0	0	0	0	0	0	0	0	0	4
Grand Total	3	62	0	0	18	9	0	9	0	0	0	0	0	0	101
Apprch %	4.6	95.4	0	0	50	25	0	25	0	0	0	0	0	0	
Total %	3	61.4	0	0	17.8	8.9	0	8.9	0	0	0	0	0	0	

	Route 1 SB Offramp From North				Rotary From East						Rotary From South				Squire Road (Route 60) From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru (Right Lane)	Thru (Left Lane)	Left (Right Lane)	Left (Left Lane)	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 02:30 PM																			
02:30 PM	**2**	**9**	0	**11**	0	0	**1**	0	**2**	3	0	0	0	0	0	0	0	0	14
02:45 PM	0	3	0	3	0	1	0	0	1	2	0	0	0	0	0	0	0	0	5
03:00 PM	0	9	0	9	0	**4**	1	0	1	**6**	0	0	0	0	0	0	0	0	**15**
03:15 PM	0	6	0	6	0	0	1	0	1	2	0	0	0	0	0	0	0	0	8
Total Volume	2	27	0	29	0	5	3	0	5	13	0	0	0	0	0	0	0	0	42
% App. Total	6.9	93.1	0		0	38.5	23.1	0	38.5		0	0	0		0	0	0		
PHF	.250	.750	.000	.659	.000	.313	.750	.000	.625	.542	.000	.000	.000	.000	.000	.000	.000	.000	.700

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N/S: Rotary/ Route 1 SB Onramp
E/W: Rotary/ Squire Road (Route 60)
City, State: Revere, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 DD
Site Code : 10271
Start Date : 6/11/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Rotary From North			Rotary From East			Route 1 SB Onramp From South			Squire Road (Route 60) From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
03:30 PM	0	46	218	0	0	0	0	0	0	23	159	0	446
03:45 PM	0	36	214	0	0	0	0	0	0	36	151	0	437
Total	0	82	432	0	0	0	0	0	0	59	310	0	883
04:00 PM	0	47	238	0	0	0	0	0	0	29	177	0	491
04:15 PM	0	37	190	0	0	0	0	0	0	32	176	0	435
04:30 PM	0	43	224	0	0	0	0	0	0	23	189	0	479
04:45 PM	0	50	189	0	0	0	0	0	0	20	183	0	442
Total	0	177	841	0	0	0	0	0	0	104	725	0	1847
05:00 PM	0	44	240	0	0	0	0	0	0	21	170	0	475
05:15 PM	0	42	243	0	0	0	0	0	0	22	179	0	486
05:30 PM	0	49	188	0	0	0	0	0	0	22	156	0	415
05:45 PM	0	38	223	0	0	0	0	0	0	33	158	0	452
Total	0	173	894	0	0	0	0	0	0	98	663	0	1828
06:00 PM	0	51	183	0	0	0	0	0	0	23	164	0	421
06:15 PM	0	44	230	0	0	0	0	0	0	33	198	0	505
Grand Total	0	527	2580	0	0	0	0	0	0	317	2060	0	5484
Apprch %	0	17	83	0	0	0	0	0	0	13.3	86.7	0	
Total %	0	9.6	47	0	0	0	0	0	0	5.8	37.6	0	
Cars	0	516	2499	0	0	0	0	0	0	308	2011	0	5334
% Cars	0	97.9	96.9	0	0	0	0	0	0	97.2	97.6	0	97.3
Heavy Vehicles	0	11	81	0	0	0	0	0	0	9	49	0	150
% Heavy Vehicles	0	2.1	3.1	0	0	0	0	0	0	2.8	2.4	0	2.7

	Rotary From North				Rotary From East				Route 1 SB Onramp From South				Squire Road (Route 60) From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	0	43	224	267	0	0	0	0	0	0	0	0	**23**	**189**	0	**212**	479
04:45 PM	0	**50**	189	239	0	0	0	0	0	0	0	0	20	183	0	203	442
05:00 PM	0	44	240	284	0	0	0	0	0	0	0	0	21	170	0	191	475
05:15 PM	0	42	**243**	**285**	0	0	0	0	0	0	0	0	22	179	0	201	**486**
Total Volume	0	179	896	1075	0	0	0	0	0	0	0	0	86	721	0	807	1882
% App. Total	0	16.7	83.3		0	0	0		0	0	0		10.7	89.3	0		
PHF	.000	.895	.922	.943	.000	.000	.000	.000	.000	.000	.000	.000	.935	.954	.000	.952	.968
Cars	0	176	868	1044	0	0	0	0	0	0	0	0	84	708	0	792	1836
% Cars	0	98.3	96.9	97.1	0	0	0	0	0	0	0	0	97.7	98.2	0	98.1	97.6
Heavy Vehicles	0	3	28	31	0	0	0	0	0	0	0	0	2	13	0	15	46
% Heavy Vehicles	0	1.7	3.1	2.9	0	0	0	0	0	0	0	0	2.3	1.8	0	1.9	2.4

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E/W: Rotary/ Squire Road (Route 60)
City, State: Revere, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 DD
Site Code : 10271
Start Date : 6/11/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Rotary From North			Rotary From East			Route 1 SB Onramp From South			Squire Road (Route 60) From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
03:30 PM	0	5	11	0	0	0	0	0	0	1	4	0	21
03:45 PM	0	0	4	0	0	0	0	0	0	1	3	0	8
Total	0	5	15	0	0	0	0	0	0	2	7	0	29
04:00 PM	0	1	9	0	0	0	0	0	0	1	6	0	17
04:15 PM	0	0	2	0	0	0	0	0	0	3	6	0	11
04:30 PM	0	1	8	0	0	0	0	0	0	1	6	0	16
04:45 PM	0	0	8	0	0	0	0	0	0	0	0	0	8
Total	0	2	27	0	0	0	0	0	0	5	18	0	52
05:00 PM	0	2	8	0	0	0	0	0	0	1	2	0	13
05:15 PM	0	0	4	0	0	0	0	0	0	0	5	0	9
05:30 PM	0	0	5	0	0	0	0	0	0	1	3	0	9
05:45 PM	0	0	2	0	0	0	0	0	0	0	5	0	7
Total	0	2	19	0	0	0	0	0	0	2	15	0	38
06:00 PM	0	0	11	0	0	0	0	0	0	0	3	0	14
06:15 PM	0	2	9	0	0	0	0	0	0	0	6	0	17
Grand Total	0	11	81	0	0	0	0	0	0	9	49	0	150
Apprch %	0	12	88	0	0	0	0	0	0	15.5	84.5	0	
Total %	0	7.3	54	0	0	0	0	0	0	6	32.7	0	

	Rotary From North				Rotary From East				Route 1 SB Onramp From South				Squire Road (Route 60) From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:30 PM																	
03:30 PM	0	**5**	**11**	**16**	0	0	0	0	0	0	0	0	1	4	0	5	**21**
03:45 PM	0	0	4	4	0	0	0	0	0	0	0	0	1	3	0	4	8
04:00 PM	0	1	9	10	0	0	0	0	0	0	0	0	1	**6**	0	7	17
04:15 PM	0	0	2	2	0	0	0	0	0	0	0	0	**3**	6	0	**9**	11
Total Volume	0	6	26	32	0	0	0	0	0	0	0	0	6	19	0	25	57
% App. Total	0	18.8	81.2		0	0	0		0	0	0		24	76	0		
PHF	.000	.300	.591	.500	.000	.000	.000	.000	.000	.000	.000	.000	.500	.792	.000	.694	.679

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N/S: Rotary/ Route 1 SB Onramp
E/W: Rotary/ Squire Road (Route 60)
City, State: Revere, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 DDD
Site Code : 10271
Start Date : 6/12/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Rotary From North			Rotary From East			Route 1 SB Onramp From South			Squire Road (Route 60) From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
02:30 PM	0	57	144	0	0	0	0	0	0	50	213	0	464
02:45 PM	0	52	123	0	0	0	0	0	0	31	151	0	357
Total	0	109	267	0	0	0	0	0	0	81	364	0	821
03:00 PM	0	51	172	0	0	0	0	0	0	41	201	0	465
03:15 PM	0	52	192	0	0	0	0	0	0	34	172	0	450
03:30 PM	0	50	171	0	0	0	0	0	0	61	211	0	493
03:45 PM	0	45	176	0	0	0	0	0	0	43	205	0	469
Total	0	198	711	0	0	0	0	0	0	179	789	0	1877
04:00 PM	0	42	195	0	0	0	0	0	0	34	175	0	446
04:15 PM	0	55	212	0	1	0	0	0	0	37	136	0	441
04:30 PM	0	55	195	0	0	0	0	0	0	32	156	0	438
04:45 PM	0	24	212	0	0	0	0	0	0	28	198	0	462
Total	0	176	814	0	1	0	0	0	0	131	665	0	1787
05:00 PM	0	39	212	0	0	0	0	0	0	35	159	0	445
05:15 PM	0	53	183	0	2	0	0	0	0	41	161	0	440
Grand Total	0	575	2187	0	3	0	0	0	0	467	2138	0	5370
Apprch %	0	20.8	79.2	0	100	0	0	0	0	17.9	82.1	0	
Total %	0	10.7	40.7	0	0.1	0	0	0	0	8.7	39.8	0	
Cars	0	567	2126	0	3	0	0	0	0	462	2101	0	5259
% Cars	0	98.6	97.2	0	100	0	0	0	0	98.9	98.3	0	97.9
Heavy Vehicles	0	8	61	0	0	0	0	0	0	5	37	0	111
% Heavy Vehicles	0	1.4	2.8	0	0	0	0	0	0	1.1	1.7	0	2.1

	Rotary From North				Rotary From East				Route 1 SB Onramp From South				Squire Road (Route 60) From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:00 PM																	
03:00 PM	0	51	172	223	0	0	0	0	0	0	0	0	41	201	0	242	465
03:15 PM	0	**52**	**192**	**244**	0	0	0	0	0	0	0	0	34	172	0	206	450
03:30 PM	0	50	171	221	0	0	0	0	0	0	0	0	**61**	**211**	0	**272**	**493**
03:45 PM	0	45	176	221	0	0	0	0	0	0	0	0	43	205	0	248	469
Total Volume	0	198	711	909	0	0	0	0	0	0	0	0	179	789	0	968	1877
% App. Total	0	21.8	78.2		0	0	0		0	0	0		18.5	81.5	0		
PHF	.000	.952	.926	.931	.000	.000	.000	.000	.000	.000	.000	.000	.734	.935	.000	.890	.952
Cars	0	196	693	889	0	0	0	0	0	0	0	0	178	777	0	955	1844
% Cars	0	99.0	97.5	97.8	0	0	0	0	0	0	0	0	99.4	98.5	0	98.7	98.2
Heavy Vehicles	0	2	18	20	0	0	0	0	0	0	0	0	1	12	0	13	33
% Heavy Vehicles	0	1.0	2.5	2.2	0	0	0	0	0	0	0	0	0.6	1.5	0	1.3	1.8

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Groups Printed- Heavy Vehicles

	Rotary From North			Rotary From East			Route 1 SB Onramp From South			Squire Road (Route 60) From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
02:30 PM	0	2	8	0	0	0	0	0	0	0	2	0	12
02:45 PM	0	1	3	0	0	0	0	0	0	1	4	0	9
Total	0	3	11	0	0	0	0	0	0	1	6	0	21
03:00 PM	0	0	10	0	0	0	0	0	0	0	2	0	12
03:15 PM	0	1	5	0	0	0	0	0	0	0	3	0	9
03:30 PM	0	1	1	0	0	0	0	0	0	0	4	0	6
03:45 PM	0	0	2	0	0	0	0	0	0	1	3	0	6
Total	0	2	18	0	0	0	0	0	0	1	12	0	33
04:00 PM	0	0	9	0	0	0	0	0	0	2	4	0	15
04:15 PM	0	2	6	0	0	0	0	0	0	0	3	0	11
04:30 PM	0	1	4	0	0	0	0	0	0	1	2	0	8
04:45 PM	0	0	6	0	0	0	0	0	0	0	5	0	11
Total	0	3	25	0	0	0	0	0	0	3	14	0	45
05:00 PM	0	0	5	0	0	0	0	0	0	0	2	0	7
05:15 PM	0	0	2	0	0	0	0	0	0	0	3	0	5
Grand Total	0	8	61	0	0	0	0	0	0	5	37	0	111
Apprch %	0	11.6	88.4	0	0	0	0	0	0	11.9	88.1	0	
Total %	0	7.2	55	0	0	0	0	0	0	4.5	33.3	0	

	Rotary From North				Rotary From East				Route 1 SB Onramp From South				Squire Road (Route 60) From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	0	**9**	**9**	0	0	0	0	0	0	0	0	**2**	4	0	**6**	**15**
04:15 PM	0	**2**	6	8	0	0	0	0	0	0	0	0	0	3	0	3	11
04:30 PM	0	1	4	5	0	0	0	0	0	0	0	0	1	2	0	3	8
04:45 PM	0	0	6	6	0	0	0	0	0	0	0	0	0	**5**	0	5	11
Total Volume	0	3	25	28	0	0	0	0	0	0	0	0	3	14	0	17	45
% App. Total	0	10.7	89.3		0	0	0		0	0	0		17.6	82.4	0		
PHF	.000	.375	.694	.778	.000	.000	.000	.000	.000	.000	.000	.000	.375	.700	.000	.708	.750

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Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

N/S: Rotary/ Squire Road (Route 60)
E/W: Rotary/ Route 1 NB Offramp
City, State: Revere, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 EE
Site Code : 10271
Start Date : 6/11/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Rotary From North					Rotary From East			Squire Road (Route 60) From South			Route 1 NB Offramp From West			
Start Time	Right	Thru (Right Lane)	Thru (Left Lane)	Left (Right Lane)	Left (Left Lane)	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
03:30 PM	0	175	157	8	22	0	0	0	0	0	0	69	28	0	459
03:45 PM	0	179	146	14	24	0	0	0	0	0	0	71	40	0	474
Total	0	354	303	22	46	0	0	0	0	0	0	140	68	0	933
04:00 PM	0	215	158	14	23	0	0	0	0	0	0	70	38	0	518
04:15 PM	0	181	139	11	20	0	0	0	0	0	0	69	46	0	466
04:30 PM	0	211	153	15	35	0	0	0	0	0	0	59	41	0	514
04:45 PM	0	193	140	15	30	0	0	0	0	0	0	74	40	0	492
Total	0	800	590	55	108	0	0	0	0	0	0	272	165	0	1990
05:00 PM	0	227	141	15	35	0	0	0	0	0	0	70	43	0	531
05:15 PM	0	229	150	8	23	0	0	0	0	0	0	67	43	0	520
05:30 PM	0	203	117	7	18	0	0	0	0	0	0	75	38	0	458
05:45 PM	0	228	114	3	21	0	0	0	0	0	0	84	40	0	490
Total	0	887	522	33	97	0	0	0	0	0	0	296	164	0	1999
06:00 PM	0	216	95	3	22	0	0	0	0	0	0	37	36	0	409
06:15 PM	0	263	110	7	30	0	0	0	0	0	0	63	37	0	510
Grand Total	0	2520	1620	120	303	0	0	0	0	0	0	808	470	0	5841
Apprch %	0	55.2	35.5	2.6	6.6	0	0	0	0	0	0	63.2	36.8	0	
Total %	0	43.1	27.7	2.1	5.2	0	0	0	0	0	0	13.8	8	0	
Cars	0	2444	1581	116	293	0	0	0	0	0	0	796	468	0	5698
% Cars	0	97	97.6	96.7	96.7	0	0	0	0	0	0	98.5	99.6	0	97.6
Heavy Vehicles	0	76	39	4	10	0	0	0	0	0	0	12	2	0	143
% Heavy Vehicles	0	3	2.4	3.3	3.3	0	0	0	0	0	0	1.5	0.4	0	2.4

	Rotary From North						Rotary From East				Squire Road (Route 60) From South				Route 1 NB Offramp From West				
Start Time	Right	Thru (Right Lane)	Thru (Left Lane)	Left (Right Lane)	Left (Left Lane)	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 04:30 PM																			
04:30 PM	0	211	**153**	**15**	**35**	414	0	0	0	0	0	0	0	0	59	41	0	100	514
04:45 PM	0	193	140	15	30	378	0	0	0	0	0	0	0	0	**74**	40	0	**114**	492
05:00 PM	0	227	141	15	35	**418**	0	0	0	0	0	0	0	0	70	**43**	0	113	**531**
05:15 PM	0	**229**	150	8	23	410	0	0	0	0	0	0	0	0	67	43	0	110	520
Total Volume	0	860	584	53	123	1620	0	0	0	0	0	0	0	0	270	167	0	437	2057
% App. Total	0	53.1	36	3.3	7.6		0	0	0		0	0	0		61.8	38.2	0		
PHF	.000	.939	.954	.883	.879	.969	.000	.000	.000	.000	.000	.000	.000	.000	.912	.971	.000	.958	.968
Cars	0	836	571	52	120	1579	0	0	0	0	0	0	0	0	266	167	0	433	2012
% Cars	0	97.2	97.8	98.1	97.6	97.5	0	0	0	0	0	0	0	0	98.5	100	0	99.1	97.8
Heavy Vehicles	0	24	13	1	3	41	0	0	0	0	0	0	0	0	4	0	0	4	45
% Heavy Vehicles	0	2.8	2.2	1.9	2.4	2.5	0	0	0	0	0	0	0	0	1.5	0	0	0.9	2.2

PRECISION
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N/S: Rotary/ Squire Road (Route 60)
E/W: Rotary/ Route 1 NB Offramp
City, State: Revere, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 EE
Site Code : 10271
Start Date : 6/11/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Rotary From North					Rotary From East			Squire Road (Route 60) From South			Route 1 NB Offramp From West			
Start Time	Right	Thru (Right Lane)	Thru (Left Lane)	Left (Right Lane)	Left (Left Lane)	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
03:30 PM	0	7	7	0	1	0	0	0	0	0	0	4	0	0	19
03:45 PM	0	6	1	1	1	0	0	0	0	0	0	0	0	0	9
Total	0	13	8	1	2	0	0	0	0	0	0	4	0	0	28
04:00 PM	0	8	5	0	1	0	0	0	0	0	0	0	1	0	15
04:15 PM	0	2	5	1	0	0	0	0	0	0	0	0	0	0	8
04:30 PM	0	8	4	1	1	0	0	0	0	0	0	1	0	0	15
04:45 PM	0	4	2	0	2	0	0	0	0	0	0	1	0	0	9
Total	0	22	16	2	4	0	0	0	0	0	0	2	1	0	47
05:00 PM	0	8	2	0	0	0	0	0	0	0	0	0	0	0	10
05:15 PM	0	4	5	0	0	0	0	0	0	0	0	2	0	0	11
05:30 PM	0	4	3	0	1	0	0	0	0	0	0	2	1	0	11
05:45 PM	0	3	2	1	1	0	0	0	0	0	0	1	0	0	8
Total	0	19	12	1	2	0	0	0	0	0	0	5	1	0	40
06:00 PM	0	10	1	0	1	0	0	0	0	0	0	0	0	0	12
06:15 PM	0	12	2	0	1	0	0	0	0	0	0	1	0	0	16
Grand Total	0	76	39	4	10	0	0	0	0	0	0	12	2	0	143
Apprch %	0	58.9	30.2	3.1	7.8	0	0	0	0	0	0	85.7	14.3	0	
Total %	0	53.1	27.3	2.8	7	0	0	0	0	0	0	8.4	1.4	0	

	Rotary From North						Rotary From East				Squire Road (Route 60) From South				Route 1 NB Offramp From West				
Start Time	Right	Thru (Right Lane)	Thru (Left Lane)	Left (Right Lane)	Left (Left Lane)	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 03:30 PM																			
03:30 PM	0	7	**7**	0	**1**	**15**	0	0	0	0	0	0	0	0	**4**	0	0	**4**	**19**
03:45 PM	0	6	1	**1**	1	9	0	0	0	0	0	0	0	0	0	0	0	0	9
04:00 PM	0	**8**	5	0	1	14	0	0	0	0	0	0	0	0	0	**1**	0	1	15
04:15 PM	0	2	5	1	0	8	0	0	0	0	0	0	0	0	0	0	0	0	8
Total Volume	0	23	18	2	3	46	0	0	0	0	0	0	0	0	4	1	0	5	51
% App. Total	0	50	39.1	4.3	6.5		0	0	0		0	0	0		80	20	0		
PHF	.000	.719	.643	.500	.750	.767	.000	.000	.000	.000	.000	.000	.000	.000	.250	.250	.000	.313	.671

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N/S: Rotary/ Squire Road (Route 60)
E/W: Rotary/ Route 1 NB Offramp
City, State: Revere, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 EEE
Site Code : 10271
Start Date : 6/12/2010

Groups Printed- Cars - Heavy Vehicles

	Rotary From North					Rotary From East			Squire Road (Route 60) From South			Route 1 NB Offramp From West			
Start Time	Right	Thru (Right Lane)	Thru (Left Lane)	Left (Right Lane)	Left (Left Lane)	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
02:30 PM	0	209	127	6	16	0	0	0	0	0	0	69	28	0	455
02:45 PM	0	164	71	14	19	0	0	0	0	0	0	71	40	0	379
Total	0	373	198	20	35	0	0	0	0	0	0	140	68	0	834
03:00 PM	0	225	111	9	17	0	0	0	0	0	0	70	38	0	470
03:15 PM	0	227	119	5	15	0	0	0	0	0	0	69	46	0	481
03:30 PM	0	232	122	10	29	0	0	0	0	0	0	59	41	0	493
03:45 PM	0	224	116	10	23	0	0	0	0	0	0	74	40	0	487
Total	0	908	468	34	84	0	0	0	0	0	0	272	165	0	1931
04:00 PM	0	196	123	10	30	0	0	0	0	0	0	70	33	0	462
04:15 PM	0	204	116	3	18	0	0	0	0	0	0	67	33	0	441
04:30 PM	0	223	103	7	18	0	0	0	0	0	0	75	27	0	453
04:45 PM	0	236	146	2	20	0	0	0	0	0	0	84	30	0	518
Total	0	859	488	22	86	0	0	0	0	0	0	296	123	0	1874
05:00 PM	0	223	124	3	11	0	0	0	0	0	0	37	26	0	424
05:15 PM	0	199	112	7	19	0	0	0	0	0	0	63	37	0	437
Grand Total	0	2562	1390	86	235	0	0	0	0	0	0	808	419	0	5500
Apprch %	0	60	32.5	2	5.5	0	0	0	0	0	0	65.9	34.1	0	
Total %	0	46.6	25.3	1.6	4.3	0	0	0	0	0	0	14.7	7.6	0	
Cars	0	2489	1369	85	233	0	0	0	0	0	0	796	418	0	5390
% Cars	0	97.2	98.5	98.8	99.1	0	0	0	0	0	0	98.5	99.8	0	98
Heavy Vehicles	0	73	21	1	2	0	0	0	0	0	0	12	1	0	110
% Heavy Vehicles	0	2.8	1.5	1.2	0.9	0	0	0	0	0	0	1.5	0.2	0	2

	Rotary From North						Rotary From East				Squire Road (Route 60) From South				Route 1 NB Offramp From West				
Start Time	Right	Thru (Right Lane)	Thru (Left Lane)	Left (Right Lane)	Left (Left Lane)	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 03:00 PM																			
03:00 PM	0	225	111	9	17	362	0	0	0	0	0	0	0	0	70	38	0	108	470
03:15 PM	0	227	119	5	15	366	0	0	0	0	0	0	0	0	69	**46**	0	**115**	481
03:30 PM	0	**232**	**122**	**10**	**29**	**393**	0	0	0	0	0	0	0	0	59	41	0	100	**493**
03:45 PM	0	224	116	10	23	373	0	0	0	0	0	0	0	0	**74**	40	0	114	487
Total Volume	0	908	468	34	84	1494	0	0	0	0	0	0	0	0	272	165	0	437	1931
% App. Total	0	60.8	31.3	2.3	5.6		0	0	0		0	0	0		62.2	37.8	0		
PHF	.000	.978	.959	.850	.724	.950	.000	.000	.000	.000	.000	.000	.000	.000	.919	.897	.000	.950	.979
Cars	0	891	454	34	84	1463	0	0	0	0	0	0	0	0	270	164	0	434	1897
% Cars	0	98.1	97.0	100	100	97.9	0	0	0	0	0	0	0	0	99.3	99.4	0	99.3	98.2
Heavy Vehicles	0	17	14	0	0	31	0	0	0	0	0	0	0	0	2	1	0	3	34
% Heavy Vehicles	0	1.9	3.0	0	0	2.1	0	0	0	0	0	0	0	0	0.7	0.6	0	0.7	1.8

PRECISION
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N/S: Rotary/ Squire Road (Route 60)
E/W: Rotary/ Route 1 NB Offramp
City, State: Revere, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 EEE
Site Code : 10271
Start Date : 6/12/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Rotary From North					Rotary From East			Squire Road (Route 60) From South			Route 1 NB Offramp From West			
Start Time	Right	Thru (Right Lane)	Thru (Left Lane)	Left (Right Lane)	Left (Left Lane)	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
02:30 PM	0	7	1	0	0	0	0	0	0	0	0	4	0	0	12
02:45 PM	0	4	1	1	1	0	0	0	0	0	0	0	0	0	7
Total	0	11	2	1	1	0	0	0	0	0	0	4	0	0	19
03:00 PM	0	8	4	0	0	0	0	0	0	0	0	0	1	0	13
03:15 PM	0	5	3	0	0	0	0	0	0	0	0	0	0	0	8
03:30 PM	0	2	4	0	0	0	0	0	0	0	0	1	0	0	7
03:45 PM	0	2	3	0	0	0	0	0	0	0	0	1	0	0	6
Total	0	17	14	0	0	0	0	0	0	0	0	2	1	0	34
04:00 PM	0	9	2	0	0	0	0	0	0	0	0	0	0	0	11
04:15 PM	0	10	0	0	0	0	0	0	0	0	0	2	0	0	12
04:30 PM	0	5	1	0	1	0	0	0	0	0	0	2	0	0	9
04:45 PM	0	8	2	0	0	0	0	0	0	0	0	1	0	0	11
Total	0	32	5	0	1	0	0	0	0	0	0	5	0	0	43
05:00 PM	0	7	0	0	0	0	0	0	0	0	0	0	0	0	7
05:15 PM	0	6	0	0	0	0	0	0	0	0	0	1	0	0	7
Grand Total	0	73	21	1	2	0	0	0	0	0	0	12	1	0	110
Apprch %	0	75.3	21.6	1	2.1	0	0	0	0	0	0	92.3	7.7	0	
Total %	0	66.4	19.1	0.9	1.8	0	0	0	0	0	0	10.9	0.9	0	

	Rotary From North						Rotary From East				Squire Road (Route 60) From South				Route 1 NB Offramp From West				
Start Time	Right	Thru (Right Lane)	Thru (Left Lane)	Left (Right Lane)	Left (Left Lane)	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 04:00 PM																			
04:00 PM	0	9	**2**	0	0	**11**	0	0	0	0	0	0	0	0	0	0	0	0	11
04:15 PM	0	**10**	0	0	0	10	0	0	0	0	0	0	0	0	**2**	0	0	**2**	**12**
04:30 PM	0	5	1	0	**1**	7	0	0	0	0	0	0	0	0	2	0	0	2	9
04:45 PM	0	8	2	0	0	10	0	0	0	0	0	0	0	0	1	0	0	1	11
Total Volume	0	32	5	0	1	38	0	0	0	0	0	0	0	0	5	0	0	5	43
% App. Total	0	84.2	13.2	0	2.6		0	0	0		0	0	0		100	0	0		
PHF	.000	.800	.625	.000	.250	.864	.000	.000	.000	.000	.000	.000	.000	.000	.625	.000	.000	.625	.896

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S: Squire Road (Route 60)
E/W: Rotary
City, State: Revere, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 FF
Site Code : 10271
Start Date : 6/11/2010

Groups Printed- Cars - Heavy Vehicles

	Rotary From East		Squire Road (Route 60) From South			Rotary From West			
Start Time	Thru	Left	Right (Right Lane)	Right (Left Lane)	Left	Right	Thru (Right Lane)	Thru (Left Lane)	Int. Total
03:30 PM	0	0	296	204	0	0	47	39	586
03:45 PM	0	0	245	184	0	0	39	47	515
Total	0	0	541	388	0	0	86	86	1101
04:00 PM	0	0	270	185	0	0	31	52	538
04:15 PM	0	0	225	238	0	0	35	54	552
04:30 PM	0	0	219	233	0	0	31	45	528
04:45 PM	0	0	239	245	0	0	35	66	585
Total	0	0	953	901	0	0	132	217	2203
05:00 PM	0	0	282	303	0	0	15	57	657
05:15 PM	0	0	302	270	0	0	9	59	640
05:30 PM	0	0	220	214	0	0	18	59	511
05:45 PM	0	0	262	271	0	0	28	59	620
Total	0	0	1066	1058	0	0	70	234	2428
06:00 PM	0	0	282	260	0	0	24	64	630
06:15 PM	0	0	236	195	0	0	20	72	523
Grand Total	0	0	3078	2802	0	0	332	673	6885
Apprch %	0	0	52.3	47.7	0	0	33	67	
Total %	0	0	44.7	40.7	0	0	4.8	9.8	
Cars	0	0	2993	2753	0	0	323	661	6730
% Cars	0	0	97.2	98.3	0	0	97.3	98.2	97.7
Heavy Vehicles	0	0	85	49	0	0	9	12	155
% Heavy Vehicles	0	0	2.8	1.7	0	0	2.7	1.8	2.3

	Rotary From East			Squire Road (Route 60) From South				Rotary From West				
Start Time	Thru	Left	App. Total	Right (Right Lane)	Right (Left Lane)	Left	App. Total	Right	Thru (Right Lane)	Thru (Left Lane)	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1												
Peak Hour for Entire Intersection Begins at 05:00 PM												
05:00 PM	0	0	0	282	**303**	0	**585**	0	15	57	72	**657**
05:15 PM	0	0	0	**302**	270	0	572	0	9	**59**	68	640
05:30 PM	0	0	0	220	214	0	434	0	18	59	77	511
05:45 PM	0	0	0	262	271	0	533	0	**28**	59	**87**	620
Total Volume	0	0	0	1066	1058	0	2124	0	70	234	304	2428
% App. Total	0	0		50.2	49.8	0		0	23	77		
PHF	.000	.000	.000	.882	.873	.000	.908	.000	.625	.992	.874	.924
Cars	0	0	0	1047	1042	0	2089	0	67	230	297	2386
% Cars	0	0	0	98.2	98.5	0	98.4	0	95.7	98.3	97.7	98.3
Heavy Vehicles	0	0	0	19	16	0	35	0	3	4	7	42
% Heavy Vehicles	0	0	0	1.8	1.5	0	1.6	0	4.3	1.7	2.3	1.7

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File Name : 102242 FF
Site Code : 10271
Start Date : 6/11/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Rotary From East		Squire Road (Route 60) From South			Rotary From West			
Start Time	Thru	Left	Right (Right Lane)	Right (Left Lane)	Left	Right	Thru (Right Lane)	Thru (Left Lane)	Int. Total
03:30 PM	0	0	11	9	0	0	0	2	22
03:45 PM	0	0	12	4	0	0	2	1	19
Total	0	0	23	13	0	0	2	3	41
04:00 PM	0	0	19	6	0	0	1	1	27
04:15 PM	0	0	6	4	0	0	1	0	11
04:30 PM	0	0	5	4	0	0	1	1	11
04:45 PM	0	0	5	2	0	0	0	2	9
Total	0	0	35	16	0	0	3	4	58
05:00 PM	0	0	10	7	0	0	0	0	17
05:15 PM	0	0	2	3	0	0	1	0	6
05:30 PM	0	0	4	4	0	0	0	3	11
05:45 PM	0	0	3	2	0	0	2	1	8
Total	0	0	19	16	0	0	3	4	42
06:00 PM	0	0	5	3	0	0	0	1	9
06:15 PM	0	0	3	1	0	0	1	0	5
Grand Total	0	0	85	49	0	0	9	12	155
Apprch %	0	0	63.4	36.6	0	0	42.9	57.1	
Total %	0	0	54.8	31.6	0	0	5.8	7.7	

	Rotary From East			Squire Road (Route 60) From South				Rotary From West				
Start Time	Thru	Left	App. Total	Right (Right Lane)	Right (Left Lane)	Left	App. Total	Right	Thru (Right Lane)	Thru (Left Lane)	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1												
Peak Hour for Entire Intersection Begins at 03:30 PM												
03:30 PM	0	0	0	11	**9**	0	20	0	0	**2**	2	22
03:45 PM	0	0	0	12	4	0	16	0	**2**	1	**3**	19
04:00 PM	0	0	0	**19**	6	0	**25**	0	1	1	2	**27**
04:15 PM	0	0	0	6	4	0	10	0	1	0	1	11
Total Volume	0	0	0	48	23	0	71	0	4	4	8	79
% App. Total	0	0		67.6	32.4	0		0	50	50		
PHF	.000	.000	.000	.632	.639	.000	.710	.000	.500	.500	.667	.731

PRECISION
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S: Squire Road (Route 60)
E/W: Rotary
City, State: Revere, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 FFF
Site Code : 10271
Start Date : 6/12/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Rotary From East		Squire Road (Route 60) From South			Rotary From West			
Start Time	Thru	Left	Right (Right Lane)	Right (Left Lane)	Left	Right	Thru (Right Lane)	Thru (Left Lane)	Int. Total
02:30 PM	0	0	296	176	0	0	21	28	521
02:45 PM	0	0	308	181	0	0	23	51	563
Total	0	0	604	357	0	0	44	79	1084
03:00 PM	0	0	326	285	0	0	26	37	674
03:15 PM	0	0	276	271	0	0	27	31	605
03:30 PM	0	0	305	316	0	0	29	49	699
03:45 PM	0	0	312	321	0	0	35	40	708
Total	0	0	1219	1193	0	0	117	157	2686
04:00 PM	0	0	297	299	0	0	31	43	670
04:15 PM	0	0	231	224	0	3	28	24	510
04:30 PM	0	0	248	267	0	0	23	21	559
04:45 PM	0	0	200	179	0	0	33	22	434
Total	0	0	976	969	0	3	115	110	2173
05:00 PM	0	0	172	173	0	0	26	16	387
05:15 PM	0	0	197	184	0	0	24	31	436
Grand Total	0	0	3168	2876	0	3	326	393	6766
Apprch %	0	0	52.4	47.6	0	0.4	45.2	54.4	
Total %	0	0	46.8	42.5	0	0	4.8	5.8	
Cars	0	0	3119	2847	0	3	325	390	6684
% Cars	0	0	98.5	99	0	100	99.7	99.2	98.8
Heavy Vehicles	0	0	49	29	0	0	1	3	82
% Heavy Vehicles	0	0	1.5	1	0	0	0.3	0.8	1.2

	Rotary From East			Squire Road (Route 60) From South				Rotary From West				
Start Time	Thru	Left	App. Total	Right (Right Lane)	Right (Left Lane)	Left	App. Total	Right	Thru (Right Lane)	Thru (Left Lane)	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1												
Peak Hour for Entire Intersection Begins at 03:00 PM												
03:00 PM	0	0	0	**326**	285	0	611	0	26	37	63	674
03:15 PM	0	0	0	276	271	0	547	0	27	31	58	605
03:30 PM	0	0	0	305	316	0	621	0	29	**49**	**78**	699
03:45 PM	0	0	0	312	**321**	0	**633**	0	**35**	40	75	**708**
Total Volume	0	0	0	1219	1193	0	2412	0	117	157	274	2686
% App. Total	0	0		50.5	49.5	0		0	42.7	57.3		
PHF	.000	.000	.000	.935	.929	.000	.953	.000	.836	.801	.878	.948
Cars	0	0	0	1197	1180	0	2377	0	117	156	273	2650
% Cars	0	0	0	98.2	98.9	0	98.5	0	100	99.4	99.6	98.7
Heavy Vehicles	0	0	0	22	13	0	35	0	0	1	1	36
% Heavy Vehicles	0	0	0	1.8	1.1	0	1.5	0	0	0.6	0.4	1.3

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S: Squire Road (Route 60)
E/W: Rotary
City, State: Revere, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 FFF
Site Code : 10271
Start Date : 6/12/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Rotary From East		Squire Road (Route 60) From South			Rotary From West			
Start Time	Thru	Left	Right (Right Lane)	Right (Left Lane)	Left	Right	Thru (Right Lane)	Thru (Left Lane)	Int. Total
02:30 PM	0	0	4	4	0	0	0	0	8
02:45 PM	0	0	6	0	0	0	1	1	8
Total	0	0	10	4	0	0	1	1	16
03:00 PM	0	0	5	3	0	0	0	1	9
03:15 PM	0	0	4	4	0	0	0	0	8
03:30 PM	0	0	10	4	0	0	0	0	14
03:45 PM	0	0	3	2	0	0	0	0	5
Total	0	0	22	13	0	0	0	1	36
04:00 PM	0	0	4	6	0	0	0	0	10
04:15 PM	0	0	3	0	0	0	0	0	3
04:30 PM	0	0	3	2	0	0	0	1	6
04:45 PM	0	0	2	1	0	0	0	0	3
Total	0	0	12	9	0	0	0	1	22
05:00 PM	0	0	2	1	0	0	0	0	3
05:15 PM	0	0	3	2	0	0	0	0	5
Grand Total	0	0	49	29	0	0	1	3	82
Apprch %	0	0	62.8	37.2	0	0	25	75	
Total %	0	0	59.8	35.4	0	0	1.2	3.7	

	Rotary From East			Squire Road (Route 60) From South				Rotary From West				
Start Time	Thru	Left	App. Total	Right (Right Lane)	Right (Left Lane)	Left	App. Total	Right	Thru (Right Lane)	Thru (Left Lane)	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1												
Peak Hour for Entire Intersection Begins at 02:45 PM												
02:45 PM	0	0	0	6	0	0	6	0	**1**	**1**	**2**	8
03:00 PM	0	0	0	5	3	0	8	0	0	1	1	9
03:15 PM	0	0	0	4	**4**	0	8	0	0	0	0	8
03:30 PM	0	0	0	**10**	4	0	**14**	0	0	0	0	**14**
Total Volume	0	0	0	25	11	0	36	0	1	2	3	39
% App. Total	0	0		69.4	30.6	0		0	33.3	66.7		
PHF	.000	.000	.000	.625	.688	.000	.643	.000	.250	.500	.375	.696

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N: Route 1 SB Offramp
E/W: Revere Beach Parkway (Route 16)
City, State: Chelsea, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 HH
Site Code : 10271
Start Date : 6/11/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Route 1 SB Offramp From North			Revere Beach Parkway (Route 16) WB From East		Revere Beach Parkway (Route 16) WB From West		
Start Time	Right	Left	To Left Lane UTurn	Right	Thru	Thru	Left	Int. Total
03:30 PM	155	0	55	0	0	0	0	210
03:45 PM	117	0	52	0	0	0	0	169
Total	272	0	107	0	0	0	0	379
04:00 PM	152	0	57	0	0	0	0	209
04:15 PM	140	0	53	0	0	0	0	193
04:30 PM	139	0	60	0	0	0	0	199
04:45 PM	153	0	30	0	0	0	0	183
Total	584	0	200	0	0	0	0	784
05:00 PM	111	0	29	0	0	0	0	140
05:15 PM	104	0	14	0	0	0	0	118
05:30 PM	142	0	48	0	0	6	0	196
05:45 PM	146	0	60	0	0	0	0	206
Total	503	0	151	0	0	6	0	660
06:00 PM	126	0	38	2	0	0	0	166
06:15 PM	124	0	56	0	0	0	0	180
Grand Total	1609	0	552	2	0	6	0	2169
Apprch %	74.5	0	25.5	100	0	100	0	
Total %	74.2	0	25.4	0.1	0	0.3	0	
Cars	1579	0	545	2	0	6	0	2132
% Cars	98.1	0	98.7	100	0	100	0	98.3
Heavy Vehicles	30	0	7	0	0	0	0	37
% Heavy Vehicles	1.9	0	1.3	0	0	0	0	1.7

	Route 1 SB Offramp From North				Revere Beach Parkway (Route 16) WB From East			Revere Beach Parkway (Route 16) WB From West			
Start Time	Right	Left	To Left Lane UTurn	App. Total	Right	Thru	App. Total	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1											
Peak Hour for Entire Intersection Begins at 04:00 PM											
04:00 PM	152	0	57	**209**	0	0	0	0	0	0	**209**
04:15 PM	140	0	53	193	0	0	0	0	0	0	193
04:30 PM	139	0	**60**	199	0	0	0	0	0	0	199
04:45 PM	**153**	0	30	183	0	0	0	0	0	0	183
Total Volume	584	0	200	784	0	0	0	0	0	0	784
% App. Total	74.5	0	25.5		0	0		0	0		
PHF	.954	.000	.833	.938	.000	.000	.000	.000	.000	.000	.938
Cars	575	0	198	773	0	0	0	0	0	0	773
% Cars	98.5	0	99.0	98.6	0	0	0	0	0	0	98.6
Heavy Vehicles	9	0	2	11	0	0	0	0	0	0	11
% Heavy Vehicles	1.5	0	1.0	1.4	0	0	0	0	0	0	1.4

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N: Route 1 SB Offramp
E/W: Revere Beach Parkway (Route 16)
City, State: Chelsea, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 HH
Site Code : 10271
Start Date : 6/11/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Route 1 SB Offramp From North			Revere Beach Parkway (Route 16) WB From East		Revere Beach Parkway (Route 16) WB From West		
Start Time	Right	Left	To Left Lane UTurn	Right	Thru	Thru	Left	Int. Total
03:30 PM	4	0	1	0	0	0	0	5
03:45 PM	5	0	1	0	0	0	0	6
Total	9	0	2	0	0	0	0	11
04:00 PM	3	0	1	0	0	0	0	4
04:15 PM	3	0	0	0	0	0	0	3
04:30 PM	2	0	1	0	0	0	0	3
04:45 PM	1	0	0	0	0	0	0	1
Total	9	0	2	0	0	0	0	11
05:00 PM	4	0	2	0	0	0	0	6
05:15 PM	2	0	0	0	0	0	0	2
05:30 PM	2	0	1	0	0	0	0	3
05:45 PM	0	0	0	0	0	0	0	0
Total	8	0	3	0	0	0	0	11
06:00 PM	2	0	0	0	0	0	0	2
06:15 PM	2	0	0	0	0	0	0	2
Grand Total	30	0	7	0	0	0	0	37
Apprch %	81.1	0	18.9	0	0	0	0	
Total %	81.1	0	18.9	0	0	0	0	

	Route 1 SB Offramp From North				Revere Beach Parkway (Route 16) WB From East			Revere Beach Parkway (Route 16) WB From West			
Start Time	Right	Left	To Left Lane UTurn	App. Total	Right	Thru	App. Total	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1											
Peak Hour for Entire Intersection Begins at 03:30 PM											
03:30 PM	4	0	**1**	5	0	0	0	0	0	0	5
03:45 PM	**5**	0	1	**6**	0	0	0	0	0	0	**6**
04:00 PM	3	0	1	4	0	0	0	0	0	0	4
04:15 PM	3	0	0	3	0	0	0	0	0	0	3
Total Volume	15	0	3	18	0	0	0	0	0	0	18
% App. Total	83.3	0	16.7		0	0		0	0		
PHF	.750	.000	.750	.750	.000	.000	.000	.000	.000	.000	.750

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N: Route 1 SB Offramp
E/W: Revere Beach Parkway (Route 16) WB
City, State: Chelsea, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 HHH
Site Code : 10271
Start Date : 6/12/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Route 1 SB Offramp From North			Revere Beach Parkway (Route 16) WB From East		Revere Beach Parkway (Route 16) WB From West		
Start Time	Right	Left	To Left Lane UTurn	Right	Thru	Thru	Left	Int. Total
02:30 PM	222	0	57	0	0	0	0	279
02:45 PM	119	0	20	0	0	0	0	139
Total	341	0	77	0	0	0	0	418
03:00 PM	162	0	29	0	0	0	0	191
03:15 PM	161	0	44	0	0	0	0	205
03:30 PM	239	0	38	0	0	0	0	277
03:45 PM	222	0	36	0	0	0	0	258
Total	784	0	147	0	0	0	0	931
04:00 PM	227	0	36	0	0	0	0	263
04:15 PM	185	0	31	0	0	0	0	216
04:30 PM	209	0	34	0	0	0	0	243
04:45 PM	186	0	35	0	0	0	0	221
Total	807	0	136	0	0	0	0	943
05:00 PM	194	0	49	0	0	0	0	243
05:15 PM	201	0	34	0	0	0	0	235
Grand Total	2327	0	443	0	0	0	0	2770
Apprch %	84	0	16	0	0	0	0	
Total %	84	0	16	0	0	0	0	
Cars	2323	0	443	0	0	0	0	2766
% Cars	99.8	0	100	0	0	0	0	99.9
Heavy Vehicles	4	0	0	0	0	0	0	4
% Heavy Vehicles	0.2	0	0	0	0	0	0	0.1

	Route 1 SB Offramp From North				Revere Beach Parkway (Route 16) WB From East			Revere Beach Parkway (Route 16) WB From West			
Start Time	Right	Left	To Left Lane UTurn	App. Total	Right	Thru	App. Total	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1											
Peak Hour for Entire Intersection Begins at 03:30 PM											
03:30 PM	**239**	0	**38**	**277**	0	0	0	0	0	0	**277**
03:45 PM	222	0	36	258	0	0	0	0	0	0	258
04:00 PM	227	0	36	263	0	0	0	0	0	0	263
04:15 PM	185	0	31	216	0	0	0	0	0	0	216
Total Volume	873	0	141	1014	0	0	0	0	0	0	1014
% App. Total	86.1	0	13.9		0	0		0	0		
PHF	.913	.000	.928	.915	.000	.000	.000	.000	.000	.000	.915
Cars	870	0	141	1011	0	0	0	0	0	0	1011
% Cars	99.7	0	100	99.7	0	0	0	0	0	0	99.7
Heavy Vehicles	3	0	0	3	0	0	0	0	0	0	3
% Heavy Vehicles	0.3	0	0	0.3	0	0	0	0	0	0	0.3

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N: Route 1 SB Offramp
E/W: Revere Beach Parkway (Route 16) WB
City, State: Chelsea, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 HHH
Site Code : 10271
Start Date : 6/12/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Route 1 SB Offramp From North			Revere Beach Parkway (Route 16) WB From East		Revere Beach Parkway (Route 16) WB From West		
Start Time	Right	Left	To Left Lane UTurn	Right	Thru	Thru	Left	Int. Total
02:30 PM	0	0	0	0	0	0	0	0
02:45 PM	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0
03:00 PM	0	0	0	0	0	0	0	0
03:15 PM	1	0	0	0	0	0	0	1
03:30 PM	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0	0
Total	1	0	0	0	0	0	0	1
04:00 PM	1	0	0	0	0	0	0	1
04:15 PM	2	0	0	0	0	0	0	2
04:30 PM	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0
Total	3	0	0	0	0	0	0	3
05:00 PM	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0
Grand Total	4	0	0	0	0	0	0	4
Apprch %	100	0	0	0	0	0	0	
Total %	100	0	0	0	0	0	0	

	Route 1 SB Offramp From North				Revere Beach Parkway (Route 16) WB From East			Revere Beach Parkway (Route 16) WB From West			
Start Time	Right	Left	To Left Lane UTurn	App. Total	Right	Thru	App. Total	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1											
Peak Hour for Entire Intersection Begins at 03:30 PM											
03:30 PM	0	0	0	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0	0	0	0	0
04:00 PM	1	0	0	1	0	0	0	0	0	0	1
04:15 PM	**2**	0	0	**2**	0	0	0	0	0	0	**2**
Total Volume	3	0	0	3	0	0	0	0	0	0	3
% App. Total	100	0	0		0	0		0	0		
PHF	.375	.000	.000	.375	.000	.000	.000	.000	.000	.000	.375

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N: Route 1 SB Onramp
E/W: Revere Beach Parkway (Route 16) WB
City, State: Chelsea, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 II
Site Code : 10271
Start Date : 6/11/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Route 1 SB Onramp From North		Revere Beach Parkway (Route 16) WB From East			Revere Beach Parkway (Route 16) WB From West		
Start Time	Right	Left	Right	Thru (Right Lane)	Thru (Left Lane)	Thru	Left	Int. Total
03:30 PM	0	0	43	198	138	0	0	379
03:45 PM	0	0	34	188	124	0	0	346
Total	0	0	77	386	262	0	0	725
04:00 PM	0	0	31	204	132	0	0	367
04:15 PM	0	0	32	190	130	0	0	352
04:30 PM	0	0	59	194	112	0	0	365
04:45 PM	0	0	21	172	117	0	0	310
Total	0	0	143	760	491	0	0	1394
05:00 PM	0	0	39	164	131	0	0	334
05:15 PM	0	0	44	110	157	0	0	311
05:30 PM	0	0	38	158	118	0	0	314
05:45 PM	0	0	35	155	116	0	0	306
Total	0	0	156	587	522	0	0	1265
06:00 PM	0	0	35	181	114	0	0	330
06:15 PM	0	0	24	166	110	0	0	300
Grand Total	0	0	435	2080	1499	0	0	4014
Apprch %	0	0	10.8	51.8	37.3	0	0	
Total %	0	0	10.8	51.8	37.3	0	0	
Cars	0	0	423	2017	1474	0	0	3914
% Cars	0	0	97.2	97	98.3	0	0	97.5
Heavy Vehicles	0	0	12	63	25	0	0	100
% Heavy Vehicles	0	0	2.8	3	1.7	0	0	2.5

	Route 1 SB Onramp From North			Revere Beach Parkway (Route 16) WB From East				Revere Beach Parkway (Route 16) WB From West			
Start Time	Right	Left	App. Total	Right	Thru (Right Lane)	Thru (Left Lane)	App. Total	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1											
Peak Hour for Entire Intersection Begins at 03:30 PM											
03:30 PM	0	0	0	**43**	198	**138**	**379**	0	0	0	**379**
03:45 PM	0	0	0	34	188	124	346	0	0	0	346
04:00 PM	0	0	0	31	**204**	132	367	0	0	0	367
04:15 PM	0	0	0	32	190	130	352	0	0	0	352
Total Volume	0	0	0	140	780	524	1444	0	0	0	1444
% App. Total	0	0		9.7	54	36.3		0	0		
PHF	.000	.000	.000	.814	.956	.949	.953	.000	.000	.000	.953
Cars	0	0	0	135	745	507	1387	0	0	0	1387
% Cars	0	0	0	96.4	95.5	96.8	96.1	0	0	0	96.1
Heavy Vehicles	0	0	0	5	35	17	57	0	0	0	57
% Heavy Vehicles	0	0	0	3.6	4.5	3.2	3.9	0	0	0	3.9

PRECISION
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N: Route 1 SB Onramp
E/W: Revere Beach Parkway (Route 16) WB
City, State: Chelsea, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 II
Site Code : 10271
Start Date : 6/11/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Route 1 SB Onramp From North		Revere Beach Parkway (Route 16) WB From East			Revere Beach Parkway (Route 16) WB From West		
Start Time	Right	Left	Right	Thru (Right Lane)	Thru (Left Lane)	Thru	Left	Int. Total
03:30 PM	0	0	2	16	3	0	0	21
03:45 PM	0	0	1	6	5	0	0	12
Total	0	0	3	22	8	0	0	33
04:00 PM	0	0	0	7	5	0	0	12
04:15 PM	0	0	2	6	4	0	0	12
04:30 PM	0	0	1	4	2	0	0	7
04:45 PM	0	0	1	9	0	0	0	10
Total	0	0	4	26	11	0	0	41
05:00 PM	0	0	2	1	1	0	0	4
05:15 PM	0	0	2	2	3	0	0	7
05:30 PM	0	0	0	2	1	0	0	3
05:45 PM	0	0	0	5	0	0	0	5
Total	0	0	4	10	5	0	0	19
06:00 PM	0	0	0	3	0	0	0	3
06:15 PM	0	0	1	2	1	0	0	4
Grand Total	0	0	12	63	25	0	0	100
Apprch %	0	0	12	63	25	0	0	
Total %	0	0	12	63	25	0	0	

	Route 1 SB Onramp From North			Revere Beach Parkway (Route 16) WB From East				Revere Beach Parkway (Route 16) WB From West			
Start Time	Right	Left	App. Total	Right	Thru (Right Lane)	Thru (Left Lane)	App. Total	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1											
Peak Hour for Entire Intersection Begins at 03:30 PM											
03:30 PM	0	0	0	**2**	**16**	3	**21**	0	0	0	**21**
03:45 PM	0	0	0	1	6	**5**	12	0	0	0	12
04:00 PM	0	0	0	0	7	5	12	0	0	0	12
04:15 PM	0	0	0	2	6	4	12	0	0	0	12
Total Volume	0	0	0	5	35	17	57	0	0	0	57
% App. Total	0	0		8.8	61.4	29.8		0	0		
PHF	.000	.000	.000	.625	.547	.850	.679	.000	.000	.000	.679

PRECISION
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N: Route 1 SB Onramp
E/W: Revere Beach Parkway (Route 16) WB
City, State: Chelsea, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 III
Site Code : 10271
Start Date : 6/12/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Route 1 SB Onramp From North		Revere Beach Parkway (Route 16) WB From East			Revere Beach Parkway (Route 16) WB From West		
Start Time	Right	Left	Right	Thru (Right lane)	Thru (Left Lane)	Thru	Left	Int. Total
02:30 PM	0	0	42	157	123	0	0	322
02:45 PM	0	0	36	146	112	0	0	294
Total	0	0	78	303	235	0	0	616
03:00 PM	0	0	42	130	111	0	0	283
03:15 PM	0	0	34	144	102	0	0	280
03:30 PM	0	0	42	139	136	0	0	317
03:45 PM	0	0	33	138	127	0	0	298
Total	0	0	151	551	476	0	0	1178
04:00 PM	0	0	42	165	130	0	0	337
04:15 PM	0	0	24	150	110	0	0	284
04:30 PM	0	0	28	153	131	0	0	312
04:45 PM	0	0	39	148	126	0	0	313
Total	0	0	133	616	497	0	0	1246
05:00 PM	0	0	36	167	120	0	0	323
05:15 PM	0	0	34	148	115	0	0	297
Grand Total	0	0	432	1785	1443	0	0	3660
Apprch %	0	0	11.8	48.8	39.4	0	0	
Total %	0	0	11.8	48.8	39.4	0	0	
Cars	0	0	428	1738	1431	0	0	3597
% Cars	0	0	99.1	97.4	99.2	0	0	98.3
Heavy Vehicles	0	0	4	47	12	0	0	63
% Heavy Vehicles	0	0	0.9	2.6	0.8	0	0	1.7

	Route 1 SB Onramp From North			Revere Beach Parkway (Route 16) WB From East				Revere Beach Parkway (Route 16) WB From West			
Start Time	Right	Left	App. Total	Right	Thru (Right lane)	Thru (Left Lane)	App. Total	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1											
Peak Hour for Entire Intersection Begins at 04:00 PM											
04:00 PM	0	0	0	**42**	**165**	130	**337**	0	0	0	**337**
04:15 PM	0	0	0	24	150	110	284	0	0	0	284
04:30 PM	0	0	0	28	153	**131**	312	0	0	0	312
04:45 PM	0	0	0	39	148	126	313	0	0	0	313
Total Volume	0	0	0	133	616	497	1246	0	0	0	1246
% App. Total	0	0		10.7	49.4	39.9		0	0		
PHF	.000	.000	.000	.792	.933	.948	.924	.000	.000	.000	.924
Cars	0	0	0	132	601	492	1225	0	0	0	1225
% Cars	0	0	0	99.2	97.6	99.0	98.3	0	0	0	98.3
Heavy Vehicles	0	0	0	1	15	5	21	0	0	0	21
% Heavy Vehicles	0	0	0	0.8	2.4	1.0	1.7	0	0	0	1.7

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N: Route 1 SB Onramp
E/W: Revere Beach Parkway (Route 16) WB
City, State: Chelsea, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 III
Site Code : 10271
Start Date : 6/12/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Route 1 SB Onramp From North		Revere Beach Parkway (Route 16) WB From East			Revere Beach Parkway (Route 16) WB From West		
Start Time	Right	Left	Right	Thru (Right lane)	Thru (Left Lane)	Thru	Left	Int. Total
02:30 PM	0	0	0	9	0	0	0	9
02:45 PM	0	0	0	4	1	0	0	5
Total	0	0	0	13	1	0	0	14
03:00 PM	0	0	0	5	1	0	0	6
03:15 PM	0	0	2	3	2	0	0	7
03:30 PM	0	0	0	3	1	0	0	4
03:45 PM	0	0	0	2	1	0	0	3
Total	0	0	2	13	5	0	0	20
04:00 PM	0	0	0	3	3	0	0	6
04:15 PM	0	0	1	3	1	0	0	5
04:30 PM	0	0	0	8	1	0	0	9
04:45 PM	0	0	0	1	0	0	0	1
Total	0	0	1	15	5	0	0	21
05:00 PM	0	0	1	2	1	0	0	4
05:15 PM	0	0	0	4	0	0	0	4
Grand Total	0	0	4	47	12	0	0	63
Apprch %	0	0	6.3	74.6	19	0	0	
Total %	0	0	6.3	74.6	19	0	0	

	Route 1 SB Onramp From North			Revere Beach Parkway (Route 16) WB From East				Revere Beach Parkway (Route 16) WB From West			
Start Time	Right	Left	App. Total	Right	Thru (Right lane)	Thru (Left Lane)	App. Total	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1											
Peak Hour for Entire Intersection Begins at 02:30 PM											
02:30 PM	0	0	0	0	**9**	0	**9**	0	0	0	**9**
02:45 PM	0	0	0	0	4	1	5	0	0	0	5
03:00 PM	0	0	0	0	5	1	6	0	0	0	6
03:15 PM	0	0	0	**2**	3	**2**	7	0	0	0	7
Total Volume	0	0	0	2	21	4	27	0	0	0	27
% App. Total	0	0		7.4	77.8	14.8		0	0		
PHF	.000	.000	.000	.250	.583	.500	.750	.000	.000	.000	.750

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S: Route 1 NB Onramp
E/W: Revere Beach Parkway (Route 16)
City, State: Chelsea, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 JJ
Site Code : 10271
Start Date : 6/11/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Revere Beach Parkway (Route 16) EB From East		Route 1 NB Onramp From South		Revere Beach Parkway (Route 16) EB From West				
Start Time	Thru	Left	Right	Left	Right	Thru (Right Lane)	Thru (Middle Lane)	Thru (Left Lane)	Int. Total
03:30 PM	0	0	0	0	154	65	150	66	435
03:45 PM	0	0	0	0	142	59	164	82	447
Total	0	0	0	0	296	124	314	148	882
04:00 PM	0	0	0	0	144	74	140	72	430
04:15 PM	0	0	0	0	136	72	165	87	460
04:30 PM	0	0	0	0	119	74	138	82	413
04:45 PM	0	0	0	0	90	75	123	78	366
Total	0	0	0	0	489	295	566	319	1669
05:00 PM	0	0	0	0	128	77	142	89	436
05:15 PM	0	0	0	0	127	77	148	93	445
05:30 PM	0	0	0	0	134	92	159	110	495
05:45 PM	0	0	0	0	114	93	165	84	456
Total	0	0	0	0	503	339	614	376	1832
06:00 PM	0	0	0	0	119	64	135	78	396
06:15 PM	0	0	0	0	141	71	140	76	428
Grand Total	0	0	0	0	1548	893	1769	997	5207
Apprch %	0	0	0	0	29.7	17.1	34	19.1	
Total %	0	0	0	0	29.7	17.1	34	19.1	
Cars	0	0	0	0	1530	866	1730	994	5120
% Cars	0	0	0	0	98.8	97	97.8	99.7	98.3
Heavy Vehicles	0	0	0	0	18	27	39	3	87
% Heavy Vehicles	0	0	0	0	1.2	3	2.2	0.3	1.7

	Revere Beach Parkway (Route 16) EB From East			Route 1 NB Onramp From South			Revere Beach Parkway (Route 16) EB From West					
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru (Right Lane)	Thru (Middle Lane)	Thru (Left Lane)	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak 1 of 1												
Peak Hour for Entire Intersection Begins at 03:30 PM												
03:30 PM	0	0	0	0	0	0	**154**	65	150	66	435	435
03:45 PM	0	0	0	0	0	0	142	59	164	82	447	447
04:00 PM	0	0	0	0	0	0	144	**74**	140	72	430	430
04:15 PM	0	0	0	0	0	0	136	72	**165**	**87**	**460**	**460**
Total Volume	0	0	0	0	0	0	576	270	619	307	1772	1772
% App. Total	0	0		0	0		32.5	15.2	34.9	17.3		
PHF	.000	.000	.000	.000	.000	.000	.935	.912	.938	.882	.963	.963
Cars	0	0	0	0	0	0	563	257	605	304	1729	1729
% Cars	0	0	0	0	0	0	97.7	95.2	97.7	99.0	97.6	97.6
Heavy Vehicles	0	0	0	0	0	0	13	13	14	3	43	43
% Heavy Vehicles	0	0	0	0	0	0	2.3	4.8	2.3	1.0	2.4	2.4

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S: Route 1 NB Onramp
E/W: Revere Beach Parkway (Route 16)
City, State: Chelsea, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 JJ
Site Code : 10271
Start Date : 6/11/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Revere Beach Parkway (Route 16) EB From East		Route 1 NB Onramp From South		Revere Beach Parkway (Route 16) EB From West				
Start Time	Thru	Left	Right	Left	Right	Thru (Right Lane)	Thru (Middle Lane)	Thru (Left Lane)	Int. Total
03:30 PM	0	0	0	0	4	3	2	0	9
03:45 PM	0	0	0	0	4	6	9	3	22
Total	0	0	0	0	8	9	11	3	31
04:00 PM	0	0	0	0	4	1	0	0	5
04:15 PM	0	0	0	0	1	3	3	0	7
04:30 PM	0	0	0	0	1	0	5	0	6
04:45 PM	0	0	0	0	0	1	2	0	3
Total	0	0	0	0	6	5	10	0	21
05:00 PM	0	0	0	0	1	4	2	0	7
05:15 PM	0	0	0	0	2	2	4	0	8
05:30 PM	0	0	0	0	0	1	5	0	6
05:45 PM	0	0	0	0	1	2	3	0	6
Total	0	0	0	0	4	9	14	0	27
06:00 PM	0	0	0	0	0	2	2	0	4
06:15 PM	0	0	0	0	0	2	2	0	4
Grand Total	0	0	0	0	18	27	39	3	87
Apprch %	0	0	0	0	20.7	31	44.8	3.4	
Total %	0	0	0	0	20.7	31	44.8	3.4	

	Revere Beach Parkway (Route 16) EB From East			Route 1 NB Onramp From South			Revere Beach Parkway (Route 16) EB From West					
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru (Right Lane)	Thru (Middle Lane)	Thru (Left Lane)	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak 1 of 1												
Peak Hour for Entire Intersection Begins at 03:30 PM												
03:30 PM	0	0	0	0	0	0	**4**	3	2	0	9	9
03:45 PM	0	0	0	0	0	0	4	**6**	**9**	**3**	**22**	**22**
04:00 PM	0	0	0	0	0	0	4	1	0	0	5	5
04:15 PM	0	0	0	0	0	0	1	3	3	0	7	7
Total Volume	0	0	0	0	0	0	13	13	14	3	43	43
% App. Total	0	0		0	0		30.2	30.2	32.6	7		
PHF	.000	.000	.000	.000	.000	.000	.813	.542	.389	.250	.489	.489

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S: Route 1 NB Onramp
E/W: Revere Beach Parkway (Route 16) EB
City, State: Chelsea, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 JJJ
Site Code : 10271
Start Date : 6/12/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Revere Beach Parkway (Route 16) EB From East		Route 1 NB Onramp From South		Revere Beach Parkway (Route 16) EB From West				
Start Time	Thru	Left	Right	Left	Right	Thru (Right Lane)	Thru (Middle Lane)	Thru (Left Lane)	Int. Total
02:30 PM	0	0	0	0	144	52	167	53	416
02:45 PM	0	0	0	0	143	53	115	53	364
Total	0	0	0	0	287	105	282	106	780
03:00 PM	0	0	0	0	149	52	99	60	360
03:15 PM	0	0	0	0	106	48	118	59	331
03:30 PM	0	0	0	0	154	73	131	66	424
03:45 PM	0	0	0	0	153	60	150	62	425
Total	0	0	0	0	562	233	498	247	1540
04:00 PM	0	0	0	0	147	58	126	65	396
04:15 PM	0	0	0	0	137	53	119	50	359
04:30 PM	0	0	0	0	162	56	118	60	396
04:45 PM	0	0	0	0	150	57	111	61	379
Total	0	0	0	0	596	224	474	236	1530
05:00 PM	0	0	0	0	172	54	123	64	413
05:15 PM	0	0	0	0	145	60	137	54	396
Grand Total	0	0	0	0	1762	676	1514	707	4659
Apprch %	0	0	0	0	37.8	14.5	32.5	15.2	
Total %	0	0	0	0	37.8	14.5	32.5	15.2	
Cars	0	0	0	0	1747	667	1493	703	4610
% Cars	0	0	0	0	99.1	98.7	98.6	99.4	98.9
Heavy Vehicles	0	0	0	0	15	9	21	4	49
% Heavy Vehicles	0	0	0	0	0.9	1.3	1.4	0.6	1.1

	Revere Beach Parkway (Route 16) EB From East			Route 1 NB Onramp From South			Revere Beach Parkway (Route 16) EB From West					
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru (Right Lane)	Thru (Middle Lane)	Thru (Left Lane)	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1												
Peak Hour for Entire Intersection Begins at 03:30 PM												
03:30 PM	0	0	0	0	0	0	**154**	**73**	131	**66**	424	424
03:45 PM	0	0	0	0	0	0	153	60	**150**	62	**425**	**425**
04:00 PM	0	0	0	0	0	0	147	58	126	65	396	396
04:15 PM	0	0	0	0	0	0	137	53	119	50	359	359
Total Volume	0	0	0	0	0	0	591	244	526	243	1604	1604
% App. Total	0	0		0	0		36.8	15.2	32.8	15.1		
PHF	.000	.000	.000	.000	.000	.000	.959	.836	.877	.920	.944	.944
Cars	0	0	0	0	0	0	587	242	520	243	1592	1592
% Cars	0	0	0	0	0	0	99.3	99.2	98.9	100	99.3	99.3
Heavy Vehicles	0	0	0	0	0	0	4	2	6	0	12	12
% Heavy Vehicles	0	0	0	0	0	0	0.7	0.8	1.1	0	0.7	0.7

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S: Route 1 NB Onramp
E/W: Revere Beach Parkway (Route 16) EB
City, State: Chelsea, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 JJJ
Site Code : 10271
Start Date : 6/12/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Revere Beach Parkway (Route 16) EB From East		Route 1 NB Onramp From South		Revere Beach Parkway (Route 16) EB From West				
Start Time	Thru	Left	Right	Left	Right	Thru (Right Lane)	Thru (Middle Lane)	Thru (Left Lane)	Int. Total
02:30 PM	0	0	0	0	3	1	1	1	6
02:45 PM	0	0	0	0	2	0	5	0	7
Total	0	0	0	0	5	1	6	1	13
03:00 PM	0	0	0	0	0	0	1	0	1
03:15 PM	0	0	0	0	0	1	2	0	3
03:30 PM	0	0	0	0	1	1	1	0	3
03:45 PM	0	0	0	0	1	1	0	0	2
Total	0	0	0	0	2	3	4	0	9
04:00 PM	0	0	0	0	1	0	4	0	5
04:15 PM	0	0	0	0	1	0	1	0	2
04:30 PM	0	0	0	0	1	0	3	0	4
04:45 PM	0	0	0	0	1	4	1	1	7
Total	0	0	0	0	4	4	9	1	18
05:00 PM	0	0	0	0	1	1	2	1	5
05:15 PM	0	0	0	0	3	0	0	1	4
Grand Total	0	0	0	0	15	9	21	4	49
Apprch %	0	0	0	0	30.6	18.4	42.9	8.2	
Total %	0	0	0	0	30.6	18.4	42.9	8.2	

	Revere Beach Parkway (Route 16) EB From East			Route 1 NB Onramp From South			Revere Beach Parkway (Route 16) EB From West					
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru (Right Lane)	Thru (Middle Lane)	Thru (Left Lane)	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1												
Peak Hour for Entire Intersection Begins at 04:30 PM												
04:30 PM	0	0	0	0	0	0	1	0	**3**	0	4	4
04:45 PM	0	0	0	0	0	0	1	**4**	1	**1**	**7**	**7**
05:00 PM	0	0	0	0	0	0	1	1	2	1	5	5
05:15 PM	0	0	0	0	0	0	**3**	0	0	1	4	4
Total Volume	0	0	0	0	0	0	6	5	6	3	20	20
% App. Total	0	0		0	0		30	25	30	15		
PHF	.000	.000	.000	.000	.000	.000	.500	.313	.500	.750	.714	.714

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S: Route 1 NB Offramp
E/W: Revere Beach Parkway (Route 16)
City, State: Chelsea, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 KK
Site Code : 10271
Start Date : 6/11/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Revere Beach Parkway (Route 16) EB From East		Route 1 NB Offramp From South		Revere Beach Parkway (Route 16) EB From West			
Start Time	Thru	Left	Right	Left	Thru (Right Lane)	Thru (Middle Lane)	Thru (Left Lane)	Int. Total
03:30 PM	0	0	178	0	66	137	71	452
03:45 PM	0	0	192	0	54	155	88	489
Total	0	0	370	0	120	292	159	941
04:00 PM	0	0	217	0	74	133	71	495
04:15 PM	0	0	189	0	70	149	90	498
04:30 PM	0	0	295	0	70	124	97	586
04:45 PM	0	0	255	0	78	136	83	552
Total	0	0	956	0	292	542	341	2131
05:00 PM	0	0	298	0	73	150	86	607
05:15 PM	0	0	284	0	77	135	97	593
05:30 PM	0	0	226	0	113	158	119	616
05:45 PM	0	0	199	0	92	143	73	507
Total	0	0	1007	0	355	586	375	2323
06:00 PM	0	0	149	0	73	125	68	415
06:15 PM	0	0	91	0	62	123	76	352
Grand Total	0	0	2573	0	902	1668	1019	6162
Apprch %	0	0	100	0	25.1	46.5	28.4	
Total %	0	0	41.8	0	14.6	27.1	16.5	
Cars	0	0	2520	0	870	1629	1015	6034
% Cars	0	0	97.9	0	96.5	97.7	99.6	97.9
Heavy Vehicles	0	0	53	0	32	39	4	128
% Heavy Vehicles	0	0	2.1	0	3.5	2.3	0.4	2.1

	Revere Beach Parkway (Route 16) EB From East			Route 1 NB Offramp From South			Revere Beach Parkway (Route 16) EB From West				
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Thru (Right Lane)	Thru (Middle Lane)	Thru (Left Lane)	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1											
Peak Hour for Entire Intersection Begins at 04:45 PM											
04:45 PM	0	0	0	255	0	255	78	136	83	297	552
05:00 PM	0	0	0	**298**	0	**298**	73	150	86	309	607
05:15 PM	0	0	0	284	0	284	77	135	97	309	593
05:30 PM	0	0	0	226	0	226	**113**	**158**	**119**	**390**	**616**
Total Volume	0	0	0	1063	0	1063	341	579	385	1305	2368
% App. Total	0	0		100	0		26.1	44.4	29.5		
PHF	.000	.000	.000	.892	.000	.892	.754	.916	.809	.837	.961
Cars	0	0	0	1047	0	1047	334	565	385	1284	2331
% Cars	0	0	0	98.5	0	98.5	97.9	97.6	100	98.4	98.4
Heavy Vehicles	0	0	0	16	0	16	7	14	0	21	37
% Heavy Vehicles	0	0	0	1.5	0	1.5	2.1	2.4	0	1.6	1.6

PRECISION DATA INDUSTRIES, LLC
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S: Route 1 NB Offramp
E/W: Revere Beach Parkway (Route 16)
City, State: Chelsea, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 KK
Site Code : 10271
Start Date : 6/11/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Revere Beach Parkway (Route 16) EB From East		Route 1 NB Offramp From South		Revere Beach Parkway (Route 16) EB From West			
Start Time	Thru	Left	Right	Left	Thru (Right Lane)	Thru (Middle Lane)	Thru (Left Lane)	Int. Total
03:30 PM	0	0	7	0	3	3	2	15
03:45 PM	0	0	9	0	6	8	1	24
Total	0	0	16	0	9	11	3	39
04:00 PM	0	0	6	0	2	0	0	8
04:15 PM	0	0	1	0	2	3	0	6
04:30 PM	0	0	6	0	1	4	1	12
04:45 PM	0	0	6	0	1	2	0	9
Total	0	0	19	0	6	9	1	35
05:00 PM	0	0	4	0	3	4	0	11
05:15 PM	0	0	2	0	2	4	0	8
05:30 PM	0	0	4	0	1	4	0	9
05:45 PM	0	0	3	0	4	2	0	9
Total	0	0	13	0	10	14	0	37
06:00 PM	0	0	3	0	2	2	0	7
06:15 PM	0	0	2	0	5	3	0	10
Grand Total	0	0	53	0	32	39	4	128
Apprch %	0	0	100	0	42.7	52	5.3	
Total %	0	0	41.4	0	25	30.5	3.1	

	Revere Beach Parkway (Route 16) EB From East			Route 1 NB Offramp From South			Revere Beach Parkway (Route 16) EB From West				
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Thru (Right Lane)	Thru (Middle Lane)	Thru (Left Lane)	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1											
Peak Hour for Entire Intersection Begins at 03:30 PM											
03:30 PM	0	0	0	7	0	7	3	3	**2**	8	15
03:45 PM	0	0	0	**9**	0	**9**	**6**	**8**	1	**15**	**24**
04:00 PM	0	0	0	6	0	6	2	0	0	2	8
04:15 PM	0	0	0	1	0	1	2	3	0	5	6
Total Volume	0	0	0	23	0	23	13	14	3	30	53
% App. Total	0	0		100	0		43.3	46.7	10		
PHF	.000	.000	.000	.639	.000	.639	.542	.438	.375	.500	.552

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S: Route 1 NB Offramp
E/W: Revere Beach Parkway (Route 16) EB
City, State: Chelsea, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 KKK
Site Code : 10271
Start Date : 6/12/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Revere Beach Parkway (Route 16) EB From East		Route 1NB Offramp From South		Revere Beach Parkway (Route 16) EB From West			
Start Time	Thru	Left	Right	Left	Thru (Right Lane)	Thru (Middle Lane)	Thru (Left Lane)	Int. Total
02:30 PM	0	0	73	0	30	89	26	218
02:45 PM	1	0	114	0	61	120	58	354
Total	1	0	187	0	91	209	84	572
03:00 PM	0	0	92	0	54	101	58	305
03:15 PM	0	0	115	0	60	131	69	375
03:30 PM	0	0	123	0	69	131	72	395
03:45 PM	0	0	118	0	70	141	67	396
Total	0	0	448	0	253	504	266	1471
04:00 PM	0	0	105	0	58	122	68	353
04:15 PM	0	0	127	0	58	121	52	358
04:30 PM	0	0	88	0	58	115	69	330
04:45 PM	0	0	104	0	55	119	65	343
Total	0	0	424	0	229	477	254	1384
05:00 PM	0	0	97	0	71	131	76	375
05:15 PM	0	0	103	0	72	137	57	369
Grand Total	1	0	1259	0	716	1458	737	4171
Apprch %	100	0	100	0	24.6	50.1	25.3	
Total %	0	0	30.2	0	17.2	35	17.7	
Cars	1	0	1247	0	710	1437	734	4129
% Cars	100	0	99	0	99.2	98.6	99.6	99
Heavy Vehicles	0	0	12	0	6	21	3	42
% Heavy Vehicles	0	0	1	0	0.8	1.4	0.4	1

	Revere Beach Parkway (Route 16) EB From East			Route 1NB Offramp From South			Revere Beach Parkway (Route 16) EB From West				
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Thru (Right Lane)	Thru (Middle Lane)	Thru (Left Lane)	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1											
Peak Hour for Entire Intersection Begins at 03:15 PM											
03:15 PM	0	0	0	115	0	115	60	131	69	260	375
03:30 PM	0	0	0	**123**	0	**123**	69	131	**72**	272	395
03:45 PM	0	0	0	118	0	118	**70**	**141**	67	**278**	**396**
04:00 PM	0	0	0	105	0	105	58	122	68	248	353
Total Volume	0	0	0	461	0	461	257	525	276	1058	1519
% App. Total	0	0		100	0		24.3	49.6	26.1		
PHF	.000	.000	.000	.937	.000	.937	.918	.931	.958	.951	.959
Cars	0	0	0	455	0	455	256	518	276	1050	1505
% Cars	0	0	0	98.7	0	98.7	99.6	98.7	100	99.2	99.1
Heavy Vehicles	0	0	0	6	0	6	1	7	0	8	14
% Heavy Vehicles	0	0	0	1.3	0	1.3	0.4	1.3	0	0.8	0.9

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S: Route 1 NB Offramp
E/W: Revere Beach Parkway (Route 16) EB
City, State: Chelsea, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 KKK
Site Code : 10271
Start Date : 6/12/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Revere Beach Parkway (Route 16) EB From East		Route 1NB Offramp From South		Revere Beach Parkway (Route 16) EB From West			
Start Time	Thru	Left	Right	Left	Thru (Right Lane)	Thru (Middle Lane)	Thru (Left Lane)	Int. Total
02:30 PM	0	0	0	0	1	1	1	3
02:45 PM	0	0	1	0	0	5	0	6
Total	0	0	1	0	1	6	1	9
03:00 PM	0	0	0	0	1	1	0	2
03:15 PM	0	0	1	0	1	2	0	4
03:30 PM	0	0	4	0	0	2	0	6
03:45 PM	0	0	1	0	0	0	0	1
Total	0	0	6	0	2	5	0	13
04:00 PM	0	0	0	0	0	3	0	3
04:15 PM	0	0	2	0	0	1	0	3
04:30 PM	0	0	0	0	0	1	1	2
04:45 PM	0	0	0	0	2	3	0	5
Total	0	0	2	0	2	8	1	13
05:00 PM	0	0	1	0	1	2	0	4
05:15 PM	0	0	2	0	0	0	1	3
Grand Total	0	0	12	0	6	21	3	42
Apprch %	0	0	100	0	20	70	10	
Total %	0	0	28.6	0	14.3	50	7.1	

	Revere Beach Parkway (Route 16) EB From East			Route 1NB Offramp From South			Revere Beach Parkway (Route 16) EB From West				
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Thru (Right Lane)	Thru (Middle Lane)	Thru (Left Lane)	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1											
Peak Hour for Entire Intersection Begins at 02:45 PM											
02:45 PM	0	0	0	1	0	1	0	**5**	0	**5**	**6**
03:00 PM	0	0	0	0	0	0	**1**	1	0	2	2
03:15 PM	0	0	0	1	0	1	1	2	0	3	4
03:30 PM	0	0	0	**4**	0	**4**	0	2	0	2	6
Total Volume	0	0	0	6	0	6	2	10	0	12	18
% App. Total	0	0		100	0		16.7	83.3	0		
PHF	.000	.000	.000	.375	.000	.375	.500	.500	.000	.600	.750

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N/S: Webster Avenue
E/W: Revere Beach Parkway (Route 16)
City, State: Chelsea, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 BB
Site Code : 10271
Start Date : 6/11/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Webster Avenue From North			Revere Beach Parkway (Route 16) From East				Webster Avenue From South			Revere Beach Parkway (Route 16) From West				
Start Time	Right	Thru	Left	Right	Thru	Left	U-Turn	Right	Thru	Left	Right	Thru	Left	U-Turn	Int. Total
03:30 PM	34	34	42	4	406	36	48	42	52	68	29	340	0	0	1135
03:45 PM	36	52	39	1	344	40	43	36	77	84	46	324	0	0	1122
Total	70	86	81	5	750	76	91	78	129	152	75	664	0	0	2257
04:00 PM	32	49	43	0	359	26	59	33	66	60	38	316	0	0	1081
04:15 PM	40	43	44	1	372	38	59	28	77	52	41	314	0	0	1109
04:30 PM	34	42	35	3	341	32	37	32	89	68	34	315	0	0	1062
04:45 PM	30	45	40	2	323	18	38	26	95	82	49	309	0	0	1057
Total	136	179	162	6	1395	114	193	119	327	262	162	1254	0	0	4309
05:00 PM	39	51	44	6	302	34	39	37	97	90	35	280	0	0	1054
05:15 PM	23	48	40	9	308	29	46	31	86	62	43	347	0	0	1072
05:30 PM	29	48	37	6	339	23	48	39	113	66	36	377	0	0	1161
05:45 PM	26	39	41	1	323	33	54	24	85	67	51	350	0	2	1096
Total	117	186	162	22	1272	119	187	131	381	285	165	1354	0	2	4383
06:00 PM	34	41	43	3	330	29	40	22	83	73	36	283	0	0	1017
06:15 PM	28	42	39	1	265	32	48	26	86	59	32	282	2	0	942
Grand Total	385	534	487	37	4012	370	559	376	1006	831	470	3837	2	2	12908
Apprch %	27.4	38	34.6	0.7	80.6	7.4	11.2	17	45.5	37.6	10.9	89	0	0	
Total %	3	4.1	3.8	0.3	31.1	2.9	4.3	2.9	7.8	6.4	3.6	29.7	0	0	
Cars	374	530	477	35	3931	366	555	372	992	816	466	3757	0	2	12673
% Cars	97.1	99.3	97.9	94.6	98	98.9	99.3	98.9	98.6	98.2	99.1	97.9	0	100	98.2
Heavy Vehicles	11	4	10	2	81	4	4	4	14	15	4	80	2	0	235
% Heavy Vehicles	2.9	0.7	2.1	5.4	2	1.1	0.7	1.1	1.4	1.8	0.9	2.1	100	0	1.8

	Webster Avenue From North				Revere Beach Parkway (Route 16) From East					Webster Avenue From South				Revere Beach Parkway (Route 16) From West					
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 03:30 PM																			
03:30 PM	34	34	42	110	**4**	**406**	36	48	**494**	**42**	52	68	162	29	**340**	0	0	369	**1135**
03:45 PM	36	**52**	39	**127**	1	344	**40**	43	428	36	**77**	**84**	**197**	**46**	324	0	0	**370**	1122
04:00 PM	32	49	43	124	0	359	26	**59**	444	33	66	60	159	38	316	0	0	354	1081
04:15 PM	**40**	43	**44**	127	1	372	38	59	470	28	77	52	157	41	314	0	0	355	1109
Total Volume	142	178	168	488	6	1481	140	209	1836	139	272	264	675	154	1294	0	0	1448	4447
% App. Total	29.1	36.5	34.4		0.3	80.7	7.6	11.4		20.6	40.3	39.1		10.6	89.4	0	0		
PHF	.888	.856	.955	.961	.375	.912	.875	.886	.929	.827	.883	.786	.857	.837	.951	.000	.000	.978	.980
Cars	140	176	165	481	5	1430	139	206	1780	139	267	257	663	154	1254	0	0	1408	4332
% Cars	98.6	98.9	98.2	98.6	83.3	96.6	99.3	98.6	96.9	100	98.2	97.3	98.2	100	96.9	0	0	97.2	97.4
Heavy Vehicles	2	2	3	7	1	51	1	3	56	0	5	7	12	0	40	0	0	40	115
% Heavy Vehicles	1.4	1.1	1.8	1.4	16.7	3.4	0.7	1.4	3.1	0	1.8	2.7	1.8	0	3.1	0	0	2.8	2.6

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N/S: Webster Avenue
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City, State: Chelsea, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 BB
Site Code : 10271
Start Date : 6/11/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Webster Avenue From North			Revere Beach Parkway (Route 16) From East				Webster Avenue From South			Revere Beach Parkway (Route 16) From West				
Start Time	Right	Thru	Left	Right	Thru	Left	U-Turn	Right	Thru	Left	Right	Thru	Left	U-Turn	Int. Total
03:30 PM	0	1	1	0	21	0	0	0	0	0	0	11	0	0	34
03:45 PM	0	0	1	0	14	0	1	0	3	2	0	16	0	0	37
Total	0	1	2	0	35	0	1	0	3	2	0	27	0	0	71
04:00 PM	2	1	0	0	7	1	0	0	2	1	0	7	0	0	21
04:15 PM	0	0	1	1	9	0	2	0	0	4	0	6	0	0	23
04:30 PM	1	0	1	0	2	1	0	1	1	1	0	9	0	0	17
04:45 PM	0	1	0	0	5	0	1	0	0	1	1	2	0	0	11
Total	3	2	2	1	23	2	3	1	3	7	1	24	0	0	72
05:00 PM	2	0	2	0	4	1	0	1	3	1	1	4	0	0	19
05:15 PM	0	0	1	1	6	1	0	1	1	0	0	7	0	0	18
05:30 PM	1	0	0	0	3	0	0	0	0	1	0	5	0	0	10
05:45 PM	4	1	2	0	3	0	0	1	3	2	2	3	0	0	21
Total	7	1	5	1	16	2	0	3	7	4	3	19	0	0	68
06:00 PM	1	0	0	0	3	0	0	0	1	2	0	6	0	0	13
06:15 PM	0	0	1	0	4	0	0	0	0	0	0	4	2	0	11
Grand Total	11	4	10	2	81	4	4	4	14	15	4	80	2	0	235
Apprch %	44	16	40	2.2	89	4.4	4.4	12.1	42.4	45.5	4.7	93	2.3	0	
Total %	4.7	1.7	4.3	0.9	34.5	1.7	1.7	1.7	6	6.4	1.7	34	0.9	0	

	Webster Avenue From North				Revere Beach Parkway (Route 16) From East					Webster Avenue From South				Revere Beach Parkway (Route 16) From West					
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 03:30 PM																			
03:30 PM	0	**1**	**1**	2	0	**21**	0	0	**21**	0	0	0	0	0	11	0	0	11	34
03:45 PM	0	0	1	1	0	14	0	1	15	0	**3**	2	**5**	0	**16**	0	0	**16**	**37**
04:00 PM	**2**	1	0	**3**	0	7	**1**	0	8	0	2	1	3	0	7	0	0	7	21
04:15 PM	0	0	1	1	**1**	9	0	**2**	12	0	0	**4**	4	0	6	0	0	6	23
Total Volume	2	2	3	7	1	51	1	3	56	0	5	7	12	0	40	0	0	40	115
% App. Total	28.6	28.6	42.9		1.8	91.1	1.8	5.4		0	41.7	58.3		0	100	0	0		
PHF	.250	.500	.750	.583	.250	.607	.250	.375	.667	.000	.417	.438	.600	.000	.625	.000	.000	.625	.777

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Groups Printed- Cars - Heavy Vehicles

	Webster Avenue From North			Revere Beach Parkway (Route 16) From East				Webster Avenue From South			Revere Beach Parkway (Route 16) From West				
Start Time	Right	Thru	Left	Right	Thru	Left	U-Turn	Right	Thru	Left	Right	Thru	Left	U-Turn	Int. Total
02:30 PM	29	43	36	2	325	26	58	36	60	51	31	325	0	0	1022
02:45 PM	32	33	42	5	285	25	41	32	51	56	33	238	0	0	873
Total	61	76	78	7	610	51	99	68	111	107	64	563	0	0	1895
03:00 PM	32	35	16	3	304	38	38	33	53	53	26	274	0	0	905
03:15 PM	27	32	34	3	273	32	62	22	45	57	30	238	0	0	855
03:30 PM	25	43	48	3	331	37	61	29	54	53	23	278	0	0	985
03:45 PM	27	43	47	1	317	30	48	37	72	51	23	270	0	0	966
Total	111	153	145	10	1225	137	209	121	224	214	102	1060	0	0	3711
04:00 PM	29	42	38	1	338	30	54	31	55	49	40	265	0	0	972
04:15 PM	23	38	34	1	329	35	59	36	55	48	22	244	0	0	924
04:30 PM	37	34	40	6	328	23	54	41	59	56	27	251	0	0	956
04:45 PM	25	40	45	1	304	29	46	35	44	58	25	253	0	0	905
Total	114	154	157	9	1299	117	213	143	213	211	114	1013	0	0	3757
05:00 PM	40	33	46	0	349	25	56	21	42	42	26	293	0	0	973
05:15 PM	38	34	35	1	288	28	49	34	73	52	31	236	0	0	899
Grand Total	364	450	461	27	3771	358	626	387	663	626	337	3165	0	0	11235
Apprch %	28.5	35.3	36.2	0.6	78.9	7.5	13.1	23.1	39.6	37.4	9.6	90.4	0	0	
Total %	3.2	4	4.1	0.2	33.6	3.2	5.6	3.4	5.9	5.6	3	28.2	0	0	
Cars	359	448	457	27	3723	356	625	386	652	622	335	3116	0	0	11106
% Cars	98.6	99.6	99.1	100	98.7	99.4	99.8	99.7	98.3	99.4	99.4	98.5	0	0	98.9
Heavy Vehicles	5	2	4	0	48	2	1	1	11	4	2	49	0	0	129
% Heavy Vehicles	1.4	0.4	0.9	0	1.3	0.6	0.2	0.3	1.7	0.6	0.6	1.5	0	0	1.1

	Webster Avenue From North				Revere Beach Parkway (Route 16) From East					Webster Avenue From South				Revere Beach Parkway (Route 16) From West					
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 03:30 PM																			
03:30 PM	25	**43**	**48**	116	**3**	331	**37**	**61**	**432**	29	54	**53**	136	23	**278**	0	0	301	**985**
03:45 PM	27	43	47	**117**	1	317	30	48	396	**37**	**72**	51	**160**	23	270	0	0	293	966
04:00 PM	**29**	42	38	109	1	**338**	30	54	423	31	55	49	135	**40**	265	0	0	**305**	972
04:15 PM	23	38	34	95	1	329	35	59	424	36	55	48	139	22	244	0	0	266	924
Total Volume	104	166	167	437	6	1315	132	222	1675	133	236	201	570	108	1057	0	0	1165	3847
% App. Total	23.8	38	38.2		0.4	78.5	7.9	13.3		23.3	41.4	35.3		9.3	90.7	0	0		
PHF	.897	.965	.870	.934	.500	.973	.892	.910	.969	.899	.819	.948	.891	.675	.951	.000	.000	.955	.976
Cars	102	166	167	435	6	1299	131	222	1658	133	231	200	564	108	1047	0	0	1155	3812
% Cars	98.1	100	100	99.5	100	98.8	99.2	100	99.0	100	97.9	99.5	98.9	100	99.1	0	0	99.1	99.1
Heavy Vehicles	2	0	0	2	0	16	1	0	17	0	5	1	6	0	10	0	0	10	35
% Heavy Vehicles	1.9	0	0	0.5	0	1.2	0.8	0	1.0	0	2.1	0.5	1.1	0	0.9	0	0	0.9	0.9

PRECISION
D A T A
INDUSTRIES, LLC
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N/S: Webster Avenue
E/W: Revere Beach Parkway (Route 16)
City, State: Chelsea, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 BBB
Site Code : 10271
Start Date : 6/12/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Webster Avenue From North			Revere Beach Parkway (Route 16) From East				Webster Avenue From South			Revere Beach Parkway (Route 16) From West				
Start Time	Right	Thru	Left	Right	Thru	Left	U-Turn	Right	Thru	Left	Right	Thru	Left	U-Turn	Int. Total
02:30 PM	0	0	0	0	8	1	0	0	2	1	0	11	0	0	23
02:45 PM	0	0	0	0	5	0	0	0	0	0	1	6	0	0	12
Total	0	0	0	0	13	1	0	0	2	1	1	17	0	0	35
03:00 PM	2	0	0	0	6	0	0	0	0	1	1	3	0	0	13
03:15 PM	1	0	0	0	4	0	0	0	0	0	0	5	0	0	10
03:30 PM	0	0	0	0	5	0	0	0	1	0	0	2	0	0	8
03:45 PM	1	0	0	0	3	0	0	0	3	0	0	1	0	0	8
Total	4	0	0	0	18	0	0	0	4	1	1	11	0	0	39
04:00 PM	1	0	0	0	3	0	0	0	1	0	0	5	0	0	10
04:15 PM	0	0	0	0	5	1	0	0	0	1	0	2	0	0	9
04:30 PM	0	0	1	0	6	0	0	0	0	0	0	5	0	0	12
04:45 PM	0	0	1	0	1	0	0	0	2	0	0	5	0	0	9
Total	1	0	2	0	15	1	0	0	3	1	0	17	0	0	40
05:00 PM	0	0	1	0	1	0	1	1	0	0	0	1	0	0	5
05:15 PM	0	2	1	0	1	0	0	0	2	1	0	3	0	0	10
Grand Total	5	2	4	0	48	2	1	1	11	4	2	49	0	0	129
Apprch %	45.5	18.2	36.4	0	94.1	3.9	2	6.2	68.8	25	3.9	96.1	0	0	
Total %	3.9	1.6	3.1	0	37.2	1.6	0.8	0.8	8.5	3.1	1.6	38	0	0	

	Webster Avenue From North				Revere Beach Parkway (Route 16) From East					Webster Avenue From South				Revere Beach Parkway (Route 16) From West					
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 02:30 PM																			
02:30 PM	0	0	0	0	0	**8**	**1**	0	**9**	0	**2**	**1**	**3**	0	**11**	0	0	**11**	**23**
02:45 PM	0	0	0	0	0	5	0	0	5	0	0	0	0	**1**	6	0	0	7	12
03:00 PM	**2**	0	0	**2**	0	6	0	0	6	0	0	1	1	1	3	0	0	4	13
03:15 PM	1	0	0	1	0	4	0	0	4	0	0	0	0	0	5	0	0	5	10
Total Volume	3	0	0	3	0	23	1	0	24	0	2	2	4	2	25	0	0	27	58
% App. Total	100	0	0		0	95.8	4.2	0		0	50	50		7.4	92.6	0	0		
PHF	.375	.000	.000	.375	.000	.719	.250	.000	.667	.000	.250	.500	.333	.500	.568	.000	.000	.614	.630

PRECISION
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S: Webster Avenue Offramp
E/W: Route 1 NB and SB
City, State: Chelsea, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 GG
Site Code : 10271
Start Date : 6/11/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Route 1 SB From East		Webster Avenue Offramp From South		Route 1 NB From West			
Start Time	Thru (All 3 Lanes)	Left	Right	Left	Right (Offramp)	Thru (Right Lane)	Thru (Left 2 Lanes)	Int. Total
03:30 PM	244	0	0	0	47	202	486	979
03:45 PM	383	0	0	0	64	283	633	1363
Total	627	0	0	0	111	485	1119	2342
04:00 PM	262	0	0	0	48	211	524	1045
04:15 PM	351	0	0	0	70	278	639	1338
04:30 PM	256	0	0	0	51	191	497	995
04:45 PM	292	0	0	0	51	222	490	1055
Total	1161	0	0	0	220	902	2150	4433
05:00 PM	315	0	0	0	41	285	566	1207
05:15 PM	275	0	0	0	72	216	478	1041
05:30 PM	338	0	0	0	52	207	450	1047
05:45 PM	416	0	0	0	65	256	604	1341
Total	1344	0	0	0	230	964	2098	4636
06:00 PM	369	0	0	0	64	217	488	1138
06:15 PM	272	0	0	0	49	158	426	905
Grand Total	3773	0	0	0	674	2726	6281	13454
Apprch %	100	0	0	0	7	28.2	64.9	
Total %	28	0	0	0	5	20.3	46.7	
Cars	3689	0	0	0	660	2656	6208	13213
% Cars	97.8	0	0	0	97.9	97.4	98.8	98.2
Heavy Vehicles	84	0	0	0	14	70	73	241
% Heavy Vehicles	2.2	0	0	0	2.1	2.6	1.2	1.8

	Route 1 SB From East			Webster Avenue Offramp From South			Route 1 NB From West				
Start Time	Thru (All 3 Lanes)	Left	App. Total	Right	Left	App. Total	Right (Offramp)	Thru (Right Lane)	Thru (Left 2 Lanes)	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1											
Peak Hour for Entire Intersection Begins at 03:45 PM											
03:45 PM	**383**	0	**383**	0	0	0	64	**283**	633	980	**1363**
04:00 PM	262	0	262	0	0	0	48	211	524	783	1045
04:15 PM	351	0	351	0	0	0	**70**	278	**639**	**987**	1338
04:30 PM	256	0	256	0	0	0	51	191	497	739	995
Total Volume	1252	0	1252	0	0	0	233	963	2293	3489	4741
% App. Total	100	0		0	0		6.7	27.6	65.7		
PHF	.817	.000	.817	.000	.000	.000	.832	.851	.897	.884	.870
Cars	1223	0	1223	0	0	0	227	928	2259	3414	4637
% Cars	97.7	0	97.7	0	0	0	97.4	96.4	98.5	97.9	97.8
Heavy Vehicles	29	0	29	0	0	0	6	35	34	75	104
% Heavy Vehicles	2.3	0	2.3	0	0	0	2.6	3.6	1.5	2.1	2.2

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S: Webster Avenue Offramp
E/W: Route 1 NB and SB
City, State: Chelsea, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 GG
Site Code : 10271
Start Date : 6/11/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Route 1 SB From East		Webster Avenue Offramp From South		Route 1 NB From West			
Start Time	Thru (All 3 Lanes)	Left	Right	Left	Right (Offramp)	Thru (Right Lane)	Thru (Left 2 Lanes)	Int. Total
03:30 PM	14	0	0	0	1	6	7	28
03:45 PM	12	0	0	0	1	12	13	38
Total	26	0	0	0	2	18	20	66
04:00 PM	2	0	0	0	2	8	7	19
04:15 PM	9	0	0	0	1	9	8	27
04:30 PM	6	0	0	0	2	6	6	20
04:45 PM	4	0	0	0	0	6	7	17
Total	21	0	0	0	5	29	28	83
05:00 PM	8	0	0	0	2	4	3	17
05:15 PM	4	0	0	0	1	4	5	14
05:30 PM	5	0	0	0	0	3	3	11
05:45 PM	9	0	0	0	3	5	5	22
Total	26	0	0	0	6	16	16	64
06:00 PM	6	0	0	0	1	4	5	16
06:15 PM	5	0	0	0	0	3	4	12
Grand Total	84	0	0	0	14	70	73	241
Apprch %	100	0	0	0	8.9	44.6	46.5	
Total %	34.9	0	0	0	5.8	29	30.3	

	Route 1 SB From East			Webster Avenue Offramp From South			Route 1 NB From West				
Start Time	Thru (All 3 Lanes)	Left	App. Total	Right	Left	App. Total	Right (Offramp)	Thru (Right Lane)	Thru (Left 2 Lanes)	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1											
Peak Hour for Entire Intersection Begins at 03:30 PM											
03:30 PM	**14**	0	**14**	0	0	0	1	6	7	14	28
03:45 PM	12	0	12	0	0	0	1	**12**	**13**	**26**	**38**
04:00 PM	2	0	2	0	0	0	**2**	8	7	17	19
04:15 PM	9	0	9	0	0	0	1	9	8	18	27
Total Volume	37	0	37	0	0	0	5	35	35	75	112
% App. Total	100	0		0	0		6.7	46.7	46.7		
PHF	.661	.000	.661	.000	.000	.000	.625	.729	.673	.721	.737

PRECISION
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S: Webster Avenue Offramp
E/W: Route 1 NB and SB
City, State: Chelsea, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 GGG
Site Code : 10271
Start Date : 6/12/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Route 1 SB From East		Webster Avenue Offramp From South		Route 1 NB From West			
Start Time	Thru (All 3 Lanes)	Left	Right	Left	Right (Offramp)	Thru (Right Lane)	Thru (Left 2 lanes)	Int. Total
02:30 PM	470	0	0	0	55	159	477	1161
02:45 PM	296	0	0	0	62	151	433	942
Total	766	0	0	0	117	310	910	2103
03:00 PM	438	0	0	0	61	141	478	1118
03:15 PM	514	0	0	0	62	153	443	1172
03:30 PM	573	0	0	0	64	142	470	1249
03:45 PM	411	0	0	0	63	132	420	1026
Total	1936	0	0	0	250	568	1811	4565
04:00 PM	376	0	0	0	57	152	425	1010
04:15 PM	365	0	0	0	72	139	456	1032
04:30 PM	402	0	0	0	63	112	428	1005
04:45 PM	384	0	0	0	66	131	436	1017
Total	1527	0	0	0	258	534	1745	4064
05:00 PM	398	0	0	0	45	118	429	990
05:15 PM	399	0	0	0	68	128	469	1064
Grand Total	5026	0	0	0	738	1658	5364	12786
Apprch %	100	0	0	0	9.5	21.4	69.1	
Total %	39.3	0	0	0	5.8	13	42	
Cars	4977	0	0	0	729	1628	5318	12652
% Cars	99	0	0	0	98.8	98.2	99.1	99
Heavy Vehicles	49	0	0	0	9	30	46	134
% Heavy Vehicles	1	0	0	0	1.2	1.8	0.9	1

	Route 1 SB From East			Webster Avenue Offramp From South			Route 1 NB From West				
Start Time	Thru (All 3 Lanes)	Left	App. Total	Right	Left	App. Total	Right (Offramp)	Thru (Right Lane)	Thru (Left 2 lanes)	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1											
Peak Hour for Entire Intersection Begins at 03:00 PM											
03:00 PM	438	0	438	0	0	0	61	141	**478**	**680**	1118
03:15 PM	514	0	514	0	0	0	62	**153**	443	658	1172
03:30 PM	**573**	0	**573**	0	0	0	**64**	142	470	676	**1249**
03:45 PM	411	0	411	0	0	0	63	132	420	615	1026
Total Volume	1936	0	1936	0	0	0	250	568	1811	2629	4565
% App. Total	100	0		0	0		9.5	21.6	68.9		
PHF	.845	.000	.845	.000	.000	.000	.977	.928	.947	.967	.914
Cars	1919	0	1919	0	0	0	247	555	1794	2596	4515
% Cars	99.1	0	99.1	0	0	0	98.8	97.7	99.1	98.7	98.9
Heavy Vehicles	17	0	17	0	0	0	3	13	17	33	50
% Heavy Vehicles	0.9	0	0.9	0	0	0	1.2	2.3	0.9	1.3	1.1

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S: Webster Avenue Offramp
E/W: Route 1 NB and SB
City, State: Chelsea, MA
Client: VHB/ S. Mandzo-Preldzie

File Name : 102242 GGG
Site Code : 10271
Start Date : 6/12/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Route 1 SB From East		Webster Avenue Offramp From South		Route 1 NB From West			
Start Time	Thru (All 3 Lanes)	Left	Right	Left	Right (Offramp)	Thru (Right Lane)	Thru (Left 2 lanes)	Int. Total
02:30 PM	1	0	0	0	1	1	4	7
02:45 PM	4	0	0	0	0	1	3	8
Total	5	0	0	0	1	2	7	15
03:00 PM	1	0	0	0	1	1	5	8
03:15 PM	10	0	0	0	0	3	6	19
03:30 PM	3	0	0	0	0	6	2	11
03:45 PM	3	0	0	0	2	3	4	12
Total	17	0	0	0	3	13	17	50
04:00 PM	6	0	0	0	3	2	4	15
04:15 PM	3	0	0	0	1	4	7	15
04:30 PM	4	0	0	0	0	2	4	10
04:45 PM	4	0	0	0	0	1	3	8
Total	17	0	0	0	4	9	18	48
05:00 PM	6	0	0	0	0	3	1	10
05:15 PM	4	0	0	0	1	3	3	11
Grand Total	49	0	0	0	9	30	46	134
Apprch %	100	0	0	0	10.6	35.3	54.1	
Total %	36.6	0	0	0	6.7	22.4	34.3	

	Route 1 SB From East			Webster Avenue Offramp From South			Route 1 NB From West				
Start Time	Thru (All 3 Lanes)	Left	App. Total	Right	Left	App. Total	Right (Offramp)	Thru (Right Lane)	Thru (Left 2 lanes)	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1											
Peak Hour for Entire Intersection Begins at 03:15 PM											
03:15 PM	**10**	0	**10**	0	0	0	0	3	**6**	**9**	**19**
03:30 PM	3	0	3	0	0	0	0	**6**	2	8	11
03:45 PM	3	0	3	0	0	0	2	3	4	9	12
04:00 PM	6	0	6	0	0	0	**3**	2	4	9	15
Total Volume	22	0	22	0	0	0	5	14	16	35	57
% App. Total	100	0		0	0		14.3	40	45.7		
PHF	.550	.000	.550	.000	.000	.000	.417	.583	.667	.972	.750

N/S: American Legion Highway (Route 60)
E/W: Revere Street
City, State: Revere, MA
Client: VHB/ R. White

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File Name : 133332 A
Site Code : 10271.07
Start Date : 5/10/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	American Legion Highway (Route 60) From North				Revere Street From East				American Legion Highway (Route 60) From South				Revere Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
03:30 PM	3	272	72	10	2	62	26	0	27	263	21	4	10	76	6	0	854
03:45 PM	2	247	82	7	3	47	17	0	19	265	28	2	15	64	4	0	802
Total	5	519	154	17	5	109	43	0	46	528	49	6	25	140	10	0	1656
04:00 PM	4	258	96	6	1	45	23	0	17	300	28	5	17	44	6	0	850
04:15 PM	2	271	81	6	3	38	17	0	13	271	24	3	14	56	6	0	805
04:30 PM	2	251	65	5	3	45	22	0	16	261	26	4	10	66	3	0	779
04:45 PM	2	259	80	6	6	65	21	0	20	259	33	3	20	73	3	0	850
Total	10	1039	322	23	13	193	83	0	66	1091	111	15	61	239	18	0	3284
05:00 PM	4	268	84	6	2	39	22	0	20	288	26	2	15	54	6	0	836
05:15 PM	1	209	95	3	5	68	26	0	17	256	36	2	17	48	4	0	787
05:30 PM	1	264	80	4	3	55	18	0	15	275	19	1	14	67	4	0	820
05:45 PM	0	282	77	10	5	49	22	0	18	298	32	3	13	61	7	0	877
Total	6	1023	336	23	15	211	88	0	70	1117	113	8	59	230	21	0	3320
06:00 PM	3	246	103	6	1	50	14	0	19	251	38	5	14	51	6	0	807
06:15 PM	1	275	97	9	5	52	12	0	19	312	28	4	7	54	1	0	876
Grand Total	25	3102	1012	78	39	615	240	0	220	3299	339	38	166	714	56	0	9943
Apprch %	0.6	73.6	24	1.8	4.4	68.8	26.8	0	5.6	84.7	8.7	1	17.7	76.3	6	0	
Total %	0.3	31.2	10.2	0.8	0.4	6.2	2.4	0	2.2	33.2	3.4	0.4	1.7	7.2	0.6	0	
Cars	25	2955	1004	78	39	600	237	0	215	3184	339	38	163	691	56	0	9624
% Cars	100	95.3	99.2	100	100	97.6	98.8	0	97.7	96.5	100	100	98.2	96.8	100	0	96.8
Heavy Vehicles	0	147	8	0	0	15	3	0	5	115	0	0	3	23	0	0	319
% Heavy Vehicles	0	4.7	0.8	0	0	2.4	1.2	0	2.3	3.5	0	0	1.8	3.2	0	0	3.2

	American Legion Highway (Route 60) From North					Revere Street From East					American Legion Highway (Route 60) From South					Revere Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:30 PM																					
05:30 PM	1	264	80	4	349	3	**55**	18	0	**76**	15	275	19	1	310	**14**	**67**	4	0	**85**	820
05:45 PM	0	**282**	77	**10**	369	**5**	49	**22**	0	76	18	298	32	3	351	13	61	**7**	0	81	**877**
06:00 PM	**3**	246	**103**	6	358	1	50	14	0	65	**19**	251	**38**	**5**	313	14	51	6	0	71	807
06:15 PM	1	275	97	9	**382**	5	52	12	0	69	19	**312**	28	4	**363**	7	54	1	0	62	876
Total Volume	5	1067	357	29	1458	14	206	66	0	286	71	1136	117	13	1337	48	233	18	0	299	3380
% App. Total	0.3	73.2	24.5	2		4.9	72	23.1	0		5.3	85	8.8	1		16.1	77.9	6	0		
PHF	.417	.946	.867	.725	.954	.700	.936	.750	.000	.941	.934	.910	.770	.650	.921	.857	.869	.643	.000	.879	.964
Cars	5	1026	354	29	1414	14	203	64	0	281	70	1104	117	13	1304	48	224	18	0	290	3289
% Cars	100	96.2	99.2	100	97.0	100	98.5	97.0	0	98.3	98.6	97.2	100	100	97.5	100	96.1	100	0	97.0	97.3
Heavy Vehicles	0	41	3	0	44	0	3	2	0	5	1	32	0	0	33	0	9	0	0	9	91
% Heavy Vehicles	0	3.8	0.8	0	3.0	0	1.5	3.0	0	1.7	1.4	2.8	0	0	2.5	0	3.9	0	0	3.0	2.7

N/S: American Legion Highway (Route 60)
E/W: Revere Street
City, State: Revere, MA
Client: VHB/ R. White

PRECISION DATA INDUSTRIES, LLC
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File Name : 133332 A
Site Code : 10271.07
Start Date : 5/10/2013
Page No : 1

Groups Printed- Heavy Vehicles

	American Legion Highway (Route 60) From North				Revere Street From East				American Legion Highway (Route 60) From South				Revere Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
03:30 PM	0	9	1	0	0	0	1	0	1	7	0	0	1	2	0	0	22
03:45 PM	0	7	0	0	0	3	0	0	1	15	0	0	0	1	0	0	27
Total	0	16	1	0	0	3	1	0	2	22	0	0	1	3	0	0	49
04:00 PM	0	19	0	0	0	2	0	0	2	19	0	0	1	2	0	0	45
04:15 PM	0	17	0	0	0	1	0	0	0	6	0	0	1	3	0	0	28
04:30 PM	0	19	1	0	0	1	0	0	0	6	0	0	0	2	0	0	29
04:45 PM	0	12	0	0	0	1	0	0	0	11	0	0	0	1	0	0	25
Total	0	67	1	0	0	5	0	0	2	42	0	0	2	8	0	0	127
05:00 PM	0	18	2	0	0	1	0	0	0	10	0	0	0	0	0	0	31
05:15 PM	0	5	1	0	0	3	0	0	0	9	0	0	0	3	0	0	21
05:30 PM	0	12	1	0	0	1	0	0	0	8	0	0	0	3	0	0	25
05:45 PM	0	9	0	0	0	1	0	0	0	9	0	0	0	2	0	0	21
Total	0	44	4	0	0	6	0	0	0	36	0	0	0	8	0	0	98
06:00 PM	0	11	1	0	0	1	1	0	0	6	0	0	0	2	0	0	22
06:15 PM	0	9	1	0	0	0	1	0	1	9	0	0	0	2	0	0	23
Grand Total	0	147	8	0	0	15	3	0	5	115	0	0	3	23	0	0	319
Apprch %	0	94.8	5.2	0	0	83.3	16.7	0	4.2	95.8	0	0	11.5	88.5	0	0	
Total %	0	46.1	2.5	0	0	4.7	0.9	0	1.6	36.1	0	0	0.9	7.2	0	0	

	American Legion Highway (Route 60) From North					Revere Street From East					American Legion Highway (Route 60) From South					Revere Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:45 PM																					
03:45 PM	0	7	0	0	7	0	**3**	0	0	**3**	1	15	0	0	16	0	1	0	0	1	27
04:00 PM	0	**19**	0	0	19	0	2	0	0	2	**2**	**19**	0	0	**21**	**1**	2	0	0	3	**45**
04:15 PM	0	17	0	0	17	0	1	0	0	1	0	6	0	0	6	1	**3**	0	0	**4**	28
04:30 PM	0	19	**1**	0	**20**	0	1	0	0	1	0	6	0	0	6	0	2	0	0	2	29
Total Volume	0	62	1	0	63	0	7	0	0	7	3	46	0	0	49	2	8	0	0	10	129
% App. Total	0	98.4	1.6	0		0	100	0	0		6.1	93.9	0	0		20	80	0	0		
PHF	.000	.816	.250	.000	.788	.000	.583	.000	.000	.583	.375	.605	.000	.000	.583	.500	.667	.000	.000	.625	.717

N/S: American Legion Highway (Route 60)
E/W: Revere Street
City, State: Revere, MA
Client: VHB/ R. White

PRECISION DATA INDUSTRIES, LLC
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File Name : 133332 A
Site Code : 10271.07
Start Date : 5/10/2013
Page No : 1

Groups Printed- Peds and Bicycles

	American Legion Highway (Route 60) From North				Revere Street From East				American Legion Highway (Route 60) From South				Revere Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
03:30 PM	0	0	0	0	0	0	0	3	0	1	0	19	0	0	0	1	24
03:45 PM	0	1	0	2	0	0	0	3	0	0	0	8	0	0	0	0	14
Total	0	1	0	2	0	0	0	6	0	1	0	27	0	0	0	1	38
04:00 PM	0	0	0	3	0	0	0	1	0	0	0	4	0	0	0	0	8
04:15 PM	0	0	0	4	0	0	0	1	0	0	0	4	0	0	0	2	11
04:30 PM	0	0	0	2	0	0	0	1	0	0	0	8	0	1	0	3	15
04:45 PM	0	0	0	1	0	0	0	5	0	0	0	2	0	0	0	1	9
Total	0	0	0	10	0	0	0	8	0	0	0	18	0	1	0	6	43
05:00 PM	0	0	0	3	0	0	0	0	0	0	0	5	0	0	0	0	8
05:15 PM	0	0	0	4	0	0	0	1	0	0	0	3	0	0	0	1	9
05:30 PM	0	0	0	8	0	0	0	0	0	0	0	3	0	1	0	1	13
05:45 PM	0	0	0	4	0	0	0	1	0	0	0	3	0	0	0	3	11
Total	0	0	0	19	0	0	0	2	0	0	0	14	0	1	0	5	41
06:00 PM	0	0	0	3	0	0	1	1	0	0	0	7	0	0	0	0	12
06:15 PM	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	4	7
Grand Total	0	1	0	36	0	0	1	17	0	1	0	67	0	2	0	16	141
Apprch %	0	2.7	0	97.3	0	0	5.6	94.4	0	1.5	0	98.5	0	11.1	0	88.9	
Total %	0	0.7	0	25.5	0	0	0.7	12.1	0	0.7	0	47.5	0	1.4	0	11.3	

	American Legion Highway (Route 60) From North					Revere Street From East					American Legion Highway (Route 60) From South					Revere Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	0	0	0	0	0	0	0	0	**3**	**3**	0	**1**	0	**19**	**20**	0	0	0	1	1	**24**
03:45 PM	0	**1**	0	2	3	0	0	0	3	3	0	0	0	8	8	0	0	0	0	0	14
04:00 PM	0	0	0	3	3	0	0	0	1	1	0	0	0	4	4	0	0	0	0	0	8
04:15 PM	0	0	0	**4**	**4**	0	0	0	1	1	0	0	0	4	4	0	0	0	**2**	**2**	11
Total Volume	0	1	0	9	10	0	0	0	8	8	0	1	0	35	36	0	0	0	3	3	57
% App. Total	0	10	0	90		0	0	0	100		0	2.8	0	97.2		0	0	0	100		
PHF	.000	.250	.000	.563	.625	.000	.000	.000	.667	.667	.000	.250	.000	.461	.450	.000	.000	.000	.375	.375	.594

PRECISION
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N/S: American Legion Highway (Route 60)
E/W: Revere Street
City, State: Revere, MA
Client: VHB/ R. White

File Name : 133332 AA
Site Code : 10271.07
Start Date : 5/11/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	American Legion Highway (Route 60) From North				Revere Street From East				American Legion Highway (Route 60) From South				Revere Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
02:30 PM	5	243	89	5	4	56	25	0	13	256	24	10	17	43	3	0	793
02:45 PM	6	227	89	5	5	48	28	0	19	237	21	3	24	49	3	0	764
Total	11	470	178	10	9	104	53	0	32	493	45	13	41	92	6	0	1557
03:00 PM	1	247	91	11	8	34	18	0	22	215	23	6	17	48	5	0	746
03:15 PM	4	270	94	4	11	47	22	0	20	250	21	6	15	67	4	0	835
03:30 PM	5	294	85	4	8	32	22	1	19	263	20	1	11	62	4	0	831
03:45 PM	4	246	95	8	3	44	23	0	22	231	31	1	9	65	7	0	789
Total	14	1057	365	27	30	157	85	1	83	959	95	14	52	242	20	0	3201
04:00 PM	0	205	91	5	5	44	23	0	20	262	21	1	15	36	4	0	732
04:15 PM	1	238	74	4	9	36	15	0	19	256	30	2	18	49	5	0	756
04:30 PM	6	266	88	1	7	48	21	0	19	231	26	1	14	66	5	0	799
04:45 PM	4	251	84	5	6	57	19	0	12	208	22	2	19	45	2	0	736
Total	11	960	337	15	27	185	78	0	70	957	99	6	66	196	16	0	3023
05:00 PM	1	238	82	4	9	44	24	0	13	231	25	2	15	54	3	0	745
05:15 PM	5	249	87	9	6	48	20	0	19	233	33	2	14	46	1	0	772
Grand Total	42	2974	1049	65	81	538	260	1	217	2873	297	37	188	630	46	0	9298
Apprch %	1	72	25.4	1.6	9.2	61.1	29.5	0.1	6.3	83.9	8.7	1.1	21.8	72.9	5.3	0	
Total %	0.5	32	11.3	0.7	0.9	5.8	2.8	0	2.3	30.9	3.2	0.4	2	6.8	0.5	0	
Cars	41	2893	1040	63	79	526	253	1	214	2801	296	37	186	619	46	0	9095
% Cars	97.6	97.3	99.1	96.9	97.5	97.8	97.3	100	98.6	97.5	99.7	100	98.9	98.3	100	0	97.8
Heavy Vehicles	1	81	9	2	2	12	7	0	3	72	1	0	2	11	0	0	203
% Heavy Vehicles	2.4	2.7	0.9	3.1	2.5	2.2	2.7	0	1.4	2.5	0.3	0	1.1	1.7	0	0	2.2

	American Legion Highway (Route 60) From North					Revere Street From East					American Legion Highway (Route 60) From South					Revere Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:00 PM																					
03:00 PM	1	247	91	**11**	350	8	34	18	0	60	**22**	215	23	**6**	266	**17**	48	5	0	70	746
03:15 PM	4	270	94	4	372	**11**	**47**	22	0	**80**	20	250	21	6	297	15	**67**	4	0	**86**	**835**
03:30 PM	**5**	**294**	85	4	**388**	8	32	22	**1**	63	19	**263**	20	1	**303**	11	62	4	0	77	831
03:45 PM	4	246	**95**	8	353	3	44	**23**	0	70	22	231	**31**	1	285	9	65	**7**	0	81	789
Total Volume	14	1057	365	27	1463	30	157	85	1	273	83	959	95	14	1151	52	242	20	0	314	3201
% App. Total	1	72.2	24.9	1.8		11	57.5	31.1	0.4		7.2	83.3	8.3	1.2		16.6	77.1	6.4	0		
PHF	.700	.899	.961	.614	.943	.682	.835	.924	.250	.853	.943	.912	.766	.583	.950	.765	.903	.714	.000	.913	.958
Cars	14	1036	361	26	1437	30	153	82	1	266	83	928	95	14	1120	50	237	20	0	307	3130
% Cars	100	98.0	98.9	96.3	98.2	100	97.5	96.5	100	97.4	100	96.8	100	100	97.3	96.2	97.9	100	0	97.8	97.8
Heavy Vehicles	0	21	4	1	26	0	4	3	0	7	0	31	0	0	31	2	5	0	0	7	71
% Heavy Vehicles	0	2.0	1.1	3.7	1.8	0	2.5	3.5	0	2.6	0	3.2	0	0	2.7	3.8	2.1	0	0	2.2	2.2

N/S: American Legion Highway (Route 60)
E/W: Revere Street
City, State: Revere, MA
Client: VHB/ R. White

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File Name : 133332 AA
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Page No : 1

Groups Printed- Heavy Vehicles

	American Legion Highway (Route 60) From North				Revere Street From East				American Legion Highway (Route 60) From South				Revere Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
02:30 PM	0	8	2	0	1	1	0	0	0	3	0	0	0	1	0	0	16
02:45 PM	1	5	1	1	0	3	2	0	1	6	0	0	0	1	0	0	21
Total	1	13	3	1	1	4	2	0	1	9	0	0	0	2	0	0	37
03:00 PM	0	8	1	1	0	0	2	0	0	6	0	0	1	1	0	0	20
03:15 PM	0	6	0	0	0	2	0	0	0	7	0	0	1	1	0	0	17
03:30 PM	0	6	0	0	0	1	1	0	0	8	0	0	0	2	0	0	18
03:45 PM	0	1	3	0	0	1	0	0	0	10	0	0	0	1	0	0	16
Total	0	21	4	1	0	4	3	0	0	31	0	0	2	5	0	0	71
04:00 PM	0	10	0	0	0	0	0	0	0	5	0	0	0	0	0	0	15
04:15 PM	0	12	0	0	1	1	0	0	1	6	1	0	0	1	0	0	23
04:30 PM	0	4	0	0	0	1	0	0	1	9	0	0	0	1	0	0	16
04:45 PM	0	4	1	0	0	1	0	0	0	6	0	0	0	1	0	0	13
Total	0	30	1	0	1	3	0	0	2	26	1	0	0	3	0	0	67
05:00 PM	0	7	1	0	0	0	0	0	0	5	0	0	0	0	0	0	13
05:15 PM	0	10	0	0	0	1	2	0	0	1	0	0	0	1	0	0	15
Grand Total	1	81	9	2	2	12	7	0	3	72	1	0	2	11	0	0	203
Apprch %	1.1	87.1	9.7	2.2	9.5	57.1	33.3	0	3.9	94.7	1.3	0	15.4	84.6	0	0	
Total %	0.5	39.9	4.4	1	1	5.9	3.4	0	1.5	35.5	0.5	0	1	5.4	0	0	

	American Legion Highway (Route 60) From North					Revere Street From East					American Legion Highway (Route 60) From South					Revere Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 02:45 PM																					
02:45 PM	**1**	5	**1**	**1**	8	0	**3**	**2**	0	**5**	**1**	6	0	0	7	0	1	0	0	1	**21**
03:00 PM	0	**8**	1	1	**10**	0	0	2	0	2	0	6	0	0	6	**1**	1	0	0	**2**	20
03:15 PM	0	6	0	0	6	0	2	0	0	2	0	7	0	0	7	1	1	0	0	2	17
03:30 PM	0	6	0	0	6	0	1	1	0	2	0	**8**	0	0	**8**	0	**2**	0	0	2	18
Total Volume	1	25	2	2	30	0	6	5	0	11	1	27	0	0	28	2	5	0	0	7	76
% App. Total	3.3	83.3	6.7	6.7		0	54.5	45.5	0		3.6	96.4	0	0		28.6	71.4	0	0		
PHF	.250	.781	.500	.500	.750	.000	.500	.625	.000	.550	.250	.844	.000	.000	.875	.500	.625	.000	.000	.875	.905

N/S: American Legion Highway (Route 60)
E/W: Revere Street
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Groups Printed- Peds and Bicycles

	American Legion Highway (Route 60) From North				Revere Street From East				American Legion Highway (Route 60) From South				Revere Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
02:30 PM	0	0	0	1	0	0	0	0	0	0	0	5	0	0	0	0	6
02:45 PM	0	0	0	4	0	1	0	0	0	0	0	1	0	0	0	0	6
Total	0	0	0	5	0	1	0	0	0	0	0	6	0	0	0	0	12
03:00 PM	0	0	0	2	0	0	0	0	0	0	0	3	0	0	0	0	5
03:15 PM	0	1	0	4	0	0	0	1	0	0	0	4	0	0	0	1	11
03:30 PM	0	0	0	2	0	0	0	0	0	0	0	7	0	0	0	2	11
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	1	5
Total	0	1	0	8	0	0	0	1	0	0	0	18	0	0	0	4	32
04:00 PM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
04:15 PM	0	0	0	1	0	0	0	0	0	0	0	4	0	0	0	0	5
04:30 PM	0	0	0	1	0	0	0	0	0	0	0	4	0	0	0	3	8
04:45 PM	0	1	0	4	0	0	0	1	0	0	0	2	0	3	0	1	12
Total	0	1	0	7	0	0	0	1	0	0	0	10	0	3	0	4	26
05:00 PM	0	0	0	9	0	0	0	1	0	0	1	5	0	0	0	2	18
05:15 PM	0	0	0	3	0	0	0	0	0	0	0	3	0	0	0	1	7
Grand Total	0	2	0	32	0	1	0	3	0	0	1	42	0	3	0	11	95
Apprch %	0	5.9	0	94.1	0	25	0	75	0	0	2.3	97.7	0	21.4	0	78.6	
Total %	0	2.1	0	33.7	0	1.1	0	3.2	0	0	1.1	44.2	0	3.2	0	11.6	

	American Legion Highway (Route 60) From North					Revere Street From East					American Legion Highway (Route 60) From South					Revere Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	0	0	0	1	1	0	0	0	0	0	0	0	0	4	4	0	0	0	**3**	3	8
04:45 PM	0	**1**	0	4	5	0	0	0	**1**	**1**	0	0	0	2	2	0	**3**	0	1	**4**	12
05:00 PM	0	0	0	**9**	**9**	0	0	0	1	1	0	0	**1**	**5**	**6**	0	0	0	2	2	**18**
05:15 PM	0	0	0	3	3	0	0	0	0	0	0	0	0	3	3	0	0	0	1	1	7
Total Volume	0	1	0	17	18	0	0	0	2	2	0	0	1	14	15	0	3	0	7	10	45
% App. Total	0	5.6	0	94.4		0	0	0	100		0	0	6.7	93.3		0	30	0	70		
PHF	.000	.250	.000	.472	.500	.000	.000	.000	.500	.500	.000	.000	.250	.700	.625	.000	.250	.000	.583	.625	.625

N/S: McClellan Highway (Route 1A)
E: Waldemar Avenue
City, State: Boston, MA
Client: VHB/ R. White

PRECISION
D A T A
INDUSTRIES, LLC
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File Name : 133332 B
Site Code : 10271.07
Start Date : 5/10/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	McClellan Highway (Route 1A) From North			Waldemar Avenue From East			McClellan Highway (Route 1A) From South			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
03:30 PM	460	0	0	42	0	0	32	546	0	1080
03:45 PM	389	0	0	42	0	0	30	500	0	961
Total	849	0	0	84	0	0	62	1046	0	2041
04:00 PM	462	0	0	35	0	0	26	495	0	1018
04:15 PM	451	0	0	30	0	0	31	521	0	1033
04:30 PM	446	0	0	19	0	0	22	519	0	1006
04:45 PM	432	0	0	27	0	0	23	517	0	999
Total	1791	0	0	111	0	0	102	2052	0	4056
05:00 PM	418	0	0	22	0	0	25	563	0	1028
05:15 PM	418	0	0	33	0	0	31	521	0	1003
05:30 PM	400	0	0	42	0	0	29	540	0	1011
05:45 PM	409	0	0	24	0	0	17	507	0	957
Total	1645	0	0	121	0	0	102	2131	0	3999
06:00 PM	393	0	0	28	0	0	32	490	0	943
06:15 PM	395	0	0	26	0	0	26	522	0	969
Grand Total	5073	0	0	370	0	0	324	6241	0	12008
Apprch %	100	0	0	100	0	0	4.9	95.1	0	
Total %	42.2	0	0	3.1	0	0	2.7	52	0	
Cars	4859	0	0	353	0	0	288	5966	0	11466
% Cars	95.8	0	0	95.4	0	0	88.9	95.6	0	95.5
Heavy Vehicles	214	0	0	17	0	0	36	275	0	542
% Heavy Vehicles	4.2	0	0	4.6	0	0	11.1	4.4	0	4.5

	McClellan Highway (Route 1A) From North				Waldemar Avenue From East				McClellan Highway (Route 1A) From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 03:30 PM													
03:30 PM	460	0	0	460	**42**	0	0	**42**	**32**	**546**	0	**578**	**1080**
03:45 PM	389	0	0	389	42	0	0	42	30	500	0	530	961
04:00 PM	**462**	0	0	**462**	35	0	0	35	26	495	0	521	1018
04:15 PM	451	0	0	451	30	0	0	30	31	521	0	552	1033
Total Volume	1762	0	0	1762	149	0	0	149	119	2062	0	2181	4092
% App. Total	100	0	0		100	0	0		5.5	94.5	0		
PHF	.953	.000	.000	.953	.887	.000	.000	.887	.930	.944	.000	.943	.947
Cars	1686	0	0	1686	141	0	0	141	102	1967	0	2069	3896
% Cars	95.7	0	0	95.7	94.6	0	0	94.6	85.7	95.4	0	94.9	95.2
Heavy Vehicles	76	0	0	76	8	0	0	8	17	95	0	112	196
% Heavy Vehicles	4.3	0	0	4.3	5.4	0	0	5.4	14.3	4.6	0	5.1	4.8

PRECISION
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N/S: McClellan Highway (Route 1A)
E: Waldemar Avenue
City, State: Boston, MA
Client: VHB/ R. White

File Name : 133332 B
Site Code : 10271.07
Start Date : 5/10/2013
Page No : 1

Groups Printed- Heavy Vehicles

	McClellan Highway (Route 1A) From North			Waldemar Avenue From East			McClellan Highway (Route 1A) From South			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
03:30 PM	17	0	0	0	0	0	4	26	0	47
03:45 PM	16	0	0	2	0	0	5	24	0	47
Total	33	0	0	2	0	0	9	50	0	94
04:00 PM	25	0	0	3	0	0	2	28	0	58
04:15 PM	18	0	0	3	0	0	6	17	0	44
04:30 PM	24	0	0	2	0	0	1	25	0	52
04:45 PM	17	0	0	1	0	0	2	29	0	49
Total	84	0	0	9	0	0	11	99	0	203
05:00 PM	17	0	0	1	0	0	4	22	0	44
05:15 PM	20	0	0	0	0	0	3	16	0	39
05:30 PM	21	0	0	3	0	0	4	19	0	47
05:45 PM	10	0	0	1	0	0	2	22	0	35
Total	68	0	0	5	0	0	13	79	0	165
06:00 PM	16	0	0	1	0	0	1	24	0	42
06:15 PM	13	0	0	0	0	0	2	23	0	38
Grand Total	214	0	0	17	0	0	36	275	0	542
Apprch %	100	0	0	100	0	0	11.6	88.4	0	
Total %	39.5	0	0	3.1	0	0	6.6	50.7	0	

	McClellan Highway (Route 1A) From North				Waldemar Avenue From East				McClellan Highway (Route 1A) From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	**25**	0	0	**25**	**3**	0	0	**3**	2	28	0	30	**58**
04:15 PM	18	0	0	18	3	0	0	3	**6**	17	0	23	44
04:30 PM	24	0	0	24	2	0	0	2	1	25	0	26	52
04:45 PM	17	0	0	17	1	0	0	1	2	**29**	0	**31**	49
Total Volume	84	0	0	84	9	0	0	9	11	99	0	110	203
% App. Total	100	0	0		100	0	0		10	90	0		
PHF	.840	.000	.000	.840	.750	.000	.000	.750	.458	.853	.000	.887	.875

N/S: McClellan Highway (Route 1A)
E: Waldemar Avenue
City, State: Boston, MA
Client: VHB/ R. White

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File Name : 133332 B
Site Code : 10271.07
Start Date : 5/10/2013
Page No : 1

Groups Printed- Peds and Bicycles

	McClellan Highway (Route 1A) From North			Waldemar Avenue From East			McClellan Highway (Route 1A) From South			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
03:30 PM	0	0	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
04:00 PM	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	3	0	0	0	3
04:30 PM	0	0	0	0	0	0	0	0	1	1
04:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	3	0	0	1	4
05:00 PM	0	0	0	0	0	1	0	0	1	2
05:15 PM	0	0	0	0	0	2	0	0	0	2
05:30 PM	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	2	0	0	0	2
Total	0	0	0	0	0	5	0	0	1	6
06:00 PM	0	0	0	0	0	0	0	0	0	0
06:15 PM	0	0	1	0	0	2	0	0	0	3
Grand Total	0	0	1	0	0	10	0	0	2	13
Apprch %	0	0	100	0	0	100	0	0	100	
Total %	0	0	7.7	0	0	76.9	0	0	15.4	

	McClellan Highway (Route 1A) From North				Waldemar Avenue From East				McClellan Highway (Route 1A) From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:15 PM													
04:15 PM	0	0	0	0	0	0	**3**	**3**	0	0	0	0	**3**
04:30 PM	0	0	0	0	0	0	0	0	0	0	**1**	**1**	1
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	1	1	0	0	1	1	2
Total Volume	0	0	0	0	0	0	4	4	0	0	2	2	6
% App. Total	0	0	0		0	0	100		0	0	100		
PHF	.000	.000	.000	.000	.000	.000	.333	.333	.000	.000	.500	.500	.500

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E: Waldemar Avenue
City, State: Boston, MA
Client: VHB/ R. White

File Name : 133332 BB
Site Code : 10271.07
Start Date : 5/11/2013

Groups Printed- Cars - Heavy Vehicles

	McClellan Highway (Route 1A) From North			Waldemar Avenue From East			McClellan Highway (Route 1A) From South			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
02:30 PM	434	0	0	44	0	0	22	396	0	896
02:45 PM	404	0	0	36	0	0	32	388	0	860
Total	838	0	0	80	0	0	54	784	0	1756
03:00 PM	419	0	0	30	0	0	32	441	0	922
03:15 PM	397	0	0	24	0	1	27	430	0	879
03:30 PM	426	0	0	42	0	0	25	447	0	940
03:45 PM	419	0	0	41	0	0	22	382	0	864
Total	1661	0	0	137	0	1	106	1700	0	3605
04:00 PM	381	0	0	31	0	0	25	461	0	898
04:15 PM	390	0	0	35	0	0	29	380	0	834
04:30 PM	394	0	0	14	0	0	30	379	0	817
04:45 PM	424	0	0	27	0	0	34	345	0	830
Total	1589	0	0	107	0	0	118	1565	0	3379
05:00 PM	389	0	0	35	0	0	26	405	0	855
05:15 PM	410	0	0	25	0	0	29	410	0	874
Grand Total	4887	0	0	384	0	1	333	4864	0	10469
Apprch %	100	0	0	99.7	0	0.3	6.4	93.6	0	
Total %	46.7	0	0	3.7	0	0	3.2	46.5	0	
Cars	4772	0	0	375	0	1	318	4756	0	10222
% Cars	97.6	0	0	97.7	0	100	95.5	97.8	0	97.6
Heavy Vehicles	115	0	0	9	0	0	15	108	0	247
% Heavy Vehicles	2.4	0	0	2.3	0	0	4.5	2.2	0	2.4

	McClellan Highway (Route 1A) From North				Waldemar Avenue From East				McClellan Highway (Route 1A) From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 03:00 PM													
03:00 PM	419	0	0	419	30	0	0	30	**32**	441	0	**473**	922
03:15 PM	397	0	0	397	24	0	**1**	25	27	430	0	457	879
03:30 PM	**426**	0	0	**426**	**42**	0	0	**42**	25	**447**	0	472	**940**
03:45 PM	419	0	0	419	41	0	0	41	22	382	0	404	864
Total Volume	1661	0	0	1661	137	0	1	138	106	1700	0	1806	3605
% App. Total	100	0	0		99.3	0	0.7		5.9	94.1	0		
PHF	.975	.000	.000	.975	.815	.000	.250	.821	.828	.951	.000	.955	.959
Cars	1619	0	0	1619	134	0	1	135	101	1650	0	1751	3505
% Cars	97.5	0	0	97.5	97.8	0	100	97.8	95.3	97.1	0	97.0	97.2
Heavy Vehicles	42	0	0	42	3	0	0	3	5	50	0	55	100
% Heavy Vehicles	2.5	0	0	2.5	2.2	0	0	2.2	4.7	2.9	0	3.0	2.8

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N/S: McClellan Highway (Route 1A)
E: Waldemar Avenue
City, State: Boston, MA
Client: VHB/ R. White

File Name : 133332 BB
Site Code : 10271.07
Start Date : 5/11/2013
Page No : 1

Groups Printed- Heavy Vehicles

	McClellan Highway (Route 1A) From North			Waldemar Avenue From East			McClellan Highway (Route 1A) From South			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
02:30 PM	10	0	0	1	0	0	1	7	0	19
02:45 PM	9	0	0	1	0	0	1	8	0	19
Total	19	0	0	2	0	0	2	15	0	38
03:00 PM	13	0	0	2	0	0	1	15	0	31
03:15 PM	14	0	0	0	0	0	2	11	0	27
03:30 PM	10	0	0	1	0	0	0	13	0	24
03:45 PM	5	0	0	0	0	0	2	11	0	18
Total	42	0	0	3	0	0	5	50	0	100
04:00 PM	10	0	0	1	0	0	0	6	0	17
04:15 PM	12	0	0	1	0	0	4	9	0	26
04:30 PM	6	0	0	0	0	0	0	8	0	14
04:45 PM	8	0	0	0	0	0	2	8	0	18
Total	36	0	0	2	0	0	6	31	0	75
05:00 PM	10	0	0	1	0	0	0	4	0	15
05:15 PM	8	0	0	1	0	0	2	8	0	19
Grand Total	115	0	0	9	0	0	15	108	0	247
Apprch %	100	0	0	100	0	0	12.2	87.8	0	
Total %	46.6	0	0	3.6	0	0	6.1	43.7	0	

	McClellan Highway (Route 1A) From North				Waldemar Avenue From East				McClellan Highway (Route 1A) From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 02:45 PM													
02:45 PM	9	0	0	9	1	0	0	1	1	8	0	9	19
03:00 PM	13	0	0	13	**2**	0	0	**2**	1	**15**	0	**16**	**31**
03:15 PM	**14**	0	0	**14**	0	0	0	0	**2**	11	0	13	27
03:30 PM	10	0	0	10	1	0	0	1	0	13	0	13	24
Total Volume	46	0	0	46	4	0	0	4	4	47	0	51	101
% App. Total	100	0	0		100	0	0		7.8	92.2	0		
PHF	.821	.000	.000	.821	.500	.000	.000	.500	.500	.783	.000	.797	.815

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N/S: McClellan Highway (Route 1A)
E: Waldemar Avenue
City, State: Boston, MA
Client: VHB/ R. White

File Name : 133332 BB
Site Code : 10271.07
Start Date : 5/11/2013
Page No : 1

Groups Printed- Peds and Bicycles

	McClellan Highway (Route 1A) From North			Waldemar Avenue From East			McClellan Highway (Route 1A) From South			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
02:30 PM	0	0	0	0	0	1	0	0	0	1
02:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	1	0	0	0	1
03:00 PM	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
04:00 PM	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	1	0	0	0	1
04:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	1	0	0	0	1
05:00 PM	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	2	0	0	0	2
Apprch %	0	0	0	0	0	100	0	0	0	
Total %	0	0	0	0	0	100	0	0	0	

	McClellan Highway (Route 1A) From North				Waldemar Avenue From East				McClellan Highway (Route 1A) From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 02:30 PM													
02:30 PM	0	0	0	0	0	0	**1**	**1**	0	0	0	0	**1**
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	1	1	0	0	0	0	1
% App. Total	0	0	0		0	0	100		0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.250	.250	.000	.000	.000	.000	.250

N/S: Lee Burbank Highway (Route 1A)
E: Furlong Drive
City, State: Revere, MA
Client: VHB/ R. White

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File Name : 133332 C
Site Code : 10271.07
Start Date : 5/10/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Lee Burbank Highway (Route 1A) From North			Furlong Drive From East			Lee Burbank Highway (Route 1A) From South			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
03:30 PM	473	0	0	30	0	0	30	538	0	1071
03:45 PM	423	0	0	17	0	0	23	489	0	952
Total	896	0	0	47	0	0	53	1027	0	2023
04:00 PM	476	0	0	34	0	0	26	494	0	1030
04:15 PM	481	0	0	27	0	0	21	510	0	1039
04:30 PM	464	0	0	25	0	0	35	509	0	1033
04:45 PM	482	0	0	36	0	0	34	522	0	1074
Total	1903	0	0	122	0	0	116	2035	0	4176
05:00 PM	444	0	0	34	0	0	26	543	0	1047
05:15 PM	397	0	0	31	0	0	25	524	0	977
05:30 PM	428	0	0	36	0	0	24	535	0	1023
05:45 PM	413	0	0	28	0	0	22	466	0	929
Total	1682	0	0	129	0	0	97	2068	0	3976
06:00 PM	429	0	0	27	0	0	20	476	0	952
06:15 PM	415	0	0	19	0	0	18	515	0	967
Grand Total	5325	0	0	344	0	0	304	6121	0	12094
Apprch %	100	0	0	100	0	0	4.7	95.3	0	
Total %	44	0	0	2.8	0	0	2.5	50.6	0	
Cars	5014	0	0	334	0	0	289	5817	0	11454
% Cars	94.2	0	0	97.1	0	0	95.1	95	0	94.7
Heavy Vehicles	311	0	0	10	0	0	15	304	0	640
% Heavy Vehicles	5.8	0	0	2.9	0	0	4.9	5	0	5.3

	Lee Burbank Highway (Route 1A) From North				Furlong Drive From East				Lee Burbank Highway (Route 1A) From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:15 PM													
04:15 PM	481	0	0	481	27	0	0	27	21	510	0	531	1039
04:30 PM	464	0	0	464	25	0	0	25	**35**	509	0	544	1033
04:45 PM	**482**	0	0	**482**	**36**	0	0	**36**	34	522	0	556	**1074**
05:00 PM	444	0	0	444	34	0	0	34	26	**543**	0	**569**	1047
Total Volume	1871	0	0	1871	122	0	0	122	116	2084	0	2200	4193
% App. Total	100	0	0		100	0	0		5.3	94.7	0		
PHF	.970	.000	.000	.970	.847	.000	.000	.847	.829	.959	.000	.967	.976
Cars	1750	0	0	1750	119	0	0	119	112	1963	0	2075	3944
% Cars	93.5	0	0	93.5	97.5	0	0	97.5	96.6	94.2	0	94.3	94.1
Heavy Vehicles	121	0	0	121	3	0	0	3	4	121	0	125	249
% Heavy Vehicles	6.5	0	0	6.5	2.5	0	0	2.5	3.4	5.8	0	5.7	5.9

PRECISION
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N/S: Lee Burbank Highway (Route 1A)
E: Furlong Drive
City, State: Revere, MA
Client: VHB/ R. White

File Name : 133332 C
Site Code : 10271.07
Start Date : 5/10/2013
Page No : 1

Groups Printed- Heavy Vehicles

	Lee Burbank Highway (Route 1A) From North			Furlong Drive From East			Lee Burbank Highway (Route 1A) From South			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
03:30 PM	27	0	0	0	0	0	2	23	0	52
03:45 PM	23	0	0	0	0	0	1	27	0	51
Total	50	0	0	0	0	0	3	50	0	103
04:00 PM	28	0	0	3	0	0	1	29	0	61
04:15 PM	28	0	0	1	0	0	2	26	0	57
04:30 PM	38	0	0	2	0	0	1	33	0	74
04:45 PM	25	0	0	0	0	0	1	32	0	58
Total	119	0	0	6	0	0	5	120	0	250
05:00 PM	30	0	0	0	0	0	0	30	0	60
05:15 PM	21	0	0	1	0	0	0	17	0	39
05:30 PM	26	0	0	1	0	0	0	21	0	48
05:45 PM	16	0	0	0	0	0	1	22	0	39
Total	93	0	0	2	0	0	1	90	0	186
06:00 PM	27	0	0	0	0	0	3	23	0	53
06:15 PM	22	0	0	2	0	0	3	21	0	48
Grand Total	311	0	0	10	0	0	15	304	0	640
Apprch %	100	0	0	100	0	0	4.7	95.3	0	
Total %	48.6	0	0	1.6	0	0	2.3	47.5	0	

	Lee Burbank Highway (Route 1A) From North				Furlong Drive From East				Lee Burbank Highway (Route 1A) From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	28	0	0	28	**3**	0	0	**3**	1	29	0	30	61
04:15 PM	28	0	0	28	1	0	0	1	**2**	26	0	28	57
04:30 PM	**38**	0	0	**38**	2	0	0	2	1	**33**	0	**34**	**74**
04:45 PM	25	0	0	25	0	0	0	0	1	32	0	33	58
Total Volume	119	0	0	119	6	0	0	6	5	120	0	125	250
% App. Total	100	0	0		100	0	0		4	96	0		
PHF	.783	.000	.000	.783	.500	.000	.000	.500	.625	.909	.000	.919	.845

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N/S: Lee Burbank Highway (Route 1A)
E: Furlong Drive
City, State: Revere, MA
Client: VHB/ R. White

File Name : 133332 C
Site Code : 10271.07
Start Date : 5/10/2013
Page No : 1

Groups Printed- Peds and Bicycles

	Lee Burbank Highway (Route 1A) From North			Furlong Drive From East			Lee Burbank Highway (Route 1A) From South			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
03:30 PM	0	0	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	2	0	0	0	2
Total	0	0	0	0	0	2	0	0	0	2
04:00 PM	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	1	1	0	1	0	0	1	4
04:30 PM	0	0	0	0	0	0	0	0	1	1
04:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	1	1	0	1	0	0	2	5
05:00 PM	0	0	0	0	0	0	0	0	0	0
05:15 PM	3	0	0	0	0	0	0	0	0	3
05:30 PM	0	0	1	0	0	0	0	0	0	1
05:45 PM	0	0	0	0	0	1	0	0	0	1
Total	3	0	1	0	0	1	0	0	0	5
06:00 PM	0	0	0	0	0	1	0	0	0	1
06:15 PM	0	0	0	0	0	2	0	0	0	2
Grand Total	3	0	2	1	0	7	0	0	2	15
Apprch %	60	0	40	12.5	0	87.5	0	0	100	
Total %	20	0	13.3	6.7	0	46.7	0	0	13.3	

	Lee Burbank Highway (Route 1A) From North				Furlong Drive From East				Lee Burbank Highway (Route 1A) From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 03:45 PM													
03:45 PM	0	0	0	0	0	0	**2**	**2**	0	0	0	0	2
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	**1**	**1**	**1**	0	1	2	0	0	**1**	**1**	**4**
04:30 PM	0	0	0	0	0	0	0	0	0	0	1	1	1
Total Volume	0	0	1	1	1	0	3	4	0	0	2	2	7
% App. Total	0	0	100		25	0	75		0	0	100		
PHF	.000	.000	.250	.250	.250	.000	.375	.500	.000	.000	.500	.500	.438

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E: Furlong Drive
City, State: Revere, MA
Client: VHB/ R. White

File Name : 133332 CC
Site Code : 10271.07
Start Date : 5/11/2013

Groups Printed- Cars - Heavy Vehicles

	Lee Burbank Highway (Route 1A) From North			Furlong Drive From East			Lee Burbank Highway (Route 1A) From South			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
02:30 PM	437	0	0	41	0	0	24	402	0	904
02:45 PM	430	0	0	35	0	0	34	396	0	895
Total	867	0	0	76	0	0	58	798	0	1799
03:00 PM	437	0	0	37	0	0	25	434	0	933
03:15 PM	410	0	0	29	0	0	36	399	0	874
03:30 PM	438	0	0	31	0	0	38	440	0	947
03:45 PM	444	0	0	35	0	0	31	414	0	924
Total	1729	0	0	132	0	0	130	1687	0	3678
04:00 PM	389	0	0	46	0	0	27	450	0	912
04:15 PM	390	0	0	35	0	0	40	377	0	842
04:30 PM	434	0	0	28	0	0	29	355	0	846
04:45 PM	429	0	0	35	0	0	34	325	0	823
Total	1642	0	0	144	0	0	130	1507	0	3423
05:00 PM	381	0	0	29	0	0	35	415	0	860
05:15 PM	451	0	0	32	0	0	37	356	0	876
Grand Total	5070	0	0	413	0	0	390	4763	0	10636
Apprch %	100	0	0	100	0	0	7.6	92.4	0	
Total %	47.7	0	0	3.9	0	0	3.7	44.8	0	
Cars	4906	0	0	403	0	0	375	4628	0	10312
% Cars	96.8	0	0	97.6	0	0	96.2	97.2	0	97
Heavy Vehicles	164	0	0	10	0	0	15	135	0	324
% Heavy Vehicles	3.2	0	0	2.4	0	0	3.8	2.8	0	3

	Lee Burbank Highway (Route 1A) From North				Furlong Drive From East				Lee Burbank Highway (Route 1A) From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 03:00 PM													
03:00 PM	437	0	0	437	**37**	0	0	**37**	25	434	0	459	933
03:15 PM	410	0	0	410	29	0	0	29	36	399	0	435	874
03:30 PM	438	0	0	438	31	0	0	31	**38**	**440**	0	**478**	**947**
03:45 PM	**444**	0	0	**444**	35	0	0	35	31	414	0	445	924
Total Volume	1729	0	0	1729	132	0	0	132	130	1687	0	1817	3678
% App. Total	100	0	0		100	0	0		7.2	92.8	0		
PHF	.974	.000	.000	.974	.892	.000	.000	.892	.855	.959	.000	.950	.971
Cars	1681	0	0	1681	128	0	0	128	125	1634	0	1759	3568
% Cars	97.2	0	0	97.2	97.0	0	0	97.0	96.2	96.9	0	96.8	97.0
Heavy Vehicles	48	0	0	48	4	0	0	4	5	53	0	58	110
% Heavy Vehicles	2.8	0	0	2.8	3.0	0	0	3.0	3.8	3.1	0	3.2	3.0

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N/S: Lee Burbank Highway (Route 1A)
E: Furlong Drive
City, State: Revere, MA
Client: VHB/ R. White

File Name : 133332 CC
Site Code : 10271.07
Start Date : 5/11/2013
Page No : 1

Groups Printed- Heavy Vehicles

	Lee Burbank Highway (Route 1A) From North			Furlong Drive From East			Lee Burbank Highway (Route 1A) From South			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
02:30 PM	14	0	0	0	0	0	2	6	0	22
02:45 PM	17	0	0	0	0	0	1	14	0	32
Total	31	0	0	0	0	0	3	20	0	54
03:00 PM	16	0	0	0	0	0	1	19	0	36
03:15 PM	11	0	0	0	0	0	2	8	0	21
03:30 PM	14	0	0	1	0	0	1	12	0	28
03:45 PM	7	0	0	3	0	0	1	14	0	25
Total	48	0	0	4	0	0	5	53	0	110
04:00 PM	15	0	0	1	0	0	1	8	0	25
04:15 PM	15	0	0	0	0	0	3	12	0	30
04:30 PM	13	0	0	3	0	0	0	11	0	27
04:45 PM	11	0	0	0	0	0	0	11	0	22
Total	54	0	0	4	0	0	4	42	0	104
05:00 PM	16	0	0	2	0	0	1	11	0	30
05:15 PM	15	0	0	0	0	0	2	9	0	26
Grand Total	164	0	0	10	0	0	15	135	0	324
Apprch %	100	0	0	100	0	0	10	90	0	
Total %	50.6	0	0	3.1	0	0	4.6	41.7	0	

	Lee Burbank Highway (Route 1A) From North				Furlong Drive From East				Lee Burbank Highway (Route 1A) From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 02:45 PM													
02:45 PM	**17**	0	0	**17**	0	0	0	0	1	14	0	15	32
03:00 PM	16	0	0	16	0	0	0	0	1	**19**	0	**20**	**36**
03:15 PM	11	0	0	11	0	0	0	0	**2**	8	0	10	21
03:30 PM	14	0	0	14	**1**	0	0	**1**	1	12	0	13	28
Total Volume	58	0	0	58	1	0	0	1	5	53	0	58	117
% App. Total	100	0	0		100	0	0		8.6	91.4	0		
PHF	.853	.000	.000	.853	.250	.000	.000	.250	.625	.697	.000	.725	.813

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N/S: Lee Burbank Highway (Route 1A)
E: Furlong Drive
City, State: Revere, MA
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File Name : 133332 CC
Site Code : 10271.07
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Page No : 1

Groups Printed- Peds and Bicycles

	Lee Burbank Highway (Route 1A) From North			Furlong Drive From East			Lee Burbank Highway (Route 1A) From South			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
02:30 PM	0	0	0	0	0	1	0	1	0	2
02:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	1	0	1	0	2
03:00 PM	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	1	0	0	1	0	0	2	4
03:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	1	0	0	1	0	0	2	4
04:00 PM	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	1	0	0	0	1
04:30 PM	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	1	0	0	0	1
05:00 PM	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	1	0	0	3	0	1	2	7
Apprch %	0	0	100	0	0	100	0	33.3	66.7	
Total %	0	0	14.3	0	0	42.9	0	14.3	28.6	

	Lee Burbank Highway (Route 1A) From North				Furlong Drive From East				Lee Burbank Highway (Route 1A) From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 03:30 PM													
03:30 PM	0	0	**1**	**1**	0	0	**1**	**1**	0	0	**2**	**2**	**4**
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	1	1	0	0	0	0	1
Total Volume	0	0	1	1	0	0	2	2	0	0	2	2	5
% App. Total	0	0	100		0	0	100		0	0	100		
PHF	.000	.000	.250	.250	.000	.000	.500	.500	.000	.000	.250	.250	.313

N/S: Ocean Avenue/ Dolphin Avenue
E/W: Revere Beach Parkway (Route 145)
City, State: Revere, MA
Client: VHB/ R. White

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Site Code : 10271.07
Start Date : 5/10/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Ocean Avenue From North				Revere Beach Parkway (Route 145) From East				Dolphin Avenue From South				Revere Beach Parkway (Route 145) From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
03:30 PM	0	4	62	0	0	0	0	0	5	0	0	0	15	252	35	0	373
03:45 PM	0	2	72	0	0	0	0	0	3	0	0	0	8	288	38	0	411
Total	0	6	134	0	0	0	0	0	8	0	0	0	23	540	73	0	784
04:00 PM	0	8	72	0	0	0	0	0	3	0	0	0	14	216	32	0	345
04:15 PM	0	4	73	0	0	0	0	0	4	0	0	0	14	263	42	0	400
04:30 PM	0	1	77	0	0	0	0	0	3	0	0	0	13	230	52	0	376
04:45 PM	0	1	74	0	0	0	0	0	2	0	0	0	16	233	43	0	369
Total	0	14	296	0	0	0	0	0	12	0	0	0	57	942	169	0	1490
05:00 PM	0	5	65	0	0	0	0	0	2	0	0	0	12	278	41	0	403
05:15 PM	0	7	66	0	0	0	0	0	2	0	0	0	15	298	30	0	418
05:30 PM	0	1	60	0	0	0	0	0	3	0	0	0	18	265	52	0	399
05:45 PM	0	3	54	0	0	0	0	0	2	0	0	0	13	259	42	0	373
Total	0	16	245	0	0	0	0	0	9	0	0	0	58	1100	165	0	1593
06:00 PM	0	3	82	0	0	0	0	0	5	0	0	0	14	261	38	0	403
06:15 PM	0	3	63	0	0	0	0	0	4	0	0	0	19	230	49	0	368
Grand Total	0	42	820	0	0	0	0	0	38	0	0	0	171	3073	494	0	4638
Apprch %	0	4.9	95.1	0	0	0	0	0	100	0	0	0	4.6	82.2	13.2	0	
Total %	0	0.9	17.7	0	0	0	0	0	0.8	0	0	0	3.7	66.3	10.7	0	
Cars	0	42	813	0	0	0	0	0	38	0	0	0	171	3054	489	0	4607
% Cars	0	100	99.1	0	0	0	0	0	100	0	0	0	100	99.4	99	0	99.3
Heavy Vehicles	0	0	7	0	0	0	0	0	0	0	0	0	0	19	5	0	31
% Heavy Vehicles	0	0	0.9	0	0	0	0	0	0	0	0	0	0	0.6	1	0	0.7

	Ocean Avenue From North					Revere Beach Parkway (Route 145) From East					Dolphin Avenue From South					Revere Beach Parkway (Route 145) From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	5	65	0	70	0	0	0	0	0	2	0	0	0	2	12	278	41	0	331	403
05:15 PM	0	**7**	**66**	0	**73**	0	0	0	0	0	2	0	0	0	2	15	**298**	30	0	**343**	**418**
05:30 PM	0	1	60	0	61	0	0	0	0	0	**3**	0	0	0	**3**	**18**	265	**52**	0	335	399
05:45 PM	0	3	54	0	57	0	0	0	0	0	2	0	0	0	2	13	259	42	0	314	373
Total Volume	0	16	245	0	261	0	0	0	0	0	9	0	0	0	9	58	1100	165	0	1323	1593
% App. Total	0	6.1	93.9	0		0	0	0	0		100	0	0	0		4.4	83.1	12.5	0		
PHF	.000	.571	.928	.000	.894	.000	.000	.000	.000	.000	.750	.000	.000	.000	.750	.806	.923	.793	.000	.964	.953
Cars	0	16	245	0	261	0	0	0	0	0	9	0	0	0	9	58	1097	164	0	1319	1589
% Cars	0	100	100	0	100	0	0	0	0	0	100	0	0	0	100	100	99.7	99.4	0	99.7	99.7
Heavy Vehicles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	4	4
% Heavy Vehicles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.6	0	0.3	0.3

PRECISION
D A T A
INDUSTRIES, LLC
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Email: datarequests@pdillc.com

N/S: Ocean Avenue/ Dolphin Avenue
E/W: Revere Beach Parkway (Route 145)
City, State: Revere, MA
Client: VHB/ R. White

File Name : 133332 D
Site Code : 10271.07
Start Date : 5/10/2013
Page No : 1

Groups Printed- Heavy Vehicles

	Ocean Avenue From North				Revere Beach Parkway (Route 145) From East				Dolphin Avenue From South				Revere Beach Parkway (Route 145) From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	6
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	9
04:00 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	3	0	0	4
04:15 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	2	1	0	4
04:30 PM	0	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	3
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	4	0	0	0	0	0	0	0	0	0	0	6	1	0	11
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	3
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	4
06:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	3
06:15 PM	0	0	3	0	0	0	0	0	0	0	0	0	0	0	1	0	4
Grand Total	0	0	7	0	0	0	0	0	0	0	0	0	0	19	5	0	31
Apprch %	0	0	100	0	0	0	0	0	0	0	0	0	0	79.2	20.8	0	
Total %	0	0	22.6	0	0	0	0	0	0	0	0	0	0	61.3	16.1	0	

	Ocean Avenue From North					Revere Beach Parkway (Route 145) From East					Dolphin Avenue From South					Revere Beach Parkway (Route 145) From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**6**	0	0	**6**	**6**
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	3
04:00 PM	0	0	**1**	0	**1**	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	4
04:15 PM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2	**1**	0	3	4
Total Volume	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	14	1	0	15	17
% App. Total	0	0	100	0		0	0	0	0		0	0	0	0		0	93.3	6.7	0		
PHF	.000	.000	.500	.000	.500	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.583	.250	.000	.625	.708

PRECISION
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N/S: Ocean Avenue/ Dolphin Avenue
E/W: Revere Beach Parkway (Route 145)
City, State: Revere, MA
Client: VHB/ R. White

File Name : 133332 D
Site Code : 10271.07
Start Date : 5/10/2013
Page No : 1

Groups Printed- Peds and Bicycles

	Ocean Avenue From North				Revere Beach Parkway (Route 145) From East				Dolphin Avenue From South				Revere Beach Parkway (Route 145) From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
03:45 PM	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	1	5
Total	0	0	0	0	0	0	0	2	0	0	0	3	0	0	0	1	6
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	4
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	9
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	5	0	1	0	0	6
04:45 PM	0	0	0	0	0	0	0	1	0	0	0	9	0	2	0	0	12
Total	0	0	0	0	0	0	0	1	0	0	0	27	0	3	0	0	31
05:00 PM	0	0	0	1	0	0	0	0	0	0	0	3	0	2	0	1	7
05:15 PM	0	0	0	0	0	0	0	1	0	0	0	7	0	1	0	0	9
05:30 PM	0	0	0	1	0	0	0	0	0	0	0	7	0	1	0	0	9
05:45 PM	0	0	1	0	0	0	0	0	0	0	0	4	0	0	0	0	5
Total	0	0	1	2	0	0	0	1	0	0	0	21	0	4	0	1	30
06:00 PM	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	1	6
06:15 PM	0	0	2	0	0	0	0	0	0	0	0	6	0	1	0	1	10
Grand Total	0	0	3	2	0	0	0	4	0	0	0	62	0	8	0	4	83
Apprch %	0	0	60	40	0	0	0	100	0	0	0	100	0	66.7	0	33.3	
Total %	0	0	3.6	2.4	0	0	0	4.8	0	0	0	74.7	0	9.6	0	4.8	

	Ocean Avenue From North					Revere Beach Parkway (Route 145) From East					Dolphin Avenue From South					Revere Beach Parkway (Route 145) From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	0	0	0	0	0	0	0	0	**1**	**1**	0	0	0	**9**	**9**	0	**2**	0	0	2	**12**
05:00 PM	0	0	0	**1**	**1**	0	0	0	0	0	0	0	0	3	3	0	2	0	**1**	**3**	7
05:15 PM	0	0	0	0	0	0	0	0	1	1	0	0	0	7	7	0	1	0	0	1	9
05:30 PM	0	0	0	1	1	0	0	0	0	0	0	0	0	7	7	0	1	0	0	1	9
Total Volume	0	0	0	2	2	0	0	0	2	2	0	0	0	26	26	0	6	0	1	7	37
% App. Total	0	0	0	100		0	0	0	100		0	0	0	100		0	85.7	0	14.3		
PHF	.000	.000	.000	.500	.500	.000	.000	.000	.500	.500	.000	.000	.000	.722	.722	.000	.750	.000	.250	.583	.771

N/S: Ocean Avenue/ Dolphin Avenue
E/W: Revere Beach Parkway (Route 145)
City, State: Revere, MA
Client: VHB/ R. White

PRECISION DATA INDUSTRIES, LLC
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File Name : 133332 DD
Site Code : 10271.07
Start Date : 5/11/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Ocean Avenue From North				Revere Beach Parkway (Route 145) From East				Dolphin Avenue From South				Revere Beach Parkway (Route 145) From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
02:30 PM	0	1	49	0	0	0	0	0	3	0	0	0	14	142	25	0	234
02:45 PM	0	3	54	0	0	0	0	0	3	0	0	0	8	169	26	0	263
Total	0	4	103	0	0	0	0	0	6	0	0	0	22	311	51	0	497
03:00 PM	0	1	62	0	0	0	0	0	2	0	0	0	13	153	24	0	255
03:15 PM	0	3	59	0	0	0	0	0	7	0	0	0	12	138	26	0	245
03:30 PM	0	3	49	0	0	0	0	0	4	0	0	0	10	158	28	0	252
03:45 PM	0	0	68	0	0	0	0	0	1	0	0	0	3	162	24	0	258
Total	0	7	238	0	0	0	0	0	14	0	0	0	38	611	102	0	1010
04:00 PM	0	4	64	0	0	0	0	0	2	0	0	0	13	161	23	0	267
04:15 PM	0	4	57	0	0	0	0	0	4	0	0	0	9	146	25	0	245
04:30 PM	0	4	51	0	0	0	0	0	4	0	0	0	6	146	28	0	239
04:45 PM	0	0	43	0	0	0	0	0	1	0	0	0	15	155	41	0	255
Total	0	12	215	0	0	0	0	0	11	0	0	0	43	608	117	0	1006
05:00 PM	0	3	54	0	0	0	0	0	6	0	0	0	7	157	20	0	247
05:15 PM	0	1	53	0	0	0	0	0	2	0	0	0	12	128	22	0	218
Grand Total	0	27	663	0	0	0	0	0	39	0	0	0	122	1815	312	0	2978
Apprch %	0	3.9	96.1	0	0	0	0	0	100	0	0	0	5.4	80.7	13.9	0	
Total %	0	0.9	22.3	0	0	0	0	0	1.3	0	0	0	4.1	60.9	10.5	0	
Cars	0	26	661	0	0	0	0	0	39	0	0	0	121	1812	308	0	2967
% Cars	0	96.3	99.7	0	0	0	0	0	100	0	0	0	99.2	99.8	98.7	0	99.6
Heavy Vehicles	0	1	2	0	0	0	0	0	0	0	0	0	1	3	4	0	11
% Heavy Vehicles	0	3.7	0.3	0	0	0	0	0	0	0	0	0	0.8	0.2	1.3	0	0.4

	Ocean Avenue From North					Revere Beach Parkway (Route 145) From East					Dolphin Avenue From South					Revere Beach Parkway (Route 145) From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:15 PM																					
03:15 PM	0	3	59	0	62	0	0	0	0	0	**7**	0	0	0	**7**	12	138	26	0	176	245
03:30 PM	0	3	49	0	52	0	0	0	0	0	4	0	0	0	4	10	158	**28**	0	196	252
03:45 PM	0	0	**68**	0	**68**	0	0	0	0	0	1	0	0	0	1	3	**162**	24	0	189	258
04:00 PM	0	**4**	64	0	68	0	0	0	0	0	2	0	0	0	2	**13**	161	23	0	**197**	**267**
Total Volume	0	10	240	0	250	0	0	0	0	0	14	0	0	0	14	38	619	101	0	758	1022
% App. Total	0	4	96	0		0	0	0	0		100	0	0	0		5	81.7	13.3	0		
PHF	.000	.625	.882	.000	.919	.000	.000	.000	.000	.000	.500	.000	.000	.000	.500	.731	.955	.902	.000	.962	.957
Cars	0	10	239	0	249	0	0	0	0	0	14	0	0	0	14	38	619	99	0	756	1019
% Cars	0	100	99.6	0	99.6	0	0	0	0	0	100	0	0	0	100	100	100	98.0	0	99.7	99.7
Heavy Vehicles	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	3
% Heavy Vehicles	0	0	0.4	0	0.4	0	0	0	0	0	0	0	0	0	0	0	0	2.0	0	0.3	0.3

PRECISION
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N/S: Ocean Avenue/ Dolphin Avenue
E/W: Revere Beach Parkway (Route 145)
City, State: Revere, MA
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File Name : 133332 DD
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Start Date : 5/11/2013
Page No : 1

Groups Printed- Heavy Vehicles

	Ocean Avenue From North				Revere Beach Parkway (Route 145) From East				Dolphin Avenue From South				Revere Beach Parkway (Route 145) From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	3
04:00 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
04:15 PM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	2	1	0	4
Total	0	1	2	0	0	0	0	0	0	0	0	0	0	2	1	0	6
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	1	2	0	0	0	0	0	0	0	0	0	1	3	4	0	11
Apprch %	0	33.3	66.7	0	0	0	0	0	0	0	0	0	12.5	37.5	50	0	
Total %	0	9.1	18.2	0	0	0	0	0	0	0	0	0	9.1	27.3	36.4	0	

	Ocean Avenue From North					Revere Beach Parkway (Route 145) From East					Dolphin Avenue From South					Revere Beach Parkway (Route 145) From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	**1**	0	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
04:15 PM	0	**1**	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	**2**	**1**	0	**3**	**4**
Total Volume	0	1	2	0	3	0	0	0	0	0	0	0	0	0	0	0	2	1	0	3	6
% App. Total	0	33.3	66.7	0		0	0	0	0		0	0	0	0		0	66.7	33.3	0		
PHF	.000	.250	.500	.000	.750	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.250	.000	.250	.375

PRECISION
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Groups Printed- Peds and Bicycles

	Ocean Avenue From North				Revere Beach Parkway (Route 145) From East				Dolphin Avenue From South				Revere Beach Parkway (Route 145) From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
02:30 PM	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	4
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Total	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	2	5
03:00 PM	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	4
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	5
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	5	0	1	0	0	6
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Grand Total	0	0	0	2	0	0	0	0	1	0	0	11	0	2	0	2	18
Apprch %	0	0	0	100	0	0	0	0	8.3	0	0	91.7	0	50	0	50	
Total %	0	0	0	11.1	0	0	0	0	5.6	0	0	61.1	0	11.1	0	11.1	

	Ocean Avenue From North					Revere Beach Parkway (Route 145) From East					Dolphin Avenue From South					Revere Beach Parkway (Route 145) From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	4
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	**5**	**5**	0	**1**	0	0	**1**	**6**
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	10	10	0	1	0	0	1	11
% App. Total	0	0	0	0		0	0	0	0		0	0	0	100		0	100	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.500	.500	.000	.250	.000	.000	.250	.458

N/S: Ocean Avenue/ Revere Beach Parkway
E/W: Eliot Circle/ State Road
City, State: Revere, MA
Client: VHB/ R. White

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
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File Name : 133332 E
Site Code : 10271.07
Start Date : 5/10/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Ocean Avenue From North				Eliot Circle From East				Revere Beach Parkway (Route 145) From South				State Road From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
03:30 PM	58	62	67	0	12	3	71	0	0	37	0	0	0	0	0	0	310
03:45 PM	54	48	73	0	18	7	41	0	0	37	0	1	0	0	0	0	279
Total	112	110	140	0	30	10	112	0	0	74	0	1	0	0	0	0	589
04:00 PM	66	73	78	0	15	6	51	1	0	32	0	0	0	0	0	0	322
04:15 PM	51	58	77	0	8	7	59	0	0	37	0	0	0	0	0	0	297
04:30 PM	53	72	76	0	11	8	50	1	0	51	0	0	0	0	0	0	322
04:45 PM	50	30	73	0	8	12	45	1	0	39	0	1	0	0	0	0	259
Total	220	233	304	0	42	33	205	3	0	159	0	1	0	0	0	0	1200
05:00 PM	50	43	70	0	12	3	51	0	0	38	0	0	0	0	0	0	267
05:15 PM	46	36	76	0	10	10	51	0	0	36	0	0	0	0	0	0	265
05:30 PM	51	51	60	0	8	8	56	0	0	48	0	1	0	0	0	0	283
05:45 PM	57	41	63	0	8	9	53	0	0	40	0	0	0	0	0	0	271
Total	204	171	269	0	38	30	211	0	0	162	0	1	0	0	0	0	1086
06:00 PM	77	41	79	0	11	7	55	0	0	40	0	0	0	0	0	0	310
06:15 PM	59	42	71	0	10	6	63	0	0	46	0	1	0	0	0	0	298
Grand Total	672	597	863	0	131	86	646	3	0	481	0	4	0	0	0	0	3483
Apprch %	31.5	28	40.5	0	15.1	9.9	74.6	0.3	0	99.2	0	0.8	0	0	0	0	
Total %	19.3	17.1	24.8	0	3.8	2.5	18.5	0.1	0	13.8	0	0.1	0	0	0	0	
Cars	664	591	856	0	129	86	637	3	0	475	0	4	0	0	0	0	3445
% Cars	98.8	99	99.2	0	98.5	100	98.6	100	0	98.8	0	100	0	0	0	0	98.9
Heavy Vehicles	8	6	7	0	2	0	9	0	0	6	0	0	0	0	0	0	38
% Heavy Vehicles	1.2	1	0.8	0	1.5	0	1.4	0	0	1.2	0	0	0	0	0	0	1.1

	Ocean Avenue From North					Eliot Circle From East					Revere Beach Parkway (Route 145) From South					State Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:45 PM																					
03:45 PM	54	48	73	0	175	**18**	7	41	0	66	0	37	0	**1**	38	0	0	0	0	0	279
04:00 PM	**66**	**73**	**78**	0	**217**	15	6	51	**1**	73	0	32	0	0	32	0	0	0	0	0	**322**
04:15 PM	51	58	77	0	186	8	7	**59**	0	**74**	0	37	0	0	37	0	0	0	0	0	297
04:30 PM	53	72	76	0	201	11	**8**	50	1	70	0	**51**	0	0	**51**	0	0	0	0	0	322
Total Volume	224	251	304	0	779	52	28	201	2	283	0	157	0	1	158	0	0	0	0	0	1220
% App. Total	28.8	32.2	39	0		18.4	9.9	71	0.7		0	99.4	0	0.6		0	0	0	0		
PHF	.848	.860	.974	.000	.897	.722	.875	.852	.500	.956	.000	.770	.000	.250	.775	.000	.000	.000	.000	.000	.947
Cars	222	249	300	0	771	50	28	199	2	279	0	155	0	1	156	0	0	0	0	0	1206
% Cars	99.1	99.2	98.7	0	99.0	96.2	100	99.0	100	98.6	0	98.7	0	100	98.7	0	0	0	0	0	98.9
Heavy Vehicles	2	2	4	0	8	2	0	2	0	4	0	2	0	0	2	0	0	0	0	0	14
% Heavy Vehicles	0.9	0.8	1.3	0	1.0	3.8	0	1.0	0	1.4	0	1.3	0	0	1.3	0	0	0	0	0	1.1

N/S: Ocean Avenue/ Revere Beach Parkway
E/W: Eliot Circle/ State Road
City, State: Revere, MA
Client: VHB/ R. White

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File Name : 133332 E
Site Code : 10271.07
Start Date : 5/10/2013
Page No : 1

Groups Printed- Heavy Vehicles

	Ocean Avenue From North				Eliot Circle From East				Revere Beach Parkway (Route 145) From South				State Road From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
03:30 PM	2	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	5
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	5
04:00 PM	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	4
04:15 PM	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0	0	4
04:30 PM	1	1	2	0	1	0	1	0	0	0	0	0	0	0	0	0	6
04:45 PM	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	3
Total	3	2	4	0	2	0	4	0	0	2	0	0	0	0	0	0	17
05:00 PM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
05:15 PM	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	2
05:30 PM	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	2	1	0	0	0	1	0	0	1	0	0	0	0	0	0	5
06:00 PM	2	1	0	0	0	0	1	0	0	2	0	0	0	0	0	0	6
06:15 PM	1	0	2	0	0	0	1	0	0	1	0	0	0	0	0	0	5
Grand Total	8	6	7	0	2	0	9	0	0	6	0	0	0	0	0	0	38
Apprch %	38.1	28.6	33.3	0	18.2	0	81.8	0	0	100	0	0	0	0	0	0	
Total %	21.1	15.8	18.4	0	5.3	0	23.7	0	0	15.8	0	0	0	0	0	0	

	Ocean Avenue From North					Eliot Circle From East					Revere Beach Parkway (Route 145) From South					State Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	**1**	**1**	1	0	3	0	0	0	0	0	0	**1**	0	0	**1**	0	0	0	0	0	4
04:15 PM	0	0	1	0	1	**1**	0	1	0	**2**	0	1	0	0	1	0	0	0	0	0	4
04:30 PM	1	1	**2**	0	**4**	1	0	1	0	2	0	0	0	0	0	0	0	0	0	0	**6**
04:45 PM	1	0	0	0	1	0	0	**2**	0	2	0	0	0	0	0	0	0	0	0	0	3
Total Volume	3	2	4	0	9	2	0	4	0	6	0	2	0	0	2	0	0	0	0	0	17
% App. Total	33.3	22.2	44.4	0		33.3	0	66.7	0		0	100	0	0		0	0	0	0		
PHF	.750	.500	.500	.000	.563	.500	.000	.500	.000	.750	.000	.500	.000	.000	.500	.000	.000	.000	.000	.000	.708

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E/W: Eliot Circle/ State Road
City, State: Revere, MA
Client: VHB/ R. White

File Name : 133332 E
Site Code : 10271.07
Start Date : 5/10/2013
Page No : 1

Groups Printed- Peds and Bicycles

	Ocean Avenue From North				Eliot Circle From East				Revere Beach Parkway (Route 145) From South				State Road From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
03:30 PM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	1	6
04:45 PM	0	0	0	3	0	0	0	1	0	0	0	0	0	0	0	0	4
Total	0	0	0	8	0	0	0	1	0	0	0	0	0	0	0	1	10
05:00 PM	2	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	4
05:15 PM	0	0	0	5	0	0	0	1	0	0	0	2	0	0	0	2	10
05:30 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	2
05:45 PM	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2
Total	2	0	1	7	0	1	0	3	0	0	0	2	0	0	0	2	18
06:00 PM	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	2
06:15 PM	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Grand Total	3	0	1	17	0	2	0	4	0	0	0	2	0	0	0	3	32
Apprch %	14.3	0	4.8	81	0	33.3	0	66.7	0	0	0	100	0	0	0	100	
Total %	9.4	0	3.1	53.1	0	6.2	0	12.5	0	0	0	6.2	0	0	0	9.4	

	Ocean Avenue From North					Eliot Circle From East					Revere Beach Parkway (Route 145) From South					State Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	0	0	0	**5**	**5**	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	6
04:45 PM	0	0	0	3	3	0	0	0	**1**	**1**	0	0	0	0	0	0	0	0	0	0	4
05:00 PM	**2**	0	0	1	3	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	4
05:15 PM	0	0	0	5	5	0	0	0	1	1	0	0	0	**2**	**2**	0	0	0	**2**	**2**	**10**
Total Volume	2	0	0	14	16	0	0	0	3	3	0	0	0	2	2	0	0	0	3	3	24
% App. Total	12.5	0	0	87.5		0	0	0	100		0	0	0	100		0	0	0	100		
PHF	.250	.000	.000	.700	.800	.000	.000	.000	.750	.750	.000	.000	.000	.250	.250	.000	.000	.000	.375	.375	.600

N/S: Ocean Avenue/ Revere Beach Parkway
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Groups Printed- Cars - Heavy Vehicles

	Ocean Avenue From North				Eliot Circle From East				Revere Beach Parkway (Route 145) From South				State Road From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
02:30 PM	34	40	50	0	9	4	68	0	0	25	0	0	0	0	0	0	230
02:45 PM	39	37	57	0	6	3	59	0	0	27	0	0	0	0	0	0	228
Total	73	77	107	0	15	7	127	0	0	52	0	0	0	0	0	0	458
03:00 PM	43	26	63	0	10	5	39	0	0	24	0	0	0	0	0	0	210
03:15 PM	49	33	62	0	9	6	52	1	0	25	0	0	0	0	0	0	237
03:30 PM	38	44	51	0	8	5	44	0	0	27	1	0	0	0	0	0	218
03:45 PM	32	30	65	0	9	7	52	0	0	21	0	0	0	0	0	0	216
Total	162	133	241	0	36	23	187	1	0	97	1	0	0	0	0	0	881
04:00 PM	53	36	67	0	15	9	43	0	0	21	0	0	0	0	0	0	244
04:15 PM	36	43	63	0	11	6	46	0	0	22	0	2	0	0	0	0	229
04:30 PM	28	47	55	0	9	4	61	1	0	29	0	0	0	0	0	0	234
04:45 PM	50	44	48	0	12	3	36	0	0	38	0	0	0	0	0	0	231
Total	167	170	233	0	47	22	186	1	0	110	0	2	0	0	0	0	938
05:00 PM	49	33	52	0	6	14	50	0	0	22	1	0	0	0	0	0	227
05:15 PM	48	35	57	0	17	2	42	0	0	23	0	0	0	0	0	0	224
Grand Total	499	448	690	0	121	68	592	2	0	304	2	2	0	0	0	0	2728
Apprch %	30.5	27.4	42.2	0	15.5	8.7	75.6	0.3	0	98.7	0.6	0.6	0	0	0	0	
Total %	18.3	16.4	25.3	0	4.4	2.5	21.7	0.1	0	11.1	0.1	0.1	0	0	0	0	
Cars	497	446	687	0	121	68	589	2	0	301	2	2	0	0	0	0	2715
% Cars	99.6	99.6	99.6	0	100	100	99.5	100	0	99	100	100	0	0	0	0	99.5
Heavy Vehicles	2	2	3	0	0	0	3	0	0	3	0	0	0	0	0	0	13
% Heavy Vehicles	0.4	0.4	0.4	0	0	0	0.5	0	0	1	0	0	0	0	0	0	0.5

	Ocean Avenue From North					Eliot Circle From East					Revere Beach Parkway (Route 145) From South					State Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	**53**	36	**67**	0	**156**	**15**	**9**	43	0	67	0	21	0	0	21	0	0	0	0	0	**244**
04:15 PM	36	43	63	0	142	11	6	46	0	63	0	22	0	**2**	24	0	0	0	0	0	229
04:30 PM	28	**47**	55	0	130	9	4	**61**	**1**	**75**	0	29	0	0	29	0	0	0	0	0	234
04:45 PM	50	44	48	0	142	12	3	36	0	51	0	**38**	0	0	**38**	0	0	0	0	0	231
Total Volume	167	170	233	0	570	47	22	186	1	256	0	110	0	2	112	0	0	0	0	0	938
% App. Total	29.3	29.8	40.9	0		18.4	8.6	72.7	0.4		0	98.2	0	1.8		0	0	0	0		
PHF	.788	.904	.869	.000	.913	.783	.611	.762	.250	.853	.000	.724	.000	.250	.737	.000	.000	.000	.000	.000	.961
Cars	167	170	230	0	567	47	22	184	1	254	0	110	0	2	112	0	0	0	0	0	933
% Cars	100	100	98.7	0	99.5	100	100	98.9	100	99.2	0	100	0	100	100	0	0	0	0	0	99.5
Heavy Vehicles	0	0	3	0	3	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	5
% Heavy Vehicles	0	0	1.3	0	0.5	0	0	1.1	0	0.8	0	0	0	0	0	0	0	0	0	0	0.5

N/S: Ocean Avenue/ Revere Beach Parkway
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Groups Printed- Heavy Vehicles

	Ocean Avenue From North				Eliot Circle From East				Revere Beach Parkway (Route 145) From South				State Road From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
02:30 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
02:45 PM	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Total	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3
03:00 PM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
03:15 PM	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
03:30 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
03:45 PM	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	2	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	5
04:00 PM	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2
04:15 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
04:30 PM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
04:45 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	0	3	0	0	0	2	0	0	0	0	0	0	0	0	0	5
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	2	2	3	0	0	0	3	0	0	3	0	0	0	0	0	0	13
Apprch %	28.6	28.6	42.9	0	0	0	100	0	0	100	0	0	0	0	0	0	
Total %	15.4	15.4	23.1	0	0	0	23.1	0	0	23.1	0	0	0	0	0	0	

	Ocean Avenue From North					Eliot Circle From East					Revere Beach Parkway (Route 145) From South					State Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 02:45 PM																					
02:45 PM	0	**2**	0	0	**2**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**2**
03:00 PM	0	0	0	0	0	0	0	**1**	0	**1**	0	0	0	0	0	0	0	0	0	0	1
03:15 PM	**1**	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	**2**	0	0	**2**	0	0	0	0	0	2
Total Volume	1	2	0	0	3	0	0	1	0	1	0	2	0	0	2	0	0	0	0	0	6
% App. Total	33.3	66.7	0	0		0	0	100	0		0	100	0	0		0	0	0	0		
PHF	.250	.250	.000	.000	.375	.000	.000	.250	.000	.250	.000	.250	.000	.000	.250	.000	.000	.000	.000	.000	.750

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N/S: Ocean Avenue/ Revere Beach Parkway
E/W: Eliot Circle/ State Road
City, State: Revere, MA
Client: VHB/ R. White

File Name : 133332 EE
Site Code : 10271.07
Start Date : 5/11/2013
Page No : 1

Groups Printed- Peds and Bicycles

	Ocean Avenue From North				Eliot Circle From East				Revere Beach Parkway (Route 145) From South				State Road From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
02:30 PM	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
02:45 PM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2
Total	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	1	4
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	3
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Grand Total	0	0	0	3	0	0	0	2	0	0	0	0	0	0	0	4	9
Apprch %	0	0	0	100	0	0	0	100	0	0	0	0	0	0	0	100	
Total %	0	0	0	33.3	0	0	0	22.2	0	0	0	0	0	0	0	44.4	

	Ocean Avenue From North					Eliot Circle From East					Revere Beach Parkway (Route 145) From South					State Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 02:30 PM																					
02:30 PM	0	0	0	0	0	0	0	0	**2**	**2**	0	0	0	0	0	0	0	0	0	0	**2**
02:45 PM	0	0	0	**1**	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**1**	2
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Total Volume	0	0	0	2	2	0	0	0	2	2	0	0	0	0	0	0	0	0	2	2	6
% App. Total	0	0	0	100		0	0	0	100		0	0	0	0		0	0	0	100		
PHF	.000	.000	.000	.500	.500	.000	.000	.000	.250	.250	.000	.000	.000	.000	.000	.000	.000	.000	.500	.500	.750

S: Neptune Road
E/W: Chelsea Street
City, State: E. Boston, MA
Client: VHB/ R. White

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File Name : 133381 B
Site Code : 10271.01
Start Date : 5/23/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Chelsea Street From East			Neptune Road From South			Chelsea Street From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
07:00 AM	41	85	0	90	48	1	22	13	0	300
07:15 AM	76	96	0	99	44	0	14	36	0	365
07:30 AM	77	95	0	107	52	1	22	19	0	373
07:45 AM	79	85	0	86	61	0	29	32	0	372
Total	273	361	0	382	205	2	87	100	0	1410
08:00 AM	71	71	0	77	69	0	19	24	0	331
08:15 AM	70	89	0	59	62	0	27	28	0	335
08:30 AM	76	81	0	70	44	1	21	28	0	321
08:45 AM	18	73	0	81	48	0	21	30	0	271
Total	235	314	0	287	223	1	88	110	0	1258
Grand Total	508	675	0	669	428	3	175	210	0	2668
Apprch %	42.9	57.1	0	60.8	38.9	0.3	45.5	54.5	0	
Total %	19	25.3	0	25.1	16	0.1	6.6	7.9	0	
Cars	487	616	0	633	402	3	162	192	0	2495
% Cars	95.9	91.3	0	94.6	93.9	100	92.6	91.4	0	93.5
Heavy Vehicles	21	59	0	36	26	0	13	18	0	173
% Heavy Vehicles	4.1	8.7	0	5.4	6.1	0	7.4	8.6	0	6.5

	Chelsea Street From East				Neptune Road From South				Chelsea Street From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:15 AM													
07:15 AM	76	96	0	172	99	44	0	143	14	36	0	50	365
07:30 AM	77	95	0	172	107	52	1	160	22	19	0	41	373
07:45 AM	79	85	0	164	86	61	0	147	29	32	0	61	372
08:00 AM	71	71	0	142	77	69	0	146	19	24	0	43	331
Total Volume	303	347	0	650	369	226	1	596	84	111	0	195	1441
% App. Total	46.6	53.4	0		61.9	37.9	0.2		43.1	56.9	0		
PHF	.959	.904	.000	.945	.862	.819	.250	.931	.724	.771	.000	.799	.966
Cars	289	318	0	607	354	211	1	566	79	103	0	182	1355
% Cars	95.4	91.6	0	93.4	95.9	93.4	100	95.0	94.0	92.8	0	93.3	94.0
Heavy Vehicles	14	29	0	43	15	15	0	30	5	8	0	13	86
% Heavy Vehicles	4.6	8.4	0	6.6	4.1	6.6	0	5.0	6.0	7.2	0	6.7	6.0

S: Neptune Road
E/W: Chelsea Street
City, State: E. Boston, MA
Client: VHB/ R. White

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File Name : 133381 B
Site Code : 10271.01
Start Date : 5/23/2013
Page No : 1

Groups Printed- Heavy Vehicles

	Chelsea Street From East			Neptune Road From South			Chelsea Street From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
07:00 AM	2	5	0	5	2	0	1	1	0	16
07:15 AM	5	10	0	7	1	0	0	4	0	27
07:30 AM	3	6	0	3	3	0	2	0	0	17
07:45 AM	4	4	0	2	7	0	0	1	0	18
Total	14	25	0	17	13	0	3	6	0	78
08:00 AM	2	9	0	3	4	0	3	3	0	24
08:15 AM	0	9	0	4	1	0	2	2	0	18
08:30 AM	1	6	0	7	3	0	2	4	0	23
08:45 AM	4	10	0	5	5	0	3	3	0	30
Total	7	34	0	19	13	0	10	12	0	95
Grand Total	21	59	0	36	26	0	13	18	0	173
Apprch %	26.2	73.8	0	58.1	41.9	0	41.9	58.1	0	
Total %	12.1	34.1	0	20.8	15	0	7.5	10.4	0	

	Chelsea Street From East				Neptune Road From South				Chelsea Street From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 08:00 AM													
08:00 AM	2	9	0	11	3	4	0	7	3	3	0	6	24
08:15 AM	0	9	0	9	4	1	0	5	2	2	0	4	18
08:30 AM	1	6	0	7	7	3	0	10	2	4	0	6	23
08:45 AM	4	10	0	14	5	5	0	10	3	3	0	6	30
Total Volume	7	34	0	41	19	13	0	32	10	12	0	22	95
% App. Total	17.1	82.9	0		59.4	40.6	0		45.5	54.5	0		
PHF	.438	.850	.000	.732	.679	.650	.000	.800	.833	.750	.000	.917	.792

S: Neptune Road
E/W: Chelsea Street
City, State: E. Boston, MA
Client: VHB/ R. White

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File Name : 133381 B
Site Code : 10271.01
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Page No : 1

Groups Printed- Peds and Bikes

	Chelsea Street From East			Neptune Road From South			Chelsea Street From West			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
07:00 AM	0	0	12	1	0	0	1	0	0	14
07:15 AM	0	1	4	0	1	2	0	0	0	8
07:30 AM	0	0	3	0	0	0	0	1	0	4
07:45 AM	0	1	3	0	0	0	0	0	0	4
Total	0	2	22	1	1	2	1	1	0	30
08:00 AM	0	0	3	0	0	0	0	1	0	4
08:15 AM	0	0	5	0	0	0	0	0	0	5
08:30 AM	0	0	7	0	0	0	0	0	0	7
08:45 AM	0	0	3	1	0	0	1	0	0	5
Total	0	0	18	1	0	0	1	1	0	21
Grand Total	0	2	40	2	1	2	2	2	0	51
Apprch %	0	4.8	95.2	40	20	40	50	50	0	
Total %	0	3.9	78.4	3.9	2	3.9	3.9	3.9	0	

	Chelsea Street From East				Neptune Road From South				Chelsea Street From West				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:00 AM													
07:00 AM	0	0	12	12	1	0	0	1	1	0	0	1	14
07:15 AM	0	1	4	5	0	1	2	3	0	0	0	0	8
07:30 AM	0	0	3	3	0	0	0	0	0	1	0	1	4
07:45 AM	0	1	3	4	0	0	0	0	0	0	0	0	4
Total Volume	0	2	22	24	1	1	2	4	1	1	0	2	30
% App. Total	0	8.3	91.7		25	25	50		50	50	0		
PHF	.000	.500	.458	.500	.250	.250	.250	.333	.250	.250	.000	.500	.536

S: Neptune Road
E/W: Chelsea Street
City, State: E. Boston, MA
Client: VHB/ R. White

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File Name : 133381 BB
Site Code : 10271.01
Start Date : 5/23/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Chelsea Street From East			Neptune Road From South			Chelsea Street From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
03:30 PM	60	93	0	95	59	0	52	80	0	439
03:45 PM	72	71	0	105	49	0	42	85	0	424
Total	132	164	0	200	108	0	94	165	0	863
04:00 PM	83	79	0	102	64	0	40	80	0	448
04:15 PM	71	77	0	112	59	0	48	89	0	456
04:30 PM	59	66	0	106	56	0	56	81	0	424
04:45 PM	78	67	0	100	63	0	52	93	0	453
Total	291	289	0	420	242	0	196	343	0	1781
05:00 PM	84	71	0	87	57	0	43	80	0	422
05:15 PM	81	70	0	97	65	0	56	85	0	454
05:30 PM	73	65	0	111	46	0	54	81	0	430
05:45 PM	61	69	0	107	49	0	47	72	0	405
Total	299	275	0	402	217	0	200	318	0	1711
06:00 PM	69	69	0	109	57	0	51	65	0	420
06:15 PM	71	59	0	72	61	0	49	57	0	369
Grand Total	862	856	0	1203	685	0	590	948	0	5144
Apprch %	50.2	49.8	0	63.7	36.3	0	38.4	61.6	0	
Total %	16.8	16.6	0	23.4	13.3	0	11.5	18.4	0	
Cars	848	826	0	1181	666	0	581	932	0	5034
% Cars	98.4	96.5	0	98.2	97.2	0	98.5	98.3	0	97.9
Heavy Vehicles	14	30	0	22	19	0	9	16	0	110
% Heavy Vehicles	1.6	3.5	0	1.8	2.8	0	1.5	1.7	0	2.1

	Chelsea Street From East				Neptune Road From South				Chelsea Street From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	83	79	0	162	102	64	0	166	40	80	0	120	448
04:15 PM	71	77	0	148	112	59	0	171	48	89	0	137	456
04:30 PM	59	66	0	125	106	56	0	162	56	81	0	137	424
04:45 PM	78	67	0	145	100	63	0	163	52	93	0	145	453
Total Volume	291	289	0	580	420	242	0	662	196	343	0	539	1781
% App. Total	50.2	49.8	0		63.4	36.6	0		36.4	63.6	0		
PHF	.877	.915	.000	.895	.938	.945	.000	.968	.875	.922	.000	.929	.976
Cars	283	279	0	562	408	236	0	644	191	335	0	526	1732
% Cars	97.3	96.5	0	96.9	97.1	97.5	0	97.3	97.4	97.7	0	97.6	97.2
Heavy Vehicles	8	10	0	18	12	6	0	18	5	8	0	13	49
% Heavy Vehicles	2.7	3.5	0	3.1	2.9	2.5	0	2.7	2.6	2.3	0	2.4	2.8

S: Neptune Road
E/W: Chelsea Street
City, State: E. Boston, MA
Client: VHB/ R. White

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File Name : 133381 BB
Site Code : 10271.01
Start Date : 5/23/2013
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Groups Printed- Heavy Vehicles

	Chelsea Street From East			Neptune Road From South			Chelsea Street From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
03:30 PM	1	5	0	1	2	0	2	2	0	13
03:45 PM	2	4	0	6	0	0	0	1	0	13
Total	3	9	0	7	2	0	2	3	0	26
04:00 PM	2	5	0	3	2	0	0	1	0	13
04:15 PM	4	1	0	4	1	0	1	1	0	12
04:30 PM	1	1	0	3	2	0	0	3	0	10
04:45 PM	1	3	0	2	1	0	4	3	0	14
Total	8	10	0	12	6	0	5	8	0	49
05:00 PM	1	4	0	2	5	0	0	1	0	13
05:15 PM	1	1	0	0	2	0	0	1	0	5
05:30 PM	0	2	0	0	1	0	1	0	0	4
05:45 PM	0	2	0	0	2	0	0	0	0	4
Total	2	9	0	2	10	0	1	2	0	26
06:00 PM	0	0	0	0	0	0	0	2	0	2
06:15 PM	1	2	0	1	1	0	1	1	0	7
Grand Total	14	30	0	22	19	0	9	16	0	110
Apprch %	31.8	68.2	0	53.7	46.3	0	36	64	0	
Total %	12.7	27.3	0	20	17.3	0	8.2	14.5	0	

	Chelsea Street From East				Neptune Road From South				Chelsea Street From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 03:30 PM													
03:30 PM	1	5	0	6	1	2	0	3	2	2	0	4	13
03:45 PM	2	4	0	6	6	0	0	6	0	1	0	1	13
04:00 PM	2	5	0	7	3	2	0	5	0	1	0	1	13
04:15 PM	4	1	0	5	4	1	0	5	1	1	0	2	12
Total Volume	9	15	0	24	14	5	0	19	3	5	0	8	51
% App. Total	37.5	62.5	0		73.7	26.3	0		37.5	62.5	0		
PHF	.563	.750	.000	.857	.583	.625	.000	.792	.375	.625	.000	.500	.981

S: Neptune Road
E/W: Chelsea Street
City, State: E. Boston, MA
Client: VHB/ R. White

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Groups Printed- Peds and Bikes

	Chelsea Street From East			Neptune Road From South			Chelsea Street From West			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
03:30 PM	2	0	0	0	0	0	1	0	0	3
03:45 PM	1	0	1	0	0	0	0	0	2	4
Total	3	0	1	0	0	0	1	0	2	7
04:00 PM	0	0	0	0	0	0	0	0	4	4
04:15 PM	0	0	0	0	0	0	0	0	1	1
04:30 PM	0	0	10	0	0	1	0	0	0	11
04:45 PM	0	1	8	0	0	1	0	0	3	13
Total	0	1	18	0	0	2	0	0	8	29
05:00 PM	0	0	6	0	0	1	0	1	2	10
05:15 PM	0	0	8	0	0	1	0	0	1	10
05:30 PM	1	0	5	0	0	0	0	0	2	8
05:45 PM	0	2	8	0	0	1	2	1	1	15
Total	1	2	27	0	0	3	2	2	6	43
06:00 PM	1	0	7	1	0	2	1	0	2	14
06:15 PM	0	0	4	1	0	3	1	0	2	11
Grand Total	5	3	57	2	0	10	5	2	20	104
Apprch %	7.7	4.6	87.7	16.7	0	83.3	18.5	7.4	74.1	
Total %	4.8	2.9	54.8	1.9	0	9.6	4.8	1.9	19.2	

	Chelsea Street From East				Neptune Road From South				Chelsea Street From West				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	0	0	10	10	0	0	1	1	0	0	0	0	11
04:45 PM	0	1	8	9	0	0	1	1	0	0	3	3	13
05:00 PM	0	0	6	6	0	0	1	1	0	1	2	3	10
05:15 PM	0	0	8	8	0	0	1	1	0	0	1	1	10
Total Volume	0	1	32	33	0	0	4	4	0	1	6	7	44
% App. Total	0	3	97		0	0	100		0	14.3	85.7		
PHF	.000	.250	.800	.825	.000	.000	1.00	1.00	.000	.250	.500	.583	.846

N/S: Neptune Road
E/W: Saratoga Street
City, State: E. Boston, MA
Client: VHB/ R. White

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File Name : 133381 C
Site Code : 10271.01
Start Date : 5/23/2013
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Groups Printed- Cars - Heavy Vehicles

	Neptune Road From North				Saratoga Street From East				Neptune Road From South				Saratoga Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	0	47	40	0	73	0	5	0	0	64	0	0	3	19	0	0	251
07:15 AM	0	55	38	0	80	0	10	0	1	68	0	0	0	15	0	0	267
07:30 AM	0	46	49	0	102	0	15	0	1	62	0	0	2	20	0	0	297
07:45 AM	0	40	48	0	91	0	19	0	1	51	0	0	4	25	0	0	279
Total	0	188	175	0	346	0	49	0	3	245	0	0	9	79	0	0	1094
08:00 AM	0	42	32	0	87	0	20	0	1	44	0	0	1	19	0	0	246
08:15 AM	0	46	39	0	70	0	12	0	0	45	0	0	3	16	0	0	231
08:30 AM	0	44	36	0	64	0	14	0	1	51	0	0	0	21	0	0	231
08:45 AM	0	34	36	1	71	0	5	0	0	63	0	0	2	16	0	0	228
Total	0	166	143	1	292	0	51	0	2	203	0	0	6	72	0	0	936
Grand Total	0	354	318	1	638	0	100	0	5	448	0	0	15	151	0	0	2030
Apprch %	0	52.6	47.3	0.1	86.4	0	13.6	0	1.1	98.9	0	0	9	91	0	0	
Total %	0	17.4	15.7	0	31.4	0	4.9	0	0.2	22.1	0	0	0.7	7.4	0	0	
Cars	0	315	297	1	606	0	99	0	5	416	0	0	15	137	0	0	1891
% Cars	0	89	93.4	100	95	0	99	0	100	92.9	0	0	100	90.7	0	0	93.2
Heavy Vehicles	0	39	21	0	32	0	1	0	0	32	0	0	0	14	0	0	139
% Heavy Vehicles	0	11	6.6	0	5	0	1	0	0	7.1	0	0	0	9.3	0	0	6.8

	Neptune Road From North					Saratoga Street From East					Neptune Road From South					Saratoga Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	47	40	0	87	73	0	5	0	78	0	64	0	0	64	3	19	0	0	22	251
07:15 AM	0	55	38	0	93	80	0	10	0	90	1	68	0	0	69	0	15	0	0	15	267
07:30 AM	0	46	49	0	95	102	0	15	0	117	1	62	0	0	63	2	20	0	0	22	297
07:45 AM	0	40	48	0	88	91	0	19	0	110	1	51	0	0	52	4	25	0	0	29	279
Total Volume	0	188	175	0	363	346	0	49	0	395	3	245	0	0	248	9	79	0	0	88	1094
% App. Total	0	51.8	48.2	0		87.6	0	12.4	0		1.2	98.8	0	0		10.2	89.8	0	0		
PHF	.000	.855	.893	.000	.955	.848	.000	.645	.000	.844	.750	.901	.000	.000	.899	.563	.790	.000	.000	.759	.921
Cars	0	173	166	0	339	331	0	49	0	380	3	228	0	0	231	9	75	0	0	84	1034
% Cars	0	92.0	94.9	0	93.4	95.7	0	100	0	96.2	100	93.1	0	0	93.1	100	94.9	0	0	95.5	94.5
Heavy Vehicles	0	15	9	0	24	15	0	0	0	15	0	17	0	0	17	0	4	0	0	4	60
% Heavy Vehicles	0	8.0	5.1	0	6.6	4.3	0	0	0	3.8	0	6.9	0	0	6.9	0	5.1	0	0	4.5	5.5

N/S: Neptune Road
E/W: Saratoga Street
City, State: E. Boston, MA
Client: VHB/ R. White

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File Name : 133381 C
Site Code : 10271.01
Start Date : 5/23/2013
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Groups Printed- Heavy Vehicles

	Neptune Road From North				Saratoga Street From East				Neptune Road From South				Saratoga Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	0	3	2	0	4	0	0	0	0	4	0	0	0	1	0	0	14
07:15 AM	0	5	4	0	2	0	0	0	0	6	0	0	0	1	0	0	18
07:30 AM	0	5	1	0	3	0	0	0	0	4	0	0	0	2	0	0	15
07:45 AM	0	2	2	0	6	0	0	0	0	3	0	0	0	0	0	0	13
Total	0	15	9	0	15	0	0	0	0	17	0	0	0	4	0	0	60
08:00 AM	0	9	1	0	5	0	1	0	0	2	0	0	0	3	0	0	21
08:15 AM	0	6	3	0	3	0	0	0	0	2	0	0	0	2	0	0	16
08:30 AM	0	2	3	0	4	0	0	0	0	6	0	0	0	2	0	0	17
08:45 AM	0	7	5	0	5	0	0	0	0	5	0	0	0	3	0	0	25
Total	0	24	12	0	17	0	1	0	0	15	0	0	0	10	0	0	79
Grand Total	0	39	21	0	32	0	1	0	0	32	0	0	0	14	0	0	139
Apprch %	0	65	35	0	97	0	3	0	0	100	0	0	0	100	0	0	
Total %	0	28.1	15.1	0	23	0	0.7	0	0	23	0	0	0	10.1	0	0	

	Neptune Road From North					Saratoga Street From East					Neptune Road From South					Saratoga Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	9	1	0	10	5	0	1	0	6	0	2	0	0	2	0	3	0	0	3	21
08:15 AM	0	6	3	0	9	3	0	0	0	3	0	2	0	0	2	0	2	0	0	2	16
08:30 AM	0	2	3	0	5	4	0	0	0	4	0	6	0	0	6	0	2	0	0	2	17
08:45 AM	0	7	5	0	12	5	0	0	0	5	0	5	0	0	5	0	3	0	0	3	25
Total Volume	0	24	12	0	36	17	0	1	0	18	0	15	0	0	15	0	10	0	0	10	79
% App. Total	0	66.7	33.3	0		94.4	0	5.6	0		0	100	0	0		0	100	0	0		
PHF	.000	.667	.600	.000	.750	.850	.000	.250	.000	.750	.000	.625	.000	.000	.625	.000	.833	.000	.000	.833	.790

N/S: Neptune Road
E/W: Saratoga Street
City, State: E. Boston, MA
Client: VHB/ R. White

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File Name : 133381 C
Site Code : 10271.01
Start Date : 5/23/2013
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Groups Printed- Peds and Bikes

	Neptune Road From North				Saratoga Street From East				Neptune Road From South				Saratoga Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	0	0	0	1	1	0	0	0	0	0	0	15	0	1	0	2	20
07:15 AM	0	0	1	2	2	0	0	0	0	0	0	13	0	0	0	2	20
07:30 AM	0	0	0	1	0	0	0	0	0	1	0	9	0	0	0	1	12
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	7	0	1	0	0	8
Total	0	0	1	4	3	0	0	0	0	1	0	44	0	2	0	5	60
08:00 AM	0	0	0	1	0	0	0	3	0	0	0	11	0	0	0	0	15
08:15 AM	0	0	0	0	0	0	0	2	0	0	0	8	0	0	0	1	11
08:30 AM	0	0	0	4	0	0	0	1	0	0	0	8	0	0	0	0	13
08:45 AM	0	0	0	0	1	0	0	1	0	0	0	5	0	1	0	0	8
Total	0	0	0	5	1	0	0	7	0	0	0	32	0	1	0	1	47
Grand Total	0	0	1	9	4	0	0	7	0	1	0	76	0	3	0	6	107
Apprch %	0	0	10	90	36.4	0	0	63.6	0	1.3	0	98.7	0	33.3	0	66.7	
Total %	0	0	0.9	8.4	3.7	0	0	6.5	0	0.9	0	71	0	2.8	0	5.6	

	Neptune Road From North					Saratoga Street From East					Neptune Road From South					Saratoga Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	1	1	1	0	0	0	1	0	0	0	15	15	0	1	0	2	3	20
07:15 AM	0	0	1	2	3	2	0	0	0	2	0	0	0	13	13	0	0	0	2	2	20
07:30 AM	0	0	0	1	1	0	0	0	0	0	0	1	0	9	10	0	0	0	1	1	12
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	7	7	0	1	0	0	1	8
Total Volume	0	0	1	4	5	3	0	0	0	3	0	1	0	44	45	0	2	0	5	7	60
% App. Total	0	0	20	80		100	0	0	0		0	2.2	0	97.8		0	28.6	0	71.4		
PHF	.000	.000	.250	.500	.417	.375	.000	.000	.000	.375	.000	.250	.000	.733	.750	.000	.500	.000	.625	.583	.750

S: Vienna Street
E/W: Bennington Street (Route 145)
City, State: E. Boston, MA
Client: VHB/ R. White

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Site Code : 10271.01
Start Date : 5/23/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Bennington Street (Route 145) From East			Vienna Street From South			Bennington Street (Route 145) From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
07:00 AM	274	0	0	62	0	0	0	33	0	369
07:15 AM	305	0	0	80	0	0	0	38	0	423
07:30 AM	310	0	0	51	0	0	0	45	0	406
07:45 AM	329	0	0	57	0	0	0	44	0	430
Total	1218	0	0	250	0	0	0	160	0	1628
08:00 AM	307	0	0	45	0	0	0	49	0	401
08:15 AM	321	0	0	38	0	0	0	58	0	417
08:30 AM	303	0	0	32	0	0	0	41	0	376
08:45 AM	319	0	0	34	0	0	0	42	0	395
Total	1250	0	0	149	0	0	0	190	0	1589
Grand Total	2468	0	0	399	0	0	0	350	0	3217
Apprch %	100	0	0	100	0	0	0	100	0	
Total %	76.7	0	0	12.4	0	0	0	10.9	0	
Cars	2396	0	0	370	0	0	0	298	0	3064
% Cars	97.1	0	0	92.7	0	0	0	85.1	0	95.2
Heavy Vehicles	72	0	0	29	0	0	0	52	0	153
% Heavy Vehicles	2.9	0	0	7.3	0	0	0	14.9	0	4.8

	Bennington Street (Route 145) From East				Vienna Street From South				Bennington Street (Route 145) From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:15 AM													
07:15 AM	305	0	0	305	80	0	0	80	0	38	0	38	423
07:30 AM	310	0	0	310	51	0	0	51	0	45	0	45	406
07:45 AM	329	0	0	329	57	0	0	57	0	44	0	44	430
08:00 AM	307	0	0	307	45	0	0	45	0	49	0	49	401
Total Volume	1251	0	0	1251	233	0	0	233	0	176	0	176	1660
% App. Total	100	0	0		100	0	0		0	100	0		
PHF	.951	.000	.000	.951	.728	.000	.000	.728	.000	.898	.000	.898	.965
Cars	1221	0	0	1221	221	0	0	221	0	146	0	146	1588
% Cars	97.6	0	0	97.6	94.8	0	0	94.8	0	83.0	0	83.0	95.7
Heavy Vehicles	30	0	0	30	12	0	0	12	0	30	0	30	72
% Heavy Vehicles	2.4	0	0	2.4	5.2	0	0	5.2	0	17.0	0	17.0	4.3

S: Vienna Street
E/W: Bennington Street (Route 145)
City, State: E. Boston, MA
Client: VHB/ R. White

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Groups Printed- Heavy Vehicles

	Bennington Street (Route 145) From East			Vienna Street From South			Bennington Street (Route 145) From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
07:00 AM	5	0	0	6	0	0	0	7	0	18
07:15 AM	5	0	0	3	0	0	0	7	0	15
07:30 AM	6	0	0	4	0	0	0	10	0	20
07:45 AM	9	0	0	2	0	0	0	5	0	16
Total	25	0	0	15	0	0	0	29	0	69
08:00 AM	10	0	0	3	0	0	0	8	0	21
08:15 AM	11	0	0	3	0	0	0	4	0	18
08:30 AM	11	0	0	3	0	0	0	4	0	18
08:45 AM	15	0	0	5	0	0	0	7	0	27
Total	47	0	0	14	0	0	0	23	0	84
Grand Total	72	0	0	29	0	0	0	52	0	153
Apprch %	100	0	0	100	0	0	0	100	0	
Total %	47.1	0	0	19	0	0	0	34	0	

	Bennington Street (Route 145) From East				Vienna Street From South				Bennington Street (Route 145) From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 08:00 AM													
08:00 AM	10	0	0	10	3	0	0	3	0	8	0	8	21
08:15 AM	11	0	0	11	3	0	0	3	0	4	0	4	18
08:30 AM	11	0	0	11	3	0	0	3	0	4	0	4	18
08:45 AM	15	0	0	15	5	0	0	5	0	7	0	7	27
Total Volume	47	0	0	47	14	0	0	14	0	23	0	23	84
% App. Total	100	0	0		100	0	0		0	100	0		
PHF	.783	.000	.000	.783	.700	.000	.000	.700	.000	.719	.000	.719	.778

S: Vienna Street
E/W: Bennington Street (Route 145)
City, State: E. Boston, MA
Client: VHB/ R. White

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File Name : 133381 D
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Groups Printed- Peds and Bikes

	Bennington Street (Route 145) From East			Vienna Street From South			Bennington Street (Route 145) From West			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
07:00 AM	0	0	3	0	0	11	0	1	1	16
07:15 AM	0	0	1	0	0	5	0	0	0	6
07:30 AM	1	0	0	0	0	14	0	0	0	15
07:45 AM	0	0	1	0	0	5	0	0	0	6
Total	1	0	5	0	0	35	0	1	1	43
08:00 AM	0	0	1	0	0	7	0	0	2	10
08:15 AM	1	0	0	0	0	6	0	0	3	10
08:30 AM	0	0	1	0	0	1	0	0	1	3
08:45 AM	0	0	0	0	0	3	0	0	0	3
Total	1	0	2	0	0	17	0	0	6	26
Grand Total	2	0	7	0	0	52	0	1	7	69
Apprch %	22.2	0	77.8	0	0	100	0	12.5	87.5	
Total %	2.9	0	10.1	0	0	75.4	0	1.4	10.1	

	Bennington Street (Route 145) From East				Vienna Street From South				Bennington Street (Route 145) From West				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:00 AM													
07:00 AM	0	0	3	3	0	0	11	11	0	1	1	2	16
07:15 AM	0	0	1	1	0	0	5	5	0	0	0	0	6
07:30 AM	1	0	0	1	0	0	14	14	0	0	0	0	15
07:45 AM	0	0	1	1	0	0	5	5	0	0	0	0	6
Total Volume	1	0	5	6	0	0	35	35	0	1	1	2	43
% App. Total	16.7	0	83.3		0	0	100		0	50	50		
PHF	.250	.000	.417	.500	.000	.000	.625	.625	.000	.250	.250	.250	.672

S: Vienna Street
E/W: Bennington Street (Route 145)
City, State: E. Boston, MA
Client: VHB/ R. White

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Groups Printed- Cars - Heavy Vehicles

	Bennington Street (Route 145) From East			Vienna Street From South			Bennington Street (Route 145) From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
03:30 PM	153	0	0	127	0	0	0	112	0	392
03:45 PM	202	0	0	99	0	0	0	96	0	397
Total	355	0	0	226	0	0	0	208	0	789
04:00 PM	186	0	0	133	0	0	0	127	0	446
04:15 PM	162	0	0	140	0	0	0	111	0	413
04:30 PM	178	0	0	165	0	0	0	125	0	468
04:45 PM	163	0	0	151	0	0	0	129	0	443
Total	689	0	0	589	0	0	0	492	0	1770
05:00 PM	171	0	0	145	0	0	0	141	0	457
05:15 PM	163	0	0	182	0	0	0	131	0	476
05:30 PM	150	0	0	183	0	0	0	129	0	462
05:45 PM	155	0	0	158	0	0	0	117	0	430
Total	639	0	0	668	0	0	0	518	0	1825
06:00 PM	160	0	0	167	0	0	0	101	0	428
06:15 PM	135	0	0	183	0	0	0	111	0	429
Grand Total	1978	0	0	1833	0	0	0	1430	0	5241
Apprch %	100	0	0	100	0	0	0	100	0	
Total %	37.7	0	0	35	0	0	0	27.3	0	
Cars	1891	0	0	1801	0	0	0	1383	0	5075
% Cars	95.6	0	0	98.3	0	0	0	96.7	0	96.8
Heavy Vehicles	87	0	0	32	0	0	0	47	0	166
% Heavy Vehicles	4.4	0	0	1.7	0	0	0	3.3	0	3.2

	Bennington Street (Route 145) From East				Vienna Street From South				Bennington Street (Route 145) From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	178	0	0	178	165	0	0	165	0	125	0	125	468
04:45 PM	163	0	0	163	151	0	0	151	0	129	0	129	443
05:00 PM	171	0	0	171	145	0	0	145	0	141	0	141	457
05:15 PM	163	0	0	163	182	0	0	182	0	131	0	131	476
Total Volume	675	0	0	675	643	0	0	643	0	526	0	526	1844
% App. Total	100	0	0		100	0	0		0	100	0		
PHF	.948	.000	.000	.948	.883	.000	.000	.883	.000	.933	.000	.933	.968
Cars	645	0	0	645	627	0	0	627	0	514	0	514	1786
% Cars	95.6	0	0	95.6	97.5	0	0	97.5	0	97.7	0	97.7	96.9
Heavy Vehicles	30	0	0	30	16	0	0	16	0	12	0	12	58
% Heavy Vehicles	4.4	0	0	4.4	2.5	0	0	2.5	0	2.3	0	2.3	3.1

S: Vienna Street
E/W: Bennington Street (Route 145)
City, State: E. Boston, MA
Client: VHB/ R. White

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Groups Printed- Heavy Vehicles

	Bennington Street (Route 145) From East			Vienna Street From South			Bennington Street (Route 145) From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
03:30 PM	10	0	0	1	0	0	0	4	0	15
03:45 PM	13	0	0	1	0	0	0	6	0	20
Total	23	0	0	2	0	0	0	10	0	35
04:00 PM	11	0	0	2	0	0	0	8	0	21
04:15 PM	8	0	0	3	0	0	0	4	0	15
04:30 PM	10	0	0	6	0	0	0	1	0	17
04:45 PM	4	0	0	4	0	0	0	4	0	12
Total	33	0	0	15	0	0	0	17	0	65
05:00 PM	10	0	0	2	0	0	0	5	0	17
05:15 PM	6	0	0	4	0	0	0	2	0	12
05:30 PM	3	0	0	2	0	0	0	2	0	7
05:45 PM	6	0	0	3	0	0	0	3	0	12
Total	25	0	0	11	0	0	0	12	0	48
06:00 PM	4	0	0	1	0	0	0	4	0	9
06:15 PM	2	0	0	3	0	0	0	4	0	9
Grand Total	87	0	0	32	0	0	0	47	0	166
Apprch %	100	0	0	100	0	0	0	100	0	
Total %	52.4	0	0	19.3	0	0	0	28.3	0	

	Bennington Street (Route 145) From East				Vienna Street From South				Bennington Street (Route 145) From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 03:45 PM													
03:45 PM	13	0	0	13	1	0	0	1	0	6	0	6	20
04:00 PM	11	0	0	11	2	0	0	2	0	8	0	8	21
04:15 PM	8	0	0	8	3	0	0	3	0	4	0	4	15
04:30 PM	10	0	0	10	6	0	0	6	0	1	0	1	17
Total Volume	42	0	0	42	12	0	0	12	0	19	0	19	73
% App. Total	100	0	0		100	0	0		0	100	0		
PHF	.808	.000	.000	.808	.500	.000	.000	.500	.000	.594	.000	.594	.869

S: Vienna Street
E/W: Bennington Street (Route 145)
City, State: E. Boston, MA
Client: VHB/ R. White

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Groups Printed- Peds and Bikes

	Bennington Street (Route 145) From East			Vienna Street From South			Bennington Street (Route 145) From West			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
03:30 PM	1	0	0	0	0	6	0	0	2	9
03:45 PM	0	0	2	0	0	12	0	0	3	17
Total	1	0	2	0	0	18	0	0	5	26
04:00 PM	0	0	3	0	0	11	0	0	1	15
04:15 PM	0	0	1	0	0	11	0	0	0	12
04:30 PM	0	0	1	0	0	11	0	0	0	12
04:45 PM	2	0	5	0	0	13	0	0	0	20
Total	2	0	10	0	0	46	0	0	1	59
05:00 PM	0	0	3	0	0	25	0	0	0	28
05:15 PM	0	0	2	0	0	10	0	1	0	13
05:30 PM	0	0	1	0	0	3	0	0	6	10
05:45 PM	0	0	0	2	0	15	0	0	2	19
Total	0	0	6	2	0	53	0	1	8	70
06:00 PM	0	0	0	0	0	5	0	1	1	7
06:15 PM	0	0	1	0	0	7	0	0	2	10
Grand Total	3	0	19	2	0	129	0	2	17	172
Apprch %	13.6	0	86.4	1.5	0	98.5	0	10.5	89.5	
Total %	1.7	0	11	1.2	0	75	0	1.2	9.9	

	Bennington Street (Route 145) From East				Vienna Street From South				Bennington Street (Route 145) From West				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	0	0	1	1	0	0	11	11	0	0	0	0	12
04:45 PM	2	0	5	7	0	0	13	13	0	0	0	0	20
05:00 PM	0	0	3	3	0	0	25	25	0	0	0	0	28
05:15 PM	0	0	2	2	0	0	10	10	0	1	0	1	13
Total Volume	2	0	11	13	0	0	59	59	0	1	0	1	73
% App. Total	15.4	0	84.6		0	0	100		0	100	0		
PHF	.250	.000	.550	.464	.000	.000	.590	.590	.000	.250	.000	.250	.652

N/S: Bennington Street
E: Crescent Avenue
City, State: Revere, MA
Client: VHB/ R. White

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Groups Printed- Cars - Heavy Vehicles

	Bennington Street From North			Crescent Avenue From East			Bennington Street From South			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
07:00 AM	189	0	0	42	37	0	0	37	0	305
07:15 AM	206	0	4	61	48	0	0	41	0	360
07:30 AM	268	0	1	47	69	0	0	42	0	427
07:45 AM	218	0	0	57	66	0	0	48	0	389
Total	881	0	5	207	220	0	0	168	0	1481
08:00 AM	268	0	0	79	64	0	0	47	0	458
08:15 AM	240	0	0	107	79	0	0	42	0	468
08:30 AM	227	0	0	109	45	0	0	43	0	424
08:45 AM	207	0	1	55	35	0	0	45	0	343
Total	942	0	1	350	223	0	0	177	0	1693
Grand Total	1823	0	6	557	443	0	0	345	0	3174
Apprch %	99.7	0	0.3	55.7	44.3	0	0	100	0	
Total %	57.4	0	0.2	17.5	14	0	0	10.9	0	
Cars	1797	0	6	547	432	0	0	326	0	3108
% Cars	98.6	0	100	98.2	97.5	0	0	94.5	0	97.9
Heavy Vehicles	26	0	0	10	11	0	0	19	0	66
% Heavy Vehicles	1.4	0	0	1.8	2.5	0	0	5.5	0	2.1

	Bennington Street From North				Crescent Avenue From East				Bennington Street From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	268	0	1	269	47	69	0	116	0	42	0	42	427
07:45 AM	218	0	0	218	57	66	0	123	0	48	0	48	389
08:00 AM	268	0	0	268	79	64	0	143	0	47	0	47	458
08:15 AM	240	0	0	240	107	79	0	186	0	42	0	42	468
Total Volume	994	0	1	995	290	278	0	568	0	179	0	179	1742
% App. Total	99.9	0	0.1		51.1	48.9	0		0	100	0		
PHF	.927	.000	.250	.925	.678	.880	.000	.763	.000	.932	.000	.932	.931
Cars	985	0	1	986	288	274	0	562	0	172	0	172	1720
% Cars	99.1	0	100	99.1	99.3	98.6	0	98.9	0	96.1	0	96.1	98.7
Heavy Vehicles	9	0	0	9	2	4	0	6	0	7	0	7	22
% Heavy Vehicles	0.9	0	0	0.9	0.7	1.4	0	1.1	0	3.9	0	3.9	1.3

N/S: Bennington Street
E: Crescent Avenue
City, State: Revere, MA
Client: VHB/ R. White

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Groups Printed- Heavy Vehicles

	Bennington Street From North			Crescent Avenue From East			Bennington Street From South			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
07:00 AM	9	0	0	0	1	0	0	6	0	16
07:15 AM	2	0	0	5	1	0	0	2	0	10
07:30 AM	3	0	0	0	0	0	0	3	0	6
07:45 AM	2	0	0	1	1	0	0	2	0	6
Total	16	0	0	6	3	0	0	13	0	38
08:00 AM	1	0	0	0	2	0	0	2	0	5
08:15 AM	3	0	0	1	1	0	0	0	0	5
08:30 AM	2	0	0	1	2	0	0	1	0	6
08:45 AM	4	0	0	2	3	0	0	3	0	12
Total	10	0	0	4	8	0	0	6	0	28
Grand Total	26	0	0	10	11	0	0	19	0	66
Apprch %	100	0	0	47.6	52.4	0	0	100	0	
Total %	39.4	0	0	15.2	16.7	0	0	28.8	0	

	Bennington Street From North				Crescent Avenue From East				Bennington Street From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:00 AM													
07:00 AM	9	0	0	9	0	1	0	1	0	6	0	6	16
07:15 AM	2	0	0	2	5	1	0	6	0	2	0	2	10
07:30 AM	3	0	0	3	0	0	0	0	0	3	0	3	6
07:45 AM	2	0	0	2	1	1	0	2	0	2	0	2	6
Total Volume	16	0	0	16	6	3	0	9	0	13	0	13	38
% App. Total	100	0	0		66.7	33.3	0		0	100	0		
PHF	.444	.000	.000	.444	.300	.750	.000	.375	.000	.542	.000	.542	.594

N/S: Bennington Street
E: Crescent Avenue
City, State: Revere, MA
Client: VHB/ R. White

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Groups Printed- Peds and Bikes

	Bennington Street From North			Crescent Avenue From East			Bennington Street From South			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
07:00 AM	0	0	0	0	0	23	0	0	0	23
07:15 AM	0	0	1	0	0	7	0	1	0	9
07:30 AM	0	0	0	0	0	7	0	0	0	7
07:45 AM	0	0	0	0	0	19	0	0	0	19
Total	0	0	1	0	0	56	0	1	0	58
08:00 AM	0	0	0	0	0	66	0	0	5	71
08:15 AM	0	0	0	0	0	40	0	0	3	43
08:30 AM	0	0	0	0	0	19	0	0	1	20
08:45 AM	1	0	0	0	0	0	0	0	4	5
Total	1	0	0	0	0	125	0	0	13	139
Grand Total	1	0	1	0	0	181	0	1	13	197
Apprch %	50	0	50	0	0	100	0	7.1	92.9	
Total %	0.5	0	0.5	0	0	91.9	0	0.5	6.6	

	Bennington Street From North				Crescent Avenue From East				Bennington Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:45 AM													
07:45 AM	0	0	0	0	0	0	19	19	0	0	0	0	19
08:00 AM	0	0	0	0	0	0	66	66	0	0	5	5	71
08:15 AM	0	0	0	0	0	0	40	40	0	0	3	3	43
08:30 AM	0	0	0	0	0	0	19	19	0	0	1	1	20
Total Volume	0	0	0	0	0	0	144	144	0	0	9	9	153
% App. Total	0	0	0		0	0	100		0	0	100		
PHF	.000	.000	.000	.000	.000	.000	.545	.545	.000	.000	.450	.450	.539

N/S: McClellan Highway (Route 1A)
SWW: Route 1 Offramp/ Curtis Street
City, State: E. Boston, MA
Client: VHB/ R. White

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Groups Printed- Cars - Heavy Vehicles

	McClellan Highway (Route 1A) From North				McClellan Highway (Route 1A) From South				Route 1A Offramp From Southwest				Curtis Street From West				
Start Time	Right	Bear Right	Thru	U-Turn	Thru	Left	Hard Left	U-Turn	Hard Right	Bear Left	Hard Left	U-Turn	Hard Right	Right	Left	U-Turn	Int. Total
07:00 AM	16	29	607	0	0	0	0	0	0	0	0	0	26	99	0	0	777
07:15 AM	21	21	604	0	0	0	0	0	0	0	0	0	23	99	0	0	768
07:30 AM	18	31	599	0	0	0	0	0	0	0	0	0	15	115	0	0	778
07:45 AM	19	17	588	0	0	0	0	0	0	0	0	0	29	108	0	0	761
Total	74	98	2398	0	0	0	0	0	0	0	0	0	93	421	0	0	3084
08:00 AM	17	23	605	0	0	0	0	0	0	0	0	0	24	99	0	0	768
08:15 AM	21	25	577	0	0	0	0	0	0	0	0	0	20	105	0	0	748
08:30 AM	17	13	556	0	0	0	0	0	0	0	0	0	25	113	0	0	724
08:45 AM	20	19	546	0	0	0	0	0	0	0	0	0	15	5	0	0	605
Total	75	80	2284	0	0	0	0	0	0	0	0	0	84	322	0	0	2845
Grand Total	149	178	4682	0	0	0	0	0	0	0	0	0	177	743	0	0	5929
Apprch %	3	3.6	93.5	0	0	0	0	0	0	0	0	0	19.2	80.8	0	0	
Total %	2.5	3	79	0	0	0	0	0	0	0	0	0	3	12.5	0	0	
Cars	124	163	4424	0	0	0	0	0	0	0	0	0	155	616	0	0	5482
% Cars	83.2	91.6	94.5	0	0	0	0	0	0	0	0	0	87.6	82.9	0	0	92.5
Heavy Vehicles	25	15	258	0	0	0	0	0	0	0	0	0	22	127	0	0	447
% Heavy Vehicles	16.8	8.4	5.5	0	0	0	0	0	0	0	0	0	12.4	17.1	0	0	7.5

	McClellan Highway (Route 1A) From North					McClellan Highway (Route 1A) From South					Route 1A Offramp From Southwest					Curtis Street From West					
Start Time	Right	Bear Right	Thru	U-Turn	App. Total	Thru	Left	Hard Left	U-Turn	App. Total	Hard Right	Bear Left	Hard Left	U-Turn	App. Total	Hard Right	Right	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	16	29	607	0	652	0	0	0	0	0	0	0	0	0	0	26	99	0	0	125	777
07:15 AM	21	21	604	0	646	0	0	0	0	0	0	0	0	0	0	23	99	0	0	122	768
07:30 AM	18	31	599	0	648	0	0	0	0	0	0	0	0	0	0	15	115	0	0	130	778
07:45 AM	19	17	588	0	624	0	0	0	0	0	0	0	0	0	0	29	108	0	0	137	761
Total Volume	74	98	2398	0	2570	0	0	0	0	0	0	0	0	0	0	93	421	0	0	514	3084
% App. Total																					
PHF	.881	.790	.988	.000	.985	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.802	.915	.000	.000	.938	.991
Cars	61	90	2281	0	2432	0	0	0	0	0	0	0	0	0	0	84	354	0	0	438	2870
% Cars	82.4	91.8	95.1	0	94.6	0	0	0	0	0	0	0	0	0	0	90.3	84.1	0	0	85.2	93.1
Heavy Vehicles																					
% Heavy Vehicles	17.6	8.2	4.9	0	5.4	0	0	0	0	0	0	0	0	0	0	9.7	15.9	0	0	14.8	6.9

N/S: McClellan Highway (Route 1A)
SWW: Route 1 Offramp/ Curtis Street
City, State: E. Boston, MA
Client: VHB/ R. White

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Groups Printed- Heavy Vehicles

	McClellan Highway (Route 1A) From North				McClellan Highway (Route 1A) From South				Route 1A Offramp From Southwest				Curtis Street From West				
Start Time	Right	Bear Right	Thru	U-Turn	Thru	Left	Hard Left	U-Turn	Hard Right	Bear Left	Hard Left	U-Turn	Hard Right	Right	Left	U-Turn	Int. Total
07:00 AM	3	2	34	0	0	0	0	0	0	0	0	0	3	16	0	0	58
07:15 AM	2	2	32	0	0	0	0	0	0	0	0	0	2	15	0	0	53
07:30 AM	4	1	25	0	0	0	0	0	0	0	0	0	1	16	0	0	47
07:45 AM	4	3	26	0	0	0	0	0	0	0	0	0	3	20	0	0	56
Total	13	8	117	0	0	0	0	0	0	0	0	0	9	67	0	0	214
08:00 AM	2	2	36	0	0	0	0	0	0	0	0	0	3	19	0	0	62
08:15 AM	5	4	43	0	0	0	0	0	0	0	0	0	3	19	0	0	74
08:30 AM	1	0	34	0	0	0	0	0	0	0	0	0	6	20	0	0	61
08:45 AM	4	1	28	0	0	0	0	0	0	0	0	0	1	2	0	0	36
Total	12	7	141	0	0	0	0	0	0	0	0	0	13	60	0	0	233
Grand Total	25	15	258	0	0	0	0	0	0	0	0	0	22	127	0	0	447
Apprch %	8.4	5	86.6	0	0	0	0	0	0	0	0	0	14.8	85.2	0	0	
Total %	5.6	3.4	57.7	0	0	0	0	0	0	0	0	0	4.9	28.4	0	0	

	McClellan Highway (Route 1A) From North					McClellan Highway (Route 1A) From South					Route 1A Offramp From Southwest					Curtis Street From West					
Start Time	Right	Bear Right	Thru	U-Turn	App. Total	Thru	Left	Hard Left	U-Turn	App. Total	Hard Right	Bear Left	Hard Left	U-Turn	App. Total	Hard Right	Right	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	4	3	26	0	33	0	0	0	0	0	0	0	0	0	0	3	20	0	0	23	56
08:00 AM	2	2	36	0	40	0	0	0	0	0	0	0	0	0	0	3	19	0	0	22	62
08:15 AM	5	4	43	0	52	0	0	0	0	0	0	0	0	0	0	3	19	0	0	22	74
08:30 AM	1	0	34	0	35	0	0	0	0	0	0	0	0	0	0	6	20	0	0	26	61
Total Volume	12	9	139	0	160	0	0	0	0	0	0	0	0	0	0	15	78	0	0	93	253
% App. Total	7.5	5.6	86.9	0		0	0	0	0		0	0	0	0		16.1	83.9	0	0		
PHF	.600	.563	.808	.000	.769	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.625	.975	.000	.000	.894	.855

N/S: McClellan Highway (Route 1A)
SWW: Route 1 Offramp/ Curtis Street
City, State: E. Boston, MA
Client: VHB/ R. White

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 133381 AA
Site Code : 10271.01
Start Date : 5/23/2013
Page No : 1

Groups Printed- Peds and Bikes

	McClellan Highway (Route 1A) From North				McClellan Highway (Route 1A) From South				Route 1A Offramp From Southwest				Curtis Street From West				
Start Time	Right	Bear Right	Thru	Peds	Thru	Left	Hard Left	Peds	Hard Right	Bear Left	Hard Left	Peds	Hard Right	Right	Left	Peds	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Apprch %	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total %	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

	McClellan Highway (Route 1A) From North					McClellan Highway (Route 1A) From South					Route 1A Offramp From Southwest					Curtis Street From West					
Start Time	Right	Bear Right	Thru	Peds	App. Total	Thru	Left	Hard Left	Peds	App. Total	Hard Right	Bear Left	Hard Left	Peds	App. Total	Hard Right	Right	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% App. Total	0	100	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.250	.000	.000	.250	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250

Accurate Counts
978-664-2565

N/S Street : Sigourney Street
E/W Street : Route 60 (Squire Road)
City/State : Revere, MA
Weather : Clear

File Name : 10271fr1
Site Code : 10271001
Start Date : 4/26/2013
Page No : 1

Groups Printed- Cars - Trucks - Buses

	Sigourney St From North				Squire Rd From East				Sigourney St From South				Squire Rd From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
03:30 PM	55	0	53	0	0	295	20	0	25	23	13	0	55	299	0	6	844
03:45 PM	56	0	60	0	0	254	21	0	23	17	5	0	61	358	0	5	860
Total	111	0	113	0	0	549	41	0	48	40	18	0	116	657	0	11	1704
04:00 PM	51	0	39	0	0	299	32	0	21	23	8	0	66	347	0	3	889
04:15 PM	46	0	39	0	0	320	30	0	26	23	7	0	64	314	0	7	876
04:30 PM	51	0	42	0	0	332	30	0	27	21	6	0	43	373	0	8	933
04:45 PM	62	0	33	0	0	283	33	0	18	14	2	0	56	330	0	2	833
Total	210	0	153	0	0	1234	125	0	92	81	23	0	229	1364	0	20	3531
05:00 PM	51	0	30	0	0	277	24	0	13	21	7	0	61	354	0	5	843
05:15 PM	55	0	39	0	0	308	21	0	24	25	1	0	65	369	0	3	910
05:30 PM	51	0	36	0	0	308	27	0	22	4	5	0	59	387	0	9	908
05:45 PM	41	0	48	0	0	354	26	0	16	18	4	0	52	319	0	2	880
Total	198	0	153	0	0	1247	98	0	75	68	17	0	237	1429	0	19	3541
06:00 PM	60	0	40	0	0	298	33	0	23	19	6	0	47	317	0	5	848
06:15 PM	47	0	38	0	0	301	26	0	26	22	5	0	59	327	0	11	862
Grand Total	626	0	497	0	0	3629	323	0	264	230	69	0	688	4094	0	66	10486
Apprch %	55.7	0	44.3	0	0	91.8	8.2	0	46.9	40.9	12.3	0	14.2	84.4	0	1.4	
Total %	6	0	4.7	0	0	34.6	3.1	0	2.5	2.2	0.7	0	6.6	39	0	0.6	
Cars	625	0	481	0	0	3539	320	0	263	230	69	0	687	3953	0	66	10233
% Cars	99.8	0	96.8	0	0	97.5	99.1	0	99.6	100	100	0	99.9	96.6	0	100	97.6
Trucks	0	0	2	0	0	70	2	0	1	0	0	0	0	102	0	0	177
% Trucks	0	0	0.4	0	0	1.9	0.6	0	0.4	0	0	0	0	2.5	0	0	1.7
Buses	1	0	14	0	0	20	1	0	0	0	0	0	1	39	0	0	76
% Buses	0.2	0	2.8	0	0	0.6	0.3	0	0	0	0	0	0.1	1	0	0	0.7

	Sigourney St From North					Squire Rd From East					Sigourney St From South					Squire Rd From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:45 PM																					
03:45 PM	**56**	0	**60**	0	**116**	0	254	21	0	275	23	17	5	0	45	61	358	0	5	**424**	860
04:00 PM	51	0	39	0	90	0	299	**32**	0	331	21	**23**	**8**	0	52	**66**	347	0	3	416	889
04:15 PM	46	0	39	0	85	0	320	30	0	350	26	23	7	0	**56**	64	314	0	7	385	876
04:30 PM	51	0	42	0	93	0	**332**	30	0	**362**	**27**	21	6	0	54	43	**373**	0	**8**	424	**933**
Total Volume	204	0	180	0	384	0	1205	113	0	1318	97	84	26	0	207	234	1392	0	23	1649	3558
% App. Total	53.1	0	46.9	0		0	91.4	8.6	0		46.9	40.6	12.6	0		14.2	84.4	0	1.4		
PHF	.911	.000	.750	.000	.828	.000	.907	.883	.000	.910	.898	.913	.813	.000	.924	.886	.933	.000	.719	.972	.953
Cars	204	0	173	0	377	0	1174	112	0	1286	96	84	26	0	206	233	1339	0	23	1595	3464
% Cars	100	0	96.1	0	98.2	0	97.4	99.1	0	97.6	99.0	100	100	0	99.5	99.6	96.2	0	100	96.7	97.4
Trucks	0	0	2	0	2	0	24	1	0	25	1	0	0	0	1	0	39	0	0	39	67
% Trucks	0	0	1.1	0	0.5	0	2.0	0.9	0	1.9	1.0	0	0	0	0.5	0	2.8	0	0	2.4	1.9
Buses	0	0	5	0	5	0	7	0	0	7	0	0	0	0	0	1	14	0	0	15	27
% Buses	0	0	2.8	0	1.3	0	0.6	0	0	0.5	0	0	0	0	0	0.4	1.0	0	0	0.9	0.8

Accurate Counts
978-664-2565

N/S Street : Sigourney Street
E/W Street : Route 60 (Squire Road)
City/State : Revere, MA
Weather : Clear

File Name : 10271fr1
Site Code : 10271001
Start Date : 4/26/2013
Page No : 1

Groups Printed- Trucks

	Sigourney St From North				Squire Rd From East				Sigourney St From South				Squire Rd From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
03:30 PM	0	0	0	0	0	8	1	0	0	0	0	0	0	14	0	0	23
03:45 PM	0	0	0	0	0	6	1	0	0	0	0	0	0	14	0	0	21
Total	0	0	0	0	0	14	2	0	0	0	0	0	0	28	0	0	44
04:00 PM	0	0	0	0	0	6	0	0	0	0	0	0	0	11	0	0	17
04:15 PM	0	0	0	0	0	6	0	0	1	0	0	0	0	8	0	0	15
04:30 PM	0	0	2	0	0	6	0	0	0	0	0	0	0	6	0	0	14
04:45 PM	0	0	0	0	0	11	0	0	0	0	0	0	0	9	0	0	20
Total	0	0	2	0	0	29	0	0	1	0	0	0	0	34	0	0	66
05:00 PM	0	0	0	0	0	4	0	0	0	0	0	0	0	7	0	0	11
05:15 PM	0	0	0	0	0	6	0	0	0	0	0	0	0	8	0	0	14
05:30 PM	0	0	0	0	0	3	0	0	0	0	0	0	0	7	0	0	10
05:45 PM	0	0	0	0	0	6	0	0	0	0	0	0	0	6	0	0	12
Total	0	0	0	0	0	19	0	0	0	0	0	0	0	28	0	0	47
06:00 PM	0	0	0	0	0	3	0	0	0	0	0	0	0	7	0	0	10
06:15 PM	0	0	0	0	0	5	0	0	0	0	0	0	0	5	0	0	10
Grand Total	0	0	2	0	0	70	2	0	1	0	0	0	0	102	0	0	177
Apprch %	0	0	100	0	0	97.2	2.8	0	100	0	0	0	0	100	0	0	
Total %	0	0	1.1	0	0	39.5	1.1	0	0.6	0	0	0	0	57.6	0	0	

	Sigourney St From North					Squire Rd From East					Sigourney St From South					Squire Rd From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	0	0	0	0	0	0	**8**	**1**	0	**9**	0	0	0	0	0	0	**14**	0	0	**14**	**23**
03:45 PM	0	0	0	0	0	0	6	1	0	7	0	0	0	0	0	0	14	0	0	14	21
04:00 PM	0	0	0	0	0	0	6	0	0	6	0	0	0	0	0	0	11	0	0	11	17
04:15 PM	0	0	0	0	0	0	6	0	0	6	**1**	0	0	0	**1**	0	8	0	0	8	15
Total Volume	0	0	0	0	0	0	26	2	0	28	1	0	0	0	1	0	47	0	0	47	76
% App. Total	0	0	0	0		0	92.9	7.1	0		100	0	0	0		0	100	0	0		
PHF	.000	.000	.000	.000	.000	.000	.813	.500	.000	.778	.250	.000	.000	.000	.250	.000	.839	.000	.000	.839	.826

Accurate Counts
978-664-2565

N/S Street : Sigourney Street
E/W Street : Route 60 (Squire Road)
City/State : Revere, MA
Weather : Clear

File Name : 10271fr1
Site Code : 10271001
Start Date : 4/26/2013
Page No : 1

Groups Printed- Buses

	Sigourney St From North				Squire Rd From East				Sigourney St From South				Squire Rd From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
03:45 PM	0	0	1	0	0	3	0	0	0	0	0	0	0	1	0	0	5
Total	0	0	1	0	0	3	0	0	0	0	0	0	0	2	0	0	6
04:00 PM	0	0	2	0	0	2	0	0	0	0	0	0	1	7	0	0	12
04:15 PM	0	0	1	0	0	1	0	0	0	0	0	0	0	2	0	0	4
04:30 PM	0	0	1	0	0	1	0	0	0	0	0	0	0	4	0	0	6
04:45 PM	1	0	1	0	0	4	1	0	0	0	0	0	0	3	0	0	10
Total	1	0	5	0	0	8	1	0	0	0	0	0	1	16	0	0	32
05:00 PM	0	0	2	0	0	0	0	0	0	0	0	0	0	7	0	0	9
05:15 PM	0	0	2	0	0	1	0	0	0	0	0	0	0	3	0	0	6
05:30 PM	0	0	1	0	0	2	0	0	0	0	0	0	0	3	0	0	6
05:45 PM	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0	4
Total	0	0	5	0	0	6	0	0	0	0	0	0	0	14	0	0	25
06:00 PM	0	0	3	0	0	3	0	0	0	0	0	0	0	6	0	0	12
06:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Grand Total	1	0	14	0	0	20	1	0	0	0	0	0	1	39	0	0	76
Apprch %	6.7	0	93.3	0	0	95.2	4.8	0	0	0	0	0	2.5	97.5	0	0	
Total %	1.3	0	18.4	0	0	26.3	1.3	0	0	0	0	0	1.3	51.3	0	0	

	Sigourney St From North					Squire Rd From East					Sigourney St From South					Squire Rd From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	**2**	0	**2**	0	2	0	0	2	0	0	0	0	0	**1**	**7**	0	0	**8**	**12**
04:15 PM	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	4
04:30 PM	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0	0	4	0	0	4	6
04:45 PM	**1**	0	1	0	2	0	**4**	**1**	0	**5**	0	0	0	0	0	0	3	0	0	3	10
Total Volume	1	0	5	0	6	0	8	1	0	9	0	0	0	0	0	1	16	0	0	17	32
% App. Total	16.7	0	83.3	0		0	88.9	11.1	0		0	0	0	0		5.9	94.1	0	0		
PHF	.250	.000	.625	.000	.750	.000	.500	.250	.000	.450	.000	.000	.000	.000	.000	.250	.571	.000	.000	.531	.667

Accurate Counts
978-664-2565

N/S Street : Sigourney Street
E/W Street : Route 60 (Squire Road)
City/State : Revere, MA
Weather : Clear

File Name : 10271fr1
Site Code : 10271001
Start Date : 4/26/2013
Page No : 1

Groups Printed- Bikes Peds

	Sigourney St From North				Squire Rd From East				Sigourney St From South				Squire Rd From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1
03:45 PM	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	2	5	0	5
Total	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	2	6	0	6
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	4	0	4
04:30 PM	0	0	0	2	0	0	0	5	0	0	0	0	0	0	0	0	7	0	7
04:45 PM	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	2
Total	0	0	0	2	0	0	0	11	0	0	0	0	0	0	0	0	13	0	13
05:00 PM	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	4	5	1	6
05:15 PM	1	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	4	1	5
05:30 PM	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	2	2	4
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2	0	0	0	0	1	1	7	0	0	0	0	0	0	0	4	11	4	15
06:00 PM	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	5	0	5
06:15 PM	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	3	0	3
Grand Total	2	0	0	2	0	1	1	28	0	0	0	2	0	0	0	6	38	4	42
Apprch %	100	0	0		0	50	50		0	0	0		0	0	0				
Total %	50	0	0		0	25	25		0	0	0		0	0	0		90.5	9.5	

	Sigourney St From North				Squire Rd From East				Sigourney St From South				Squire Rd From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	**1**	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	0	1
05:15 PM	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
05:30 PM	0	0	0	0	0	**1**	**1**	**2**	0	0	0	0	0	0	0	0	**2**
Total Volume	2	0	0	2	0	1	1	2	0	0	0	0	0	0	0	0	4
% App. Total	100	0	0		0	50	50		0	0	0		0	0	0		
PHF	.500	.000	.000	.500	.000	.250	.250	.250	.000	.000	.000	.000	.000	.000	.000	.000	.500

Accurate Counts
978-664-2565

N/S Street : Charger Street
E/W Street: Route 60 (Squire Road)
City/State : Revere, MA
Weather : Clear

File Name : 10271FR2
Site Code : 10271002
Start Date : 4/26/2013
Page No : 1

Groups Printed- Cars - Trucks - Buses

	Charger St From North				Squire Rd From East				Charger St From South				Squire Rd From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
03:30 PM	46	0	24	0	0	276	26	0	5	22	7	0	37	324	0	1	768
03:45 PM	50	0	20	0	0	274	37	0	4	17	11	0	35	391	0	0	839
Total	96	0	44	0	0	550	63	0	9	39	18	0	72	715	0	1	1607
04:00 PM	53	0	26	0	0	314	35	0	12	17	6	0	37	354	0	4	858
04:15 PM	58	0	30	0	0	318	38	0	8	21	6	0	49	332	0	0	860
04:30 PM	54	0	38	0	0	313	60	0	11	20	7	0	37	384	0	2	926
04:45 PM	63	0	37	0	0	279	38	0	6	30	16	0	30	378	0	1	878
Total	228	0	131	0	0	1224	171	0	37	88	35	0	153	1448	0	7	3522
05:00 PM	73	0	33	0	0	299	44	0	5	22	5	0	36	357	0	1	875
05:15 PM	49	0	22	0	0	308	44	0	13	19	13	0	33	402	0	1	904
05:30 PM	49	0	34	0	0	311	38	0	13	18	10	0	39	386	0	0	898
05:45 PM	57	0	26	0	0	333	40	0	9	19	5	0	45	350	0	3	887
Total	228	0	115	0	0	1251	166	0	40	78	33	0	153	1495	0	5	3564
06:00 PM	58	0	19	0	0	309	37	0	6	23	6	0	45	308	0	2	813
06:15 PM	50	0	33	0	0	307	48	0	14	26	3	0	42	350	0	2	875
Grand Total	660	0	342	0	0	3641	485	0	106	254	95	0	465	4316	0	17	10381
Apprch %	65.9	0	34.1	0	0	88.2	11.8	0	23.3	55.8	20.9	0	9.7	90	0	0.4	
Total %	6.4	0	3.3	0	0	35.1	4.7	0	1	2.4	0.9	0	4.5	41.6	0	0.2	
Cars	653	0	342	0	0	3537	483	0	106	251	95	0	443	4196	0	17	10123
% Cars	98.9	0	100	0	0	97.1	99.6	0	100	98.8	100	0	95.3	97.2	0	100	97.5
Trucks	4	0	0	0	0	80	2	0	0	1	0	0	8	96	0	0	191
% Trucks	0.6	0	0	0	0	2.2	0.4	0	0	0.4	0	0	1.7	2.2	0	0	1.8
Buses	3	0	0	0	0	24	0	0	0	2	0	0	14	24	0	0	67
% Buses	0.5	0	0	0	0	0.7	0	0	0	0.8	0	0	3	0.6	0	0	0.6

	Charger St From North					Squire Rd From East					Charger St From South					Squire Rd From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	54	0	**38**	0	92	0	**313**	**60**	0	**373**	11	20	7	0	38	**37**	384	0	**2**	423	**926**
04:45 PM	63	0	37	0	100	0	279	38	0	317	6	**30**	**16**	0	**52**	30	378	0	1	409	878
05:00 PM	**73**	0	33	0	**106**	0	299	44	0	343	5	22	5	0	32	36	357	0	1	394	875
05:15 PM	49	0	22	0	71	0	308	44	0	352	**13**	19	13	0	45	33	**402**	0	1	**436**	904
Total Volume	239	0	130	0	369	0	1199	186	0	1385	35	91	41	0	167	136	1521	0	5	1662	3583
% App. Total	64.8	0	35.2	0		0	86.6	13.4	0		21	54.5	24.6	0		8.2	91.5	0	0.3		
PHF	.818	.000	.855	.000	.870	.000	.958	.775	.000	.928	.673	.758	.641	.000	.803	.919	.946	.000	.625	.953	.967
Cars	237	0	130	0	367	0	1160	186	0	1346	35	91	41	0	167	129	1485	0	5	1619	3499
% Cars	99.2	0	100	0	99.5	0	96.7	100	0	97.2	100	100	100	0	100	94.9	97.6	0	100	97.4	97.7
Trucks	1	0	0	0	1	0	31	0	0	31	0	0	0	0	0	2	26	0	0	28	60
% Trucks	0.4	0	0	0	0.3	0	2.6	0	0	2.2	0	0	0	0	0	1.5	1.7	0	0	1.7	1.7
Buses	1	0	0	0	1	0	8	0	0	8	0	0	0	0	0	5	10	0	0	15	24
% Buses	0.4	0	0	0	0.3	0	0.7	0	0	0.6	0	0	0	0	0	3.7	0.7	0	0	0.9	0.7

Accurate Counts
978-664-2565

N/S Street : Charger Street
E/W Street: Route 60 (Squire Road)
City/State : Revere, MA
Weather : Clear

File Name : 10271FR2
Site Code : 10271002
Start Date : 4/26/2013
Page No : 1

Groups Printed- Trucks

	Charger St From North				Squire Rd From East				Charger St From South				Squire Rd From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
03:30 PM	1	0	0	0	0	9	0	0	0	0	0	0	0	16	0	0	26
03:45 PM	0	0	0	0	0	7	0	0	0	1	0	0	0	13	0	0	21
Total	1	0	0	0	0	16	0	0	0	1	0	0	0	29	0	0	47
04:00 PM	0	0	0	0	0	8	1	0	0	0	0	0	2	9	0	0	20
04:15 PM	1	0	0	0	0	5	1	0	0	0	0	0	3	7	0	0	17
04:30 PM	0	0	0	0	0	8	0	0	0	0	0	0	1	4	0	0	13
04:45 PM	1	0	0	0	0	11	0	0	0	0	0	0	1	8	0	0	21
Total	2	0	0	0	0	32	2	0	0	0	0	0	7	28	0	0	71
05:00 PM	0	0	0	0	0	6	0	0	0	0	0	0	0	7	0	0	13
05:15 PM	0	0	0	0	0	6	0	0	0	0	0	0	0	7	0	0	13
05:30 PM	0	0	0	0	0	5	0	0	0	0	0	0	0	7	0	0	12
05:45 PM	1	0	0	0	0	8	0	0	0	0	0	0	0	6	0	0	15
Total	1	0	0	0	0	25	0	0	0	0	0	0	0	27	0	0	53
06:00 PM	0	0	0	0	0	3	0	0	0	0	0	0	0	7	0	0	10
06:15 PM	0	0	0	0	0	4	0	0	0	0	0	0	1	5	0	0	10
Grand Total	4	0	0	0	0	80	2	0	0	1	0	0	8	96	0	0	191
Apprch %	100	0	0	0	0	97.6	2.4	0	0	100	0	0	7.7	92.3	0	0	
Total %	2.1	0	0	0	0	41.9	1	0	0	0.5	0	0	4.2	50.3	0	0	

	Charger St From North					Squire Rd From East					Charger St From South					Squire Rd From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	**1**	0	0	0	**1**	0	**9**	0	0	**9**	0	0	0	0	0	0	**16**	0	0	**16**	**26**
03:45 PM	0	0	0	0	0	0	7	0	0	7	0	**1**	0	0	**1**	0	13	0	0	13	21
04:00 PM	0	0	0	0	0	0	8	**1**	0	9	0	0	0	0	0	2	9	0	0	11	20
04:15 PM	1	0	0	0	1	0	5	1	0	6	0	0	0	0	0	**3**	7	0	0	10	17
Total Volume	2	0	0	0	2	0	29	2	0	31	0	1	0	0	1	5	45	0	0	50	84
% App. Total	100	0	0	0		0	93.5	6.5	0		0	100	0	0		10	90	0	0		
PHF	.500	.000	.000	.000	.500	.000	.806	.500	.000	.861	.000	.250	.000	.000	.250	.417	.703	.000	.000	.781	.808

Accurate Counts
978-664-2565

N/S Street : Charger Street
E/W Street: Route 60 (Squire Road)
City/State : Revere, MA
Weather : Clear

File Name : 10271FR2
Site Code : 10271002
Start Date : 4/26/2013
Page No : 1

Groups Printed- Buses

	Charger St From North				Squire Rd From East				Charger St From South				Squire Rd From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
03:45 PM	1	0	0	0	0	3	0	0	0	1	0	0	0	1	0	0	6
Total	1	0	0	0	0	3	0	0	0	1	0	0	1	1	0	0	7
04:00 PM	0	0	0	0	0	4	0	0	0	1	0	0	3	6	0	0	14
04:15 PM	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	3
04:30 PM	1	0	0	0	0	1	0	0	0	0	0	0	1	2	0	0	5
04:45 PM	0	0	0	0	0	5	0	0	0	0	0	0	1	2	0	0	8
Total	2	0	0	0	0	11	0	0	0	1	0	0	5	11	0	0	30
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	2	5	0	0	7
05:15 PM	0	0	0	0	0	2	0	0	0	0	0	0	1	1	0	0	4
05:30 PM	0	0	0	0	0	3	0	0	0	0	0	0	1	2	0	0	6
05:45 PM	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0	4
Total	0	0	0	0	0	8	0	0	0	0	0	0	4	9	0	0	21
06:00 PM	0	0	0	0	0	2	0	0	0	0	0	0	4	2	0	0	8
06:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Grand Total	3	0	0	0	0	24	0	0	0	2	0	0	14	24	0	0	67
Apprch %	100	0	0	0	0	100	0	0	0	100	0	0	36.8	63.2	0	0	
Total %	4.5	0	0	0	0	35.8	0	0	0	3	0	0	20.9	35.8	0	0	

	Charger St From North					Squire Rd From East					Charger St From South					Squire Rd From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	0	0	0	0	4	0	0	4	0	**1**	0	0	**1**	**3**	**6**	0	0	**9**	**14**
04:15 PM	**1**	0	0	0	**1**	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	3
04:30 PM	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	1	2	0	0	3	5
04:45 PM	0	0	0	0	0	0	**5**	0	0	**5**	0	0	0	0	0	1	2	0	0	3	8
Total Volume	2	0	0	0	2	0	11	0	0	11	0	1	0	0	1	5	11	0	0	16	30
% App. Total	100	0	0	0		0	100	0	0		0	100	0	0		31.2	68.8	0	0		
PHF	.500	.000	.000	.000	.500	.000	.550	.000	.000	.550	.000	.250	.000	.000	.250	.417	.458	.000	.000	.444	.536

Accurate Counts
978-664-2565

N/S Street : Charger Street
E/W Street: Route 60 (Squire Road)
City/State : Revere, MA
Weather : Clear

File Name : 10271FR2
Site Code : 10271002
Start Date : 4/26/2013
Page No : 1

Groups Printed- Bikes Peds

	Charger St From North				Squire Rd From East				Charger St From South				Squire Rd From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
03:30 PM	0	0	2	1	0	0	0	3	0	0	0	0	0	0	0	1	5	2	7
03:45 PM	0	0	0	4	0	0	0	4	0	0	0	1	1	0	0	0	9	1	10
Total	0	0	2	5	0	0	0	7	0	0	0	1	1	0	0	1	14	3	17
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1
04:15 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1
04:30 PM	0	0	0	1	0	0	0	2	0	1	0	0	0	0	0	0	3	1	4
04:45 PM	0	0	0	1	0	0	0	3	0	0	0	1	0	0	0	1	6	0	6
Total	0	0	0	2	0	0	0	6	0	1	0	1	0	0	0	2	11	1	12
05:00 PM	0	0	0	4	0	0	0	5	0	0	0	4	0	0	0	0	13	0	13
05:15 PM	0	0	0	2	0	0	0	4	0	0	0	0	0	0	0	0	6	0	6
05:30 PM	0	0	0	2	0	0	0	2	0	1	0	7	0	0	0	0	11	1	12
05:45 PM	0	0	0	2	0	0	0	10	0	0	0	0	0	0	0	1	13	0	13
Total	0	0	0	10	0	0	0	21	0	1	0	11	0	0	0	1	43	1	44
06:00 PM	0	0	0	2	0	0	0	7	0	0	0	0	0	0	0	0	9	0	9
06:15 PM	0	0	0	1	0	0	0	4	0	0	0	0	0	0	0	3	8	0	8
Grand Total	0	0	2	20	0	0	0	45	0	2	0	13	1	0	0	7	85	5	90
Apprch %	0	0	100		0	0	0		0	100	0		100	0	0				
Total %	0	0	40		0	0	0		0	40	0		20	0	0		94.4	5.6	

	Charger St From North				Squire Rd From East				Charger St From South				Squire Rd From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:30 PM																	
03:30 PM	0	0	**2**	**2**	0	0	0	0	0	0	0	0	0	0	0	0	**2**
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	**1**	1
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	2	2	0	0	0	0	0	0	0	0	1	0	0	1	3
% App. Total	0	0	100		0	0	0		0	0	0		100	0	0		
PHF	.000	.000	.250	.250	.000	.000	.000	.000	.000	.000	.000	.000	.250	.000	.000	.250	.375

Accurate Counts
978-664-2565

N/S Street : Route 1A (North Shore Road)
E/W Street: Revere Street
City/State : Revere, MA
Weather : Clear

File Name : 10271fr3
Site Code : 10271003
Start Date : 4/26/2013
Page No : 1

Groups Printed- Cars - Trucks - Buses

	Route 1A From North				Revere St From East				Route 1A From South				Revere St From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
03:30 PM	8	262	57	0	5	51	8	0	47	317	4	0	48	46	20	0	873
03:45 PM	11	219	51	0	5	42	8	0	38	312	2	2	50	45	22	0	807
Total	19	481	108	0	10	93	16	0	85	629	6	2	98	91	42	0	1680
04:00 PM	8	245	64	0	6	44	5	0	40	334	3	0	61	47	17	0	874
04:15 PM	5	258	55	0	8	55	9	0	39	312	6	1	53	56	14	0	871
04:30 PM	17	209	69	0	8	43	12	0	47	363	4	1	47	40	13	0	873
04:45 PM	15	217	69	0	5	41	6	0	46	332	5	0	61	40	8	0	845
Total	45	929	257	0	27	183	32	0	172	1341	18	2	222	183	52	0	3463
05:00 PM	8	222	51	0	3	61	10	0	64	404	3	0	55	35	12	0	928
05:15 PM	12	234	56	0	4	48	7	0	62	342	7	0	58	28	13	0	871
05:30 PM	6	204	63	0	4	49	14	0	91	405	5	1	61	30	15	0	948
05:45 PM	15	246	62	0	5	52	14	0	59	369	5	0	90	36	15	0	968
Total	41	906	232	0	16	210	45	0	276	1520	20	1	264	129	55	0	3715
06:00 PM	5	196	49	0	6	69	14	0	75	385	3	0	45	35	22	0	904
06:15 PM	14	217	66	0	9	54	6	0	46	379	10	2	49	33	8	0	893
Grand Total	124	2729	712	0	68	609	113	0	654	4254	57	7	678	471	179	0	10655
Apprch %	3.5	76.5	20	0	8.6	77.1	14.3	0	13.2	85.6	1.1	0.1	51.1	35.5	13.5	0	
Total %	1.2	25.6	6.7	0	0.6	5.7	1.1	0	6.1	39.9	0.5	0.1	6.4	4.4	1.7	0	
Cars	124	2695	707	0	68	608	112	0	645	4174	57	7	668	468	167	0	10500
% Cars	100	98.8	99.3	0	100	99.8	99.1	0	98.6	98.1	100	100	98.5	99.4	93.3	0	98.5
Trucks	0	18	1	0	0	1	1	0	0	39	0	0	2	0	0	0	62
% Trucks	0	0.7	0.1	0	0	0.2	0.9	0	0	0.9	0	0	0.3	0	0	0	0.6
Buses	0	16	4	0	0	0	0	0	9	41	0	0	8	3	12	0	93
% Buses	0	0.6	0.6	0	0	0	0	0	1.4	1	0	0	1.2	0.6	6.7	0	0.9

	Route 1A From North					Revere St From East					Route 1A From South					Revere St From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	8	222	51	0	281	3	**61**	10	0	**74**	64	404	3	0	471	55	35	12	0	102	928
05:15 PM	12	234	56	0	302	4	48	7	0	59	62	342	**7**	0	411	58	28	13	0	99	871
05:30 PM	6	204	**63**	0	273	4	49	**14**	0	67	**91**	**405**	5	**1**	**502**	61	30	**15**	0	106	948
05:45 PM	**15**	**246**	62	0	**323**	**5**	52	14	0	71	59	369	5	0	433	**90**	**36**	15	0	**141**	**968**
Total Volume	41	906	232	0	1179	16	210	45	0	271	276	1520	20	1	1817	264	129	55	0	448	3715
% App. Total	3.5	76.8	19.7	0		5.9	77.5	16.6	0		15.2	83.7	1.1	0.1		58.9	28.8	12.3	0		
PHF	.683	.921	.921	.000	.913	.800	.861	.804	.000	.916	.758	.938	.714	.250	.905	.733	.896	.917	.000	.794	.959
Cars	41	891	231	0	1163	16	209	45	0	270	273	1492	20	1	1786	259	127	52	0	438	3657
% Cars	100	98.3	99.6	0	98.6	100	99.5	100	0	99.6	98.9	98.2	100	100	98.3	98.1	98.4	94.5	0	97.8	98.4
Trucks	0	8	0	0	8	0	1	0	0	1	0	10	0	0	10	1	0	0	0	1	20
% Trucks	0	0.9	0	0	0.7	0	0.5	0	0	0.4	0	0.7	0	0	0.6	0.4	0	0	0	0.2	0.5
Buses	0	7	1	0	8	0	0	0	0	0	3	18	0	0	21	4	2	3	0	9	38
% Buses	0	0.8	0.4	0	0.7	0	0	0	0	0	1.1	1.2	0	0	1.2	1.5	1.6	5.5	0	2.0	1.0

Accurate Counts
978-664-2565

N/S Street : Route 1A (North Shore Road)
E/W Street: Revere Street
City/State : Revere, MA
Weather : Clear

File Name : 10271fr3
Site Code : 10271003
Start Date : 4/26/2013
Page No : 1

Groups Printed- Trucks

	Route 1A From North				Revere St From East				Route 1A From South				Revere St From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
03:30 PM	0	2	0	0	0	0	0	0	0	3	0	0	0	0	0	0	5
03:45 PM	0	1	0	0	0	0	0	0	0	6	0	0	0	0	0	0	7
Total	0	3	0	0	0	0	0	0	0	9	0	0	0	0	0	0	12
04:00 PM	0	1	0	0	0	0	0	0	0	7	0	0	1	0	0	0	9
04:15 PM	0	1	0	0	0	0	1	0	0	2	0	0	0	0	0	0	4
04:30 PM	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	3
04:45 PM	0	3	0	0	0	0	0	0	0	4	0	0	0	0	0	0	7
Total	0	6	0	0	0	0	1	0	0	15	0	0	1	0	0	0	23
05:00 PM	0	2	0	0	0	0	0	0	0	2	0	0	0	0	0	0	4
05:15 PM	0	4	0	0	0	1	0	0	0	2	0	0	0	0	0	0	7
05:30 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
05:45 PM	0	2	0	0	0	0	0	0	0	4	0	0	1	0	0	0	7
Total	0	8	0	0	0	1	0	0	0	10	0	0	1	0	0	0	20
06:00 PM	0	1	0	0	0	0	0	0	0	3	0	0	0	0	0	0	4
06:15 PM	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	3
Grand Total	0	18	1	0	0	1	1	0	0	39	0	0	2	0	0	0	62
Apprch %	0	94.7	5.3	0	0	50	50	0	0	100	0	0	100	0	0	0	
Total %	0	29	1.6	0	0	1.6	1.6	0	0	62.9	0	0	3.2	0	0	0	

	Route 1A From North					Revere St From East					Route 1A From South					Revere St From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	0	**2**	0	0	**2**	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	5
03:45 PM	0	1	0	0	1	0	0	0	0	0	0	6	0	0	6	0	0	0	0	0	7
04:00 PM	0	1	0	0	1	0	0	0	0	0	0	**7**	0	0	**7**	**1**	0	0	0	**1**	**9**
04:15 PM	0	1	0	0	1	0	0	**1**	0	**1**	0	2	0	0	2	0	0	0	0	0	4
Total Volume	0	5	0	0	5	0	0	1	0	1	0	18	0	0	18	1	0	0	0	1	25
% App. Total	0	100	0	0		0	0	100	0		0	100	0	0		100	0	0	0		
PHF	.000	.625	.000	.000	.625	.000	.000	.250	.000	.250	.000	.643	.000	.000	.643	.250	.000	.000	.000	.250	.694

Accurate Counts
978-664-2565

N/S Street : Route 1A (North Shore Road)
E/W Street: Revere Street
City/State : Revere, MA
Weather : Clear

File Name : 10271fr3
Site Code : 10271003
Start Date : 4/26/2013
Page No : 1

Groups Printed- Buses

	Route 1A From North				Revere St From East				Route 1A From South				Revere St From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
03:30 PM	0	1	1	0	0	0	0	0	1	2	0	0	1	0	2	0	8
03:45 PM	0	1	0	0	0	0	0	0	0	2	0	0	0	0	1	0	4
Total	0	2	1	0	0	0	0	0	1	4	0	0	1	0	3	0	12
04:00 PM	0	1	0	0	0	0	0	0	1	3	0	0	0	0	1	0	6
04:15 PM	0	1	0	0	0	0	0	0	1	3	0	0	1	0	2	0	8
04:30 PM	0	2	2	0	0	0	0	0	1	4	0	0	0	0	0	0	9
04:45 PM	0	2	0	0	0	0	0	0	0	4	0	0	1	0	1	0	8
Total	0	6	2	0	0	0	0	0	3	14	0	0	2	0	4	0	31
05:00 PM	0	1	0	0	0	0	0	0	1	3	0	0	1	2	0	0	8
05:15 PM	0	2	1	0	0	0	0	0	1	6	0	0	0	0	2	0	12
05:30 PM	0	2	0	0	0	0	0	0	1	6	0	0	2	0	0	0	11
05:45 PM	0	2	0	0	0	0	0	0	0	3	0	0	1	0	1	0	7
Total	0	7	1	0	0	0	0	0	3	18	0	0	4	2	3	0	38
06:00 PM	0	1	0	0	0	0	0	0	2	4	0	0	0	0	1	0	8
06:15 PM	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0	4
Grand Total	0	16	4	0	0	0	0	0	9	41	0	0	8	3	12	0	93
Apprch %	0	80	20	0	0	0	0	0	18	82	0	0	34.8	13	52.2	0	
Total %	0	17.2	4.3	0	0	0	0	0	9.7	44.1	0	0	8.6	3.2	12.9	0	

	Route 1A From North					Revere St From East					Route 1A From South					Revere St From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	0	**2**	0	0	2	0	0	0	0	0	0	4	0	0	4	1	0	1	0	2	8
05:00 PM	0	1	0	0	1	0	0	0	0	0	**1**	3	0	0	4	1	**2**	0	0	**3**	8
05:15 PM	0	2	**1**	0	**3**	0	0	0	0	0	1	**6**	0	0	**7**	0	0	**2**	0	2	**12**
05:30 PM	0	2	0	0	2	0	0	0	0	0	1	6	0	0	7	**2**	0	0	0	2	11
Total Volume	0	7	1	0	8	0	0	0	0	0	3	19	0	0	22	4	2	3	0	9	39
% App. Total	0	87.5	12.5	0		0	0	0	0		13.6	86.4	0	0		44.4	22.2	33.3	0		
PHF	.000	.875	.250	.000	.667	.000	.000	.000	.000	.000	.750	.792	.000	.000	.786	.500	.250	.375	.000	.750	.813

Accurate Counts
978-664-2565

N/S Street : Route 1A (North Shore Road)
E/W Street: Revere Street
City/State : Revere, MA
Weather : Clear

File Name : 10271fr3
Site Code : 10271003
Start Date : 4/26/2013
Page No : 1

Groups Printed- Bikes Peds

	Route 1A From North				Revere St From East				Route 1A From South				Revere St From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
03:30 PM	0	0	0	3	0	0	0	4	0	0	0	8	0	0	0	0	15	0	15
03:45 PM	0	0	0	2	0	0	0	3	0	1	0	10	0	0	0	1	16	1	17
Total	0	0	0	5	0	0	0	7	0	1	0	18	0	0	0	1	31	1	32
04:00 PM	0	0	0	10	0	0	0	9	0	0	0	4	0	0	0	0	23	0	23
04:15 PM	0	0	0	0	0	0	0	1	0	1	0	8	0	1	0	0	9	2	11
04:30 PM	0	0	0	2	0	0	0	9	0	0	0	8	0	0	0	0	19	0	19
04:45 PM	0	0	0	2	0	0	0	4	0	0	0	8	0	0	0	1	15	0	15
Total	0	0	0	14	0	0	0	23	0	1	0	28	0	1	0	1	66	2	68
05:00 PM	0	1	0	1	0	0	0	4	0	0	0	3	0	0	0	1	9	1	10
05:15 PM	0	0	0	3	0	0	0	7	0	0	0	14	0	0	0	0	24	0	24
05:30 PM	0	0	0	5	0	1	0	5	0	0	0	12	0	1	0	1	23	2	25
05:45 PM	0	0	0	0	0	2	0	6	0	0	0	10	0	0	0	0	16	2	18
Total	0	1	0	9	0	3	0	22	0	0	0	39	0	1	0	2	72	5	77
06:00 PM	0	0	0	3	0	0	0	8	0	0	0	7	0	0	0	0	18	0	18
06:15 PM	0	0	0	0	0	0	0	5	0	0	0	4	0	0	0	0	9	0	9
Grand Total	0	1	0	31	0	3	0	65	0	2	0	96	0	2	0	4	196	8	204
Apprch %	0	100	0		0	100	0		0	100	0		0	100	0				
Total %	0	12.5	0		0	37.5	0		0	25	0		0	25	0		96.1	3.9	

	Route 1A From North				Revere St From East				Route 1A From South				Revere St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	0	**1**	0	**1**	0	0	0	0	0	0	0	0	0	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	**1**	0	**1**	**2**
05:45 PM	0	0	0	0	0	**2**	0	**2**	0	0	0	0	0	0	0	0	2
Total Volume	0	1	0	1	0	3	0	3	0	0	0	0	0	1	0	1	5
% App. Total	0	100	0		0	100	0		0	0	0		0	100	0		
PHF	.000	.250	.000	.250	.000	.375	.000	.375	.000	.000	.000	.000	.000	.250	.000	.250	.625

Accurate Counts
978-664-2565

N/S Street : Route 1A North Shore Road)
E/W Street : MBTA Driveway
City/State : Revere, MA
Weather : Clear

File Name : 10271FR4
Site Code : 10271004
Start Date : 4/26/2013
Page No : 1

Groups Printed- Cars - Trucks - Buses

	Route 1A From North		MBTA From East		Route 1A From South		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
03:30 PM	6	292	9	31	327	10	675
03:45 PM	7	223	9	38	322	8	607
Total	13	515	18	69	649	18	1282
04:00 PM	11	249	7	35	332	8	642
04:15 PM	10	272	11	30	318	3	644
04:30 PM	6	203	5	41	357	7	619
04:45 PM	21	271	16	73	326	9	716
Total	48	995	39	179	1333	27	2621
05:00 PM	9	186	16	69	384	11	675
05:15 PM	25	245	10	72	305	9	666
05:30 PM	17	197	22	123	344	12	715
05:45 PM	16	244	20	91	344	16	731
Total	67	872	68	355	1377	48	2787
06:00 PM	15	236	15	70	351	11	698
06:15 PM	8	212	6	63	343	7	639
Grand Total	151	2830	146	736	4053	111	8027
Apprch %	5.1	94.9	16.6	83.4	97.3	2.7	
Total %	1.9	35.3	1.8	9.2	50.5	1.4	
Cars	151	2768	121	699	3992	111	7842
% Cars	100	97.8	82.9	95	98.5	100	97.7
Trucks	0	31	1	1	45	0	78
% Trucks	0	1.1	0.7	0.1	1.1	0	1
Buses	0	31	24	36	16	0	107
% Buses	0	1.1	16.4	4.9	0.4	0	1.3

	Route 1A From North			MBTA From East			Route 1A From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 05:15 PM										
05:15 PM	**25**	**245**	**270**	10	72	82	305	9	314	666
05:30 PM	17	197	214	**22**	**123**	**145**	344	12	356	715
05:45 PM	16	244	260	20	91	111	344	**16**	360	**731**
06:00 PM	15	236	251	15	70	85	**351**	11	**362**	698
Total Volume	73	922	995	67	356	423	1344	48	1392	2810
% App. Total	7.3	92.7		15.8	84.2		96.6	3.4		
PHF	.730	.941	.921	.761	.724	.729	.957	.750	.961	.961
Cars	73	899	972	60	342	402	1326	48	1374	2748
% Cars	100	97.5	97.7	89.6	96.1	95.0	98.7	100	98.7	97.8
Trucks	0	10	10	0	0	0	13	0	13	23
% Trucks	0	1.1	1.0	0	0	0	1.0	0	0.9	0.8
Buses	0	13	13	7	14	21	5	0	5	39
% Buses	0	1.4	1.3	10.4	3.9	5.0	0.4	0	0.4	1.4

Accurate Counts
978-664-2565

N/S Street : Route 1A North Shore Road)
E/W Street : MBTA Driveway
City/State : Revere, MA
Weather : Clear

File Name : 10271FR4
Site Code : 10271004
Start Date : 4/26/2013
Page No : 1

Groups Printed- Trucks

	Route 1A From North		MBTA From East		Route 1A From South		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
03:30 PM	0	6	1	0	4	0	11
03:45 PM	0	5	0	1	4	0	10
Total	0	11	1	1	8	0	21
04:00 PM	0	3	0	0	7	0	10
04:15 PM	0	1	0	0	2	0	3
04:30 PM	0	2	0	0	3	0	5
04:45 PM	0	3	0	0	6	0	9
Total	0	9	0	0	18	0	27
05:00 PM	0	1	0	0	2	0	3
05:15 PM	0	4	0	0	5	0	9
05:30 PM	0	1	0	0	2	0	3
05:45 PM	0	3	0	0	4	0	7
Total	0	9	0	0	13	0	22
06:00 PM	0	2	0	0	2	0	4
06:15 PM	0	0	0	0	4	0	4
Grand Total	0	31	1	1	45	0	78
Apprch %	0	100	50	50	100	0	
Total %	0	39.7	1.3	1.3	57.7	0	

	Route 1A From North			MBTA From East			Route 1A From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 03:30 PM										
03:30 PM	0	**6**	**6**	**1**	0	**1**	4	0	4	**11**
03:45 PM	0	5	5	0	**1**	1	4	0	4	10
04:00 PM	0	3	3	0	0	0	**7**	0	**7**	10
04:15 PM	0	1	1	0	0	0	2	0	2	3
Total Volume	0	15	15	1	1	2	17	0	17	34
% App. Total	0	100		50	50		100	0		
PHF	.000	.625	.625	.250	.250	.500	.607	.000	.607	.773

Accurate Counts
978-664-2565

N/S Street : Route 1A North Shore Road)
E/W Street : MBTA Driveway
City/State : Revere, MA
Weather : Clear

File Name : 10271FR4
Site Code : 10271004
Start Date : 4/26/2013
Page No : 1

Groups Printed- Buses

	Route 1A From North		MBTA From East		Route 1A From South		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
03:30 PM	0	4	4	2	1	0	11
03:45 PM	0	0	2	1	1	0	4
Total	0	4	6	3	2	0	15
04:00 PM	0	5	0	4	1	0	10
04:15 PM	0	1	3	2	1	0	7
04:30 PM	0	3	1	3	2	0	9
04:45 PM	0	2	3	2	2	0	9
Total	0	11	7	11	6	0	35
05:00 PM	0	1	2	2	2	0	7
05:15 PM	0	4	2	4	2	0	12
05:30 PM	0	2	2	5	2	0	11
05:45 PM	0	4	2	1	1	0	8
Total	0	11	8	12	7	0	38
06:00 PM	0	3	1	4	0	0	8
06:15 PM	0	2	2	6	1	0	11
Grand Total	0	31	24	36	16	0	107
Apprch %	0	100	40	60	100	0	
Total %	0	29	22.4	33.6	15	0	

	Route 1A From North			MBTA From East			Route 1A From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:45 PM										
04:45 PM	0	2	2	**3**	2	5	**2**	0	**2**	9
05:00 PM	0	1	1	2	2	4	2	0	2	7
05:15 PM	0	**4**	**4**	2	4	6	2	0	2	**12**
05:30 PM	0	2	2	2	**5**	**7**	2	0	2	11
Total Volume	0	9	9	9	13	22	8	0	8	39
% App. Total	0	100		40.9	59.1		100	0		
PHF	.000	.563	.563	.750	.650	.786	1.00	.000	1.00	.813

Accurate Counts
978-664-2565

N/S Street : Route 1A North Shore Road)
E/W Street : MBTA Driveway
City/State : Revere, MA
Weather : Clear

File Name : 10271FR4
Site Code : 10271004
Start Date : 4/26/2013
Page No : 1

Groups Printed- Bikes Peds

	Route 1A From North			MBTA From East			Route 1A From South					
Start Time	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
03:30 PM	0	0	6	0	0	3	0	0	1	10	0	10
03:45 PM	0	0	2	0	0	0	1	0	1	3	1	4
Total	0	0	8	0	0	3	1	0	2	13	1	14
04:00 PM	0	0	6	0	0	6	0	0	0	12	0	12
04:15 PM	0	0	9	0	0	2	1	0	1	12	1	13
04:30 PM	0	1	2	0	0	4	0	0	0	6	1	7
04:45 PM	0	0	7	0	0	4	0	0	1	12	0	12
Total	0	1	24	0	0	16	1	0	2	42	2	44
05:00 PM	0	0	3	0	0	1	1	0	1	5	1	6
05:15 PM	0	0	5	0	0	0	0	0	0	5	0	5
05:30 PM	0	0	2	0	0	4	0	0	1	7	0	7
05:45 PM	0	0	3	0	0	0	0	0	1	4	0	4
Total	0	0	13	0	0	5	1	0	3	21	1	22
06:00 PM	0	0	6	0	0	0	0	0	0	6	0	6
06:15 PM	0	1	2	0	0	3	0	0	0	5	1	6
Grand Total	0	2	53	0	0	27	3	0	7	87	5	92
Apprch %	0	100		0	0		100	0				
Total %	0	40		0	0		60	0		94.6	5.4	

	Route 1A From North			MBTA From East			Route 1A From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 03:45 PM										
03:45 PM	0	0	0	0	0	0	**1**	0	**1**	**1**
04:00 PM	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	1	0	1	1
04:30 PM	0	**1**	**1**	0	0	0	0	0	0	1
Total Volume	0	1	1	0	0	0	2	0	2	3
% App. Total	0	100		0	0		100	0		
PHF	.000	.250	.250	.000	.000	.000	.500	.000	.500	.750

Accurate Counts
978-664-2565

N/S Street : Bennington Street
E/W Street : Crescent Avenue
City/State : Revere, MA
Weather : Clear

File Name : 10271FR5
Site Code : 10271005
Start Date : 4/26/2013
Page No : 1

Groups Printed- Cars - Trucks - Buses

	Bennington St From North		Crescent Ave From East		Bennington St From South		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
03:30 PM	0	98	19	34	172	0	323
03:45 PM	0	111	17	32	161	0	321
Total	0	209	36	66	333	0	644
04:00 PM	0	68	8	36	153	0	265
04:15 PM	0	84	18	35	137	0	274
04:30 PM	0	100	16	42	148	0	306
04:45 PM	0	105	22	28	171	0	326
Total	0	357	64	141	609	0	1171
05:00 PM	0	77	9	29	160	0	275
05:15 PM	0	103	14	31	198	0	346
05:30 PM	0	101	11	42	194	0	348
05:45 PM	0	76	26	38	160	0	300
Total	0	357	60	140	712	0	1269
06:00 PM	0	91	12	38	164	0	305
06:15 PM	0	83	11	49	148	0	291
Grand Total	0	1097	183	434	1966	0	3680
Apprch %	0	100	29.7	70.3	100	0	
Total %	0	29.8	5	11.8	53.4	0	
Cars	0	1096	182	431	1959	0	3668
% Cars	0	99.9	99.5	99.3	99.6	0	99.7
Trucks	0	0	0	0	1	0	1
% Trucks	0	0	0	0	0.1	0	0
Buses	0	1	1	3	6	0	11
% Buses	0	0.1	0.5	0.7	0.3	0	0.3

	Bennington St From North			Crescent Ave From East			Bennington St From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 05:15 PM										
05:15 PM	0	**103**	**103**	14	31	45	**198**	0	**198**	346
05:30 PM	0	101	101	11	**42**	53	194	0	194	**348**
05:45 PM	0	76	76	**26**	38	**64**	160	0	160	300
06:00 PM	0	91	91	12	38	50	164	0	164	305
Total Volume	0	371	371	63	149	212	716	0	716	1299
% App. Total	0	100		29.7	70.3		100	0		
PHF	.000	.900	.900	.606	.887	.828	.904	.000	.904	.933
Cars	0	371	371	63	148	211	714	0	714	1296
% Cars	0	100	100	100	99.3	99.5	99.7	0	99.7	99.8
Trucks	0	0	0	0	0	0	0	0	0	0
% Trucks	0	0	0	0	0	0	0	0	0	0
Buses	0	0	0	0	1	1	2	0	2	3
% Buses	0	0	0	0	0.7	0.5	0.3	0	0.3	0.2

Accurate Counts
978-664-2565

N/S Street : Bennington Street
E/W Street : Crescent Avenue
City/State : Revere, MA
Weather : Clear

File Name : 10271FR5
Site Code : 10271005
Start Date : 4/26/2013
Page No : 1

Groups Printed- Trucks

	Bennington St From North		Crescent Ave From East		Bennington St From South		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
03:30 PM	0	0	0	0	1	0	1
03:45 PM	0	0	0	0	0	0	0
Total	0	0	0	0	1	0	1
04:00 PM	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
06:00 PM	0	0	0	0	0	0	0
06:15 PM	0	0	0	0	0	0	0
Grand Total	0	0	0	0	1	0	1
Apprch %	0	0	0	0	100	0	
Total %	0	0	0	0	100	0	

	Bennington St From North			Crescent Ave From East			Bennington St From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 03:30 PM										
03:30 PM	0	0	0	0	0	0	**1**	0	**1**	**1**
03:45 PM	0	0	0	0	0	0	0	0	0	0
04:00 PM	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	1	0	1	1
% App. Total	0	0		0	0		100	0		
PHF	.000	.000	.000	.000	.000	.000	.250	.000	.250	.250

Accurate Counts
978-664-2565

N/S Street : Bennington Street
E/W Street : Crescent Avenue
City/State : Revere, MA
Weather : Clear

File Name : 10271FR5
Site Code : 10271005
Start Date : 4/26/2013
Page No : 1

Groups Printed- Buses

	Bennington St From North		Crescent Ave From East		Bennington St From South		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
03:30 PM	0	0	0	0	1	0	1
03:45 PM	0	1	0	1	0	0	2
Total	0	1	0	1	1	0	3
04:00 PM	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	1	0	1
04:45 PM	0	0	1	1	1	0	3
Total	0	0	1	1	2	0	4
05:00 PM	0	0	0	0	1	0	1
05:15 PM	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	1	0	1
Total	0	0	0	0	2	0	2
06:00 PM	0	0	0	1	1	0	2
06:15 PM	0	0	0	0	0	0	0
Grand Total	0	1	1	3	6	0	11
Apprch %	0	100	25	75	100	0	
Total %	0	9.1	9.1	27.3	54.5	0	

	Bennington St From North			Crescent Ave From East			Bennington St From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:15 PM										
04:15 PM	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	**1**	0	**1**	1
04:45 PM	0	0	0	**1**	**1**	**2**	1	0	1	**3**
05:00 PM	0	0	0	0	0	0	1	0	1	1
Total Volume	0	0	0	1	1	2	3	0	3	5
% App. Total	0	0		50	50		100	0		
PHF	.000	.000	.000	.250	.250	.250	.750	.000	.750	.417

Accurate Counts
978-664-2565

N/S Street : Bennington Street
E/W Street : Crescent Avenue
City/State : Revere, MA
Weather : Clear

File Name : 10271FR5
Site Code : 10271005
Start Date : 4/26/2013
Page No : 1

Groups Printed- Bikes Peds

	Bennington St From North			Crescent Ave From East			Bennington St From South					
Start Time	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
03:30 PM	0	1	0	0	0	4	0	0	4	8	1	9
03:45 PM	0	1	0	0	0	5	0	0	1	6	1	7
Total	0	2	0	0	0	9	0	0	5	14	2	16
04:00 PM	0	0	1	0	0	16	0	0	0	17	0	17
04:15 PM	0	1	0	0	0	2	0	0	1	3	1	4
04:30 PM	0	0	0	0	0	3	0	0	1	4	0	4
04:45 PM	0	0	0	0	0	8	0	0	0	8	0	8
Total	0	1	1	0	0	29	0	0	2	32	1	33
05:00 PM	0	0	0	0	0	1	0	0	0	1	0	1
05:15 PM	0	0	0	0	0	4	3	0	0	4	3	7
05:30 PM	0	1	0	0	0	4	2	0	0	4	3	7
05:45 PM	0	1	0	0	0	6	2	0	0	6	3	9
Total	0	2	0	0	0	15	7	0	0	15	9	24
06:00 PM	0	0	0	0	0	7	1	0	1	8	1	9
06:15 PM	0	3	0	2	0	4	0	0	0	4	5	9
Grand Total	0	8	1	2	0	64	8	0	8	73	18	91
Apprch %	0	100		100	0		100	0				
Total %	0	44.4		11.1	0		44.4	0		80.2	19.8	

	Bennington St From North			Crescent Ave From East			Bennington St From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 05:30 PM										
05:30 PM	0	1	1	0	0	0	**2**	0	**2**	3
05:45 PM	0	1	1	0	0	0	2	0	2	3
06:00 PM	0	0	0	0	0	0	1	0	1	1
06:15 PM	0	**3**	**3**	**2**	0	**2**	0	0	0	**5**
Total Volume	0	5	5	2	0	2	5	0	5	12
% App. Total	0	100		100	0		100	0		
PHF	.000	.417	.417	.250	.000	.250	.625	.000	.625	.600

Accurate Counts
978-664-2565

N/S Street : Route 1A
E/W Street : Curtis Road / Rte 1A Ramp
City/State : Revere, MA
Weather : Clear

File Name : 10271FR6
Site Code : 10271006
Start Date : 4/26/2013
Page No : 1

Groups Printed- Cars - Trucks - Buses

	Route 1A From North			Route 1A From South			Off Ramp From Southwest			Curtis St From West			
Start Time	Thru	BrRt	Right	HdLt	Left	Thru	HdLt	BrLt	HdRt	Left	Right	HdRt	Int. Total
03:30 PM	375	47	37	0	0	0	0	0	0	0	69	43	571
03:45 PM	361	67	35	0	0	0	0	0	0	0	53	45	561
Total	736	114	72	0	0	0	0	0	0	0	122	88	1132
04:00 PM	340	68	30	0	0	0	0	0	0	0	73	34	545
04:15 PM	375	70	27	0	0	0	0	0	0	0	59	34	565
04:30 PM	354	50	29	0	0	0	0	0	0	0	66	35	534
04:45 PM	328	73	38	0	0	0	0	0	0	0	58	47	544
Total	1397	261	124	0	0	0	0	0	0	0	256	150	2188
05:00 PM	283	73	39	0	0	0	0	0	0	0	61	40	496
05:15 PM	339	58	20	0	0	0	0	0	0	0	53	42	512
05:30 PM	308	69	25	0	0	0	0	0	0	0	27	39	468
05:45 PM	343	78	32	0	0	0	0	0	0	0	51	52	556
Total	1273	278	116	0	0	0	0	0	0	0	192	173	2032
06:00 PM	278	50	34	0	0	0	0	0	0	0	53	34	449
06:15 PM	293	57	31	0	0	0	0	0	0	0	44	31	456
Grand Total	3977	760	377	0	0	0	0	0	0	0	667	476	6257
Apprch %	77.8	14.9	7.4	0	0	0	0	0	0	0	58.4	41.6	
Total %	63.6	12.1	6	0	0	0	0	0	0	0	10.7	7.6	
Cars	3820	751	348	0	0	0	0	0	0	0	606	436	5961
% Cars	96.1	98.8	92.3	0	0	0	0	0	0	0	90.9	91.6	95.3
Trucks	80	3	26	0	0	0	0	0	0	0	36	27	172
% Trucks	2	0.4	6.9	0	0	0	0	0	0	0	5.4	5.7	2.7
Buses	77	6	3	0	0	0	0	0	0	0	25	13	124
% Buses	1.9	0.8	0.8	0	0	0	0	0	0	0	3.7	2.7	2

	Route 1A From North				Route 1A From South				Off Ramp From Southwest				Curtis St From West				
Start Time	Thru	BrRt	Right	App. Total	HdLt	Left	Thru	App. Total	HdLt	BrLt	HdRt	App. Total	Left	Right	HdRt	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:30 PM																	
03:30 PM	**375**	47	**37**	459	0	0	0	0	0	0	0	0	0	69	43	**112**	**571**
03:45 PM	361	67	35	463	0	0	0	0	0	0	0	0	0	53	**45**	98	561
04:00 PM	340	68	30	438	0	0	0	0	0	0	0	0	0	**73**	34	107	545
04:15 PM	375	**70**	27	**472**	0	0	0	0	0	0	0	0	0	59	34	93	565
Total Volume	1451	252	129	1832	0	0	0	0	0	0	0	0	0	254	156	410	2242
% App. Total	79.2	13.8	7		0	0	0		0	0	0		0	62	38		
PHF	.967	.900	.872	.970	.000	.000	.000	.000	.000	.000	.000	.000	.000	.870	.867	.915	.982
Cars	1388	250	118	1756	0	0	0	0	0	0	0	0	0	235	132	367	2123
% Cars	95.7	99.2	91.5	95.9	0	0	0	0	0	0	0	0	0	92.5	84.6	89.5	94.7
Trucks	35	0	9	44	0	0	0	0	0	0	0	0	0	15	15	30	74
% Trucks	2.4	0	7.0	2.4	0	0	0	0	0	0	0	0	0	5.9	9.6	7.3	3.3
Buses	28	2	2	32	0	0	0	0	0	0	0	0	0	4	9	13	45
% Buses	1.9	0.8	1.6	1.7	0	0	0	0	0	0	0	0	0	1.6	5.8	3.2	2.0

Accurate Counts
978-664-2565

N/S Street : Route 1A
E/W Street : Curtis Road / Rte 1A Ramp
City/State : Revere, MA
Weather : Clear

File Name : 10271FR6
Site Code : 10271006
Start Date : 4/26/2013
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Groups Printed- Trucks

	Route 1A From North			Route 1A From South			Off Ramp From Southwest			Curtis St From West			
Start Time	Thru	BrRt	Right	HdLt	Left	Thru	HdLt	BrLt	HdRt	Left	Right	HdRt	Int. Total
03:30 PM	8	0	1	0	0	0	0	0	0	0	3	5	17
03:45 PM	8	0	3	0	0	0	0	0	0	0	3	2	16
Total	16	0	4	0	0	0	0	0	0	0	6	7	33
04:00 PM	6	0	2	0	0	0	0	0	0	0	5	2	15
04:15 PM	13	0	3	0	0	0	0	0	0	0	4	6	26
04:30 PM	3	0	2	0	0	0	0	0	0	0	4	3	12
04:45 PM	6	1	4	0	0	0	0	0	0	0	5	0	16
Total	28	1	11	0	0	0	0	0	0	0	18	11	69
05:00 PM	6	0	3	0	0	0	0	0	0	0	1	2	12
05:15 PM	8	1	2	0	0	0	0	0	0	0	2	1	14
05:30 PM	9	0	2	0	0	0	0	0	0	0	1	1	13
05:45 PM	2	1	0	0	0	0	0	0	0	0	1	1	5
Total	25	2	7	0	0	0	0	0	0	0	5	5	44
06:00 PM	7	0	1	0	0	0	0	0	0	0	3	1	12
06:15 PM	4	0	3	0	0	0	0	0	0	0	4	3	14
Grand Total	80	3	26	0	0	0	0	0	0	0	36	27	172
Apprch %	73.4	2.8	23.9	0	0	0	0	0	0	0	57.1	42.9	
Total %	46.5	1.7	15.1	0	0	0	0	0	0	0	20.9	15.7	

	Route 1A From North				Route 1A From South				Off Ramp From Southwest				Curtis St From West				
Start Time	Thru	BrRt	Right	App. Total	HdLt	Left	Thru	App. Total	HdLt	BrLt	HdRt	App. Total	Left	Right	HdRt	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:30 PM																	
03:30 PM	8	0	1	9	0	0	0	0	0	0	0	0	0	3	5	8	17
03:45 PM	8	0	**3**	11	0	0	0	0	0	0	0	0	0	3	2	5	16
04:00 PM	6	0	2	8	0	0	0	0	0	0	0	0	0	**5**	2	7	15
04:15 PM	**13**	0	3	**16**	0	0	0	0	0	0	0	0	0	4	**6**	**10**	**26**
Total Volume	35	0	9	44	0	0	0	0	0	0	0	0	0	15	15	30	74
% App. Total	79.5	0	20.5		0	0	0		0	0	0		0	50	50		
PHF	.673	.000	.750	.688	.000	.000	.000	.000	.000	.000	.000	.000	.000	.750	.625	.750	.712

Accurate Counts
978-664-2565

N/S Street : Route 1A
E/W Street : Curtis Road / Rte 1A Ramp
City/State : Revere, MA
Weather : Clear

File Name : 10271FR6
Site Code : 10271006
Start Date : 4/26/2013
Page No : 1

Groups Printed- Buses

	Route 1A From North			Route 1A From South			Off Ramp From Southwest			Curtis St From West			
Start Time	Thru	BrRt	Right	HdLt	Left	Thru	HdLt	BrLt	HdRt	Left	Right	HdRt	Int. Total
03:30 PM	5	0	1	0	0	0	0	0	0	0	2	2	10
03:45 PM	6	2	1	0	0	0	0	0	0	0	1	2	12
Total	11	2	2	0	0	0	0	0	0	0	3	4	22
04:00 PM	10	0	0	0	0	0	0	0	0	0	0	3	13
04:15 PM	7	0	0	0	0	0	0	0	0	0	1	2	10
04:30 PM	7	1	0	0	0	0	0	0	0	0	4	2	14
04:45 PM	9	1	0	0	0	0	0	0	0	0	3	1	14
Total	33	2	0	0	0	0	0	0	0	0	8	8	51
05:00 PM	6	0	0	0	0	0	0	0	0	0	3	0	9
05:15 PM	6	0	1	0	0	0	0	0	0	0	3	0	10
05:30 PM	7	1	0	0	0	0	0	0	0	0	1	0	9
05:45 PM	9	1	0	0	0	0	0	0	0	0	3	1	14
Total	28	2	1	0	0	0	0	0	0	0	10	1	42
06:00 PM	5	0	0	0	0	0	0	0	0	0	2	0	7
06:15 PM	0	0	0	0	0	0	0	0	0	0	2	0	2
Grand Total	77	6	3	0	0	0	0	0	0	0	25	13	124
Apprch %	89.5	7	3.5	0	0	0	0	0	0	0	65.8	34.2	
Total %	62.1	4.8	2.4	0	0	0	0	0	0	0	20.2	10.5	

	Route 1A From North				Route 1A From South				Off Ramp From Southwest				Curtis St From West				
Start Time	Thru	BrRt	Right	App. Total	HdLt	Left	Thru	App. Total	HdLt	BrLt	HdRt	App. Total	Left	Right	HdRt	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	**10**	0	0	**10**	0	0	0	0	0	0	0	0	0	0	**3**	3	13
04:15 PM	7	0	0	7	0	0	0	0	0	0	0	0	0	1	2	3	10
04:30 PM	7	**1**	0	8	0	0	0	0	0	0	0	0	0	**4**	2	**6**	**14**
04:45 PM	9	1	0	10	0	0	0	0	0	0	0	0	0	3	1	4	14
Total Volume	33	2	0	35	0	0	0	0	0	0	0	0	0	8	8	16	51
% App. Total	94.3	5.7	0		0	0	0		0	0	0		0	50	50		
PHF	.825	.500	.000	.875	.000	.000	.000	.000	.000	.000	.000	.000	.000	.500	.667	.667	.911

Accurate Counts
978-664-2565

N/S Street : Route 1A
E/W Street : Curtis Road / Rte 1A Ramp
City/State : Revere, MA
Weather : Clear

File Name : 10271FR6
Site Code : 10271006
Start Date : 4/26/2013
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Groups Printed- Bikes Peds

	Route 1A From North				Route 1A From South				Off Ramp From Southwest				Curtis St From West						
Start Time	Thru	BrRt	Right	Peds	HdLt	Left	Thru	Peds	HdLt	BrLt	HdRt	Peds	Left	Right	HdRt	Peds	Exclu. Total	Inclu. Total	Int. Total
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Apprch %	0	0	0		0	0	0		0	0	0		0	100	0				
Total %	0	0	0		0	0	0		0	0	0		0	100	0		0	100	

	Route 1A From North				Route 1A From South				Off Ramp From Southwest				Curtis St From West				
Start Time	Thru	BrRt	Right	App. Total	HdLt	Left	Thru	App. Total	HdLt	BrLt	HdRt	App. Total	Left	Right	HdRt	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:30 PM																	
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	**1**	**1**
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
% App. Total	0	0	0		0	0	0		0	0	0		0	100	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.000	.250	.250

Accurate Counts
978-664-2565

N/S Street : Saratoga Street
E/W Street: Neptune Road
City/State : East Boston, MA
Weather : Clear

File Name : 10271FR7
Site Code : 10271007
Start Date : 4/26/2013
Page No : 1

Groups Printed- Cars - Trucks - Buses

	Saratoga St From North			Neptune Rd From East			Saratoga St From South			Neptune Rd From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
03:30 PM	5	0	66	0	80	1	1	52	15	36	32	0	288
03:45 PM	3	0	96	0	78	2	2	37	10	51	33	0	312
Total	8	0	162	0	158	3	3	89	25	87	65	0	600
04:00 PM	1	0	74	0	79	4	1	48	12	56	12	0	287
04:15 PM	1	0	95	0	88	4	3	45	13	45	33	0	327
04:30 PM	3	0	76	0	98	1	0	35	12	31	34	0	290
04:45 PM	0	0	70	0	75	2	0	44	15	48	33	0	287
Total	5	0	315	0	340	11	4	172	52	180	112	0	1191
05:00 PM	3	0	93	0	88	5	2	60	17	43	34	0	345
05:15 PM	7	0	128	0	103	4	1	35	15	40	31	0	364
05:30 PM	2	0	93	0	87	1	1	45	12	33	25	0	299
05:45 PM	2	0	105	0	78	3	5	46	23	46	45	0	353
Total	14	0	419	0	356	13	9	186	67	162	135	0	1361
06:00 PM	3	0	102	0	119	1	5	51	29	35	32	0	377
06:15 PM	0	0	81	0	91	2	2	26	11	52	21	0	286
Grand Total	30	0	1079	0	1064	30	23	524	184	516	365	0	3815
Apprch %	2.7	0	97.3	0	97.3	2.7	3.1	71.7	25.2	58.6	41.4	0	
Total %	0.8	0	28.3	0	27.9	0.8	0.6	13.7	4.8	13.5	9.6	0	
Cars	30	0	1067	0	1040	30	23	520	181	504	346	0	3741
% Cars	100	0	98.9	0	97.7	100	100	99.2	98.4	97.7	94.8	0	98.1
Trucks	0	0	6	0	22	0	0	2	2	7	10	0	49
% Trucks	0	0	0.6	0	2.1	0	0	0.4	1.1	1.4	2.7	0	1.3
Buses	0	0	6	0	2	0	0	2	1	5	9	0	25
% Buses	0	0	0.6	0	0.2	0	0	0.4	0.5	1	2.5	0	0.7

	Saratoga St From North				Neptune Rd From East				Saratoga St From South				Neptune Rd From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:15 PM																	
05:15 PM	**7**	0	**128**	**135**	0	103	**4**	107	1	35	15	51	40	31	0	71	364
05:30 PM	2	0	93	95	0	87	1	88	1	45	12	58	33	25	0	58	299
05:45 PM	2	0	105	107	0	78	3	81	**5**	46	23	74	**46**	**45**	0	**91**	353
06:00 PM	3	0	102	105	0	**119**	1	**120**	5	**51**	**29**	**85**	35	32	0	67	**377**
Total Volume	14	0	428	442	0	387	9	396	12	177	79	268	154	133	0	287	1393
% App. Total	3.2	0	96.8		0	97.7	2.3		4.5	66	29.5		53.7	46.3	0		
PHF	.500	.000	.836	.819	.000	.813	.563	.825	.600	.868	.681	.788	.837	.739	.000	.788	.924
Cars	14	0	425	439	0	381	9	390	12	176	79	267	151	125	0	276	1372
% Cars	100	0	99.3	99.3	0	98.4	100	98.5	100	99.4	100	99.6	98.1	94.0	0	96.2	98.5
Trucks	0	0	1	1	0	6	0	6	0	1	0	1	2	6	0	8	16
% Trucks	0	0	0.2	0.2	0	1.6	0	1.5	0	0.6	0	0.4	1.3	4.5	0	2.8	1.1
Buses	0	0	2	2	0	0	0	0	0	0	0	0	1	2	0	3	5
% Buses	0	0	0.5	0.5	0	0	0	0	0	0	0	0	0.6	1.5	0	1.0	0.4

Accurate Counts
978-664-2565

N/S Street : Saratoga Street
E/W Street: Neptune Road
City/State : East Boston, MA
Weather : Clear

File Name : 10271FR7
Site Code : 10271007
Start Date : 4/26/2013
Page No : 1

Groups Printed- Trucks

	Saratoga St From North			Neptune Rd From East			Saratoga St From South			Neptune Rd From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
03:30 PM	0	0	0	0	2	0	0	0	1	1	1	0	5
03:45 PM	0	0	0	0	3	0	0	0	0	1	0	0	4
Total	0	0	0	0	5	0	0	0	1	2	1	0	9
04:00 PM	0	0	1	0	2	0	0	1	0	0	1	0	5
04:15 PM	0	0	1	0	1	0	0	0	0	1	0	0	3
04:30 PM	0	0	1	0	1	0	0	0	0	0	1	0	3
04:45 PM	0	0	2	0	2	0	0	0	0	0	1	0	5
Total	0	0	5	0	6	0	0	1	0	1	3	0	16
05:00 PM	0	0	0	0	3	0	0	0	0	0	0	0	3
05:15 PM	0	0	1	0	3	0	0	0	0	2	4	0	10
05:30 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
05:45 PM	0	0	0	0	2	0	0	0	0	0	1	0	3
Total	0	0	1	0	8	0	0	0	0	2	6	0	17
06:00 PM	0	0	0	0	1	0	0	1	0	0	0	0	2
06:15 PM	0	0	0	0	2	0	0	0	1	2	0	0	5
Grand Total	0	0	6	0	22	0	0	2	2	7	10	0	49
Apprch %	0	0	100	0	100	0	0	50	50	41.2	58.8	0	
Total %	0	0	12.2	0	44.9	0	0	4.1	4.1	14.3	20.4	0	

	Saratoga St From North				Neptune Rd From East				Saratoga St From South				Neptune Rd From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	0	0	1	1	0	1	0	1	0	0	0	0	0	1	0	1	3
04:45 PM	0	0	**2**	**2**	0	2	0	2	0	0	0	0	0	1	0	1	5
05:00 PM	0	0	0	0	0	**3**	0	**3**	0	0	0	0	0	0	0	0	3
05:15 PM	0	0	1	1	0	3	0	3	0	0	0	0	**2**	**4**	0	**6**	**10**
Total Volume	0	0	4	4	0	9	0	9	0	0	0	0	2	6	0	8	21
% App. Total	0	0	100		0	100	0		0	0	0		25	75	0		
PHF	.000	.000	.500	.500	.000	.750	.000	.750	.000	.000	.000	.000	.250	.375	.000	.333	.525

Accurate Counts
978-664-2565

N/S Street : Saratoga Street
E/W Street: Neptune Road
City/State : East Boston, MA
Weather : Clear

File Name : 10271FR7
Site Code : 10271007
Start Date : 4/26/2013
Page No : 1

Groups Printed- Buses

	Saratoga St From North			Neptune Rd From East			Saratoga St From South			Neptune Rd From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
03:30 PM	0	0	2	0	0	0	0	1	1	0	0	0	4
03:45 PM	0	0	1	0	0	0	0	0	0	3	3	0	7
Total	0	0	3	0	0	0	0	1	1	3	3	0	11
04:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	1
04:15 PM	0	0	1	0	0	0	0	0	0	0	0	0	1
04:30 PM	0	0	0	0	1	0	0	1	0	0	1	0	3
04:45 PM	0	0	0	0	1	0	0	0	0	0	1	0	2
Total	0	0	1	0	2	0	0	1	0	1	2	0	7
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	1	0	0	0	0	0	0	0	1	0	2
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
Total	0	0	1	0	0	0	0	0	0	0	2	0	3
06:00 PM	0	0	1	0	0	0	0	0	0	1	0	0	2
06:15 PM	0	0	0	0	0	0	0	0	0	0	2	0	2
Grand Total	0	0	6	0	2	0	0	2	1	5	9	0	25
Apprch %	0	0	100	0	100	0	0	66.7	33.3	35.7	64.3	0	
Total %	0	0	24	0	8	0	0	8	4	20	36	0	

	Saratoga St From North				Neptune Rd From East				Saratoga St From South				Neptune Rd From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:30 PM																	
03:30 PM	0	0	**2**	**2**	0	0	0	0	0	**1**	**1**	**2**	0	0	0	0	4
03:45 PM	0	0	1	1	0	0	0	0	0	0	0	0	**3**	**3**	0	**6**	**7**
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
04:15 PM	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Total Volume	0	0	4	4	0	0	0	0	0	1	1	2	4	3	0	7	13
% App. Total	0	0	100		0	0	0		0	50	50		57.1	42.9	0		
PHF	.000	.000	.500	.500	.000	.000	.000	.000	.000	.250	.250	.250	.333	.250	.000	.292	.464

Accurate Counts
978-664-2565

N/S Street : Saratoga Street
E/W Street: Neptune Road
City/State : East Boston, MA
Weather : Clear

File Name : 10271FR7
Site Code : 10271007
Start Date : 4/26/2013
Page No : 1

Groups Printed- Bikes Peds

	Saratoga St From North				Neptune Rd From East				Saratoga St From South				Neptune Rd From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
03:30 PM	0	0	0	6	0	0	0	5	0	0	0	1	0	0	0	0	12	0	12
03:45 PM	0	0	0	1	0	0	0	16	0	0	0	3	0	0	0	0	20	0	20
Total	0	0	0	7	0	0	0	21	0	0	0	4	0	0	0	0	32	0	32
04:00 PM	0	0	0	7	0	0	0	14	0	1	0	3	0	0	0	0	24	1	25
04:15 PM	0	0	0	6	0	0	0	16	0	0	0	3	0	0	0	0	25	0	25
04:30 PM	0	0	0	1	0	0	1	23	0	1	0	3	1	0	0	0	27	3	30
04:45 PM	0	1	0	5	0	0	0	8	0	0	0	2	0	0	0	0	15	1	16
Total	0	1	0	19	0	0	1	61	0	2	0	11	1	0	0	0	91	5	96
05:00 PM	0	0	0	4	0	0	0	11	0	0	0	3	0	0	0	0	18	0	18
05:15 PM	0	0	0	3	0	0	0	17	0	0	0	2	0	0	0	0	22	0	22
05:30 PM	0	0	0	0	0	0	0	17	0	0	0	4	0	0	0	0	21	0	21
05:45 PM	0	0	1	7	0	0	0	10	0	0	0	2	0	2	0	0	19	3	22
Total	0	0	1	14	0	0	0	55	0	0	0	11	0	2	0	0	80	3	83
06:00 PM	0	0	0	1	0	0	0	22	0	0	0	1	0	1	0	0	24	1	25
06:15 PM	0	0	0	1	0	0	0	18	0	0	0	1	0	0	0	0	20	0	20
Grand Total	0	1	1	42	0	0	1	177	0	2	0	28	1	3	0	0	247	9	256
Apprch %	0	50	50		0	0	100		0	100	0		25	75	0				
Total %	0	11.1	11.1		0	0	11.1		0	22.2	0		11.1	33.3	0		96.5	3.5	

	Saratoga St From North				Neptune Rd From East				Saratoga St From South				Neptune Rd From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	0	0	0	0	0	0	0	0	**1**	0	**1**	0	0	0	0	1
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	**1**	**1**	0	1	0	1	**1**	0	0	**1**	**3**
04:45 PM	0	**1**	0	**1**	0	0	0	0	0	0	0	0	0	0	0	0	1
Total Volume	0	1	0	1	0	0	1	1	0	2	0	2	1	0	0	1	5
% App. Total	0	100	0		0	0	100		0	100	0		100	0	0		
PHF	.000	.250	.000	.250	.000	.000	.250	.250	.000	.500	.000	.500	.250	.000	.000	.250	.417

Accurate Counts
978-664-2565

N/S Street : Bremen Street
E/W Street : Neptune Road
City/State : Revere, MA
Weather : Clear

File Name : 10271FR8
Site Code : 10271008
Start Date : 4/26/2013
Page No : 1

Groups Printed- Cars - Trucks - Buses

	Bremen St From North			Neptune Rd From East			Bremen St From South			Neptune Rd From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
03:30 PM	4	10	2	4	80	2	0	0	0	0	46	7	155
03:45 PM	4	16	2	1	75	2	0	0	0	1	37	6	144
Total	8	26	4	5	155	4	0	0	0	1	83	13	299
04:00 PM	5	19	1	2	83	4	0	0	0	1	21	4	140
04:15 PM	6	18	1	2	88	3	0	0	0	1	41	5	165
04:30 PM	3	18	2	0	98	4	0	0	0	0	45	4	174
04:45 PM	5	18	4	0	69	7	0	0	0	1	39	8	151
Total	19	73	8	4	338	18	0	0	0	3	146	21	630
05:00 PM	3	19	1	0	97	7	0	0	0	1	44	8	180
05:15 PM	3	20	3	1	100	5	0	0	0	2	40	10	184
05:30 PM	6	14	2	3	89	8	0	0	0	1	28	8	159
05:45 PM	4	27	0	3	84	6	0	0	0	1	53	18	196
Total	16	80	6	7	370	26	0	0	0	5	165	44	719
06:00 PM	5	19	1	1	115	2	0	0	0	1	50	13	207
06:15 PM	1	12	3	2	92	2	0	0	0	0	23	9	144
Grand Total	49	210	22	19	1070	52	0	0	0	10	467	100	1999
Apprch %	17.4	74.7	7.8	1.7	93.8	4.6	0	0	0	1.7	80.9	17.3	
Total %	2.5	10.5	1.1	1	53.5	2.6	0	0	0	0.5	23.4	5	
Cars	49	210	22	19	1046	52	0	0	0	10	445	100	1953
% Cars	100	100	100	100	97.8	100	0	0	0	100	95.3	100	97.7
Trucks	0	0	0	0	22	0	0	0	0	0	12	0	34
% Trucks	0	0	0	0	2.1	0	0	0	0	0	2.6	0	1.7
Buses	0	0	0	0	2	0	0	0	0	0	10	0	12
% Buses	0	0	0	0	0.2	0	0	0	0	0	2.1	0	0.6

	Bremen St From North				Neptune Rd From East				Bremen St From South				Neptune Rd From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:15 PM																	
05:15 PM	3	20	**3**	26	1	100	5	106	0	0	0	0	**2**	40	10	52	184
05:30 PM	**6**	14	2	22	**3**	89	**8**	100	0	0	0	0	1	28	8	37	159
05:45 PM	4	**27**	0	**31**	3	84	6	93	0	0	0	0	1	**53**	**18**	**72**	196
06:00 PM	5	19	1	25	1	**115**	2	**118**	0	0	0	0	1	50	13	64	**207**
Total Volume	18	80	6	104	8	388	21	417	0	0	0	0	5	171	49	225	746
% App. Total	17.3	76.9	5.8		1.9	93	5		0	0	0		2.2	76	21.8		
PHF	.750	.741	.500	.839	.667	.843	.656	.883	.000	.000	.000	.000	.625	.807	.681	.781	.901
Cars	18	80	6	104	8	382	21	411	0	0	0	0	5	163	49	217	732
% Cars	100	100	100	100	100	98.5	100	98.6	0	0	0	0	100	95.3	100	96.4	98.1
Trucks	0	0	0	0	0	6	0	6	0	0	0	0	0	6	0	6	12
% Trucks	0	0	0	0	0	1.5	0	1.4	0	0	0	0	0	3.5	0	2.7	1.6
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	1.2	0	0.9	0.3

Accurate Counts
978-664-2565

N/S Street : Bremen Street
E/W Street : Neptune Road
City/State : Revere, MA
Weather : Clear

File Name : 10271FR8
Site Code : 10271008
Start Date : 4/26/2013
Page No : 1

Groups Printed- Trucks

	Bremen St From North			Neptune Rd From East			Bremen St From South			Neptune Rd From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
03:30 PM	0	0	0	0	2	0	0	0	0	0	2	0	4
03:45 PM	0	0	0	0	3	0	0	0	0	0	0	0	3
Total	0	0	0	0	5	0	0	0	0	0	2	0	7
04:00 PM	0	0	0	0	2	0	0	0	0	0	1	0	3
04:15 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
04:30 PM	0	0	0	0	1	0	0	0	0	0	1	0	2
04:45 PM	0	0	0	0	2	0	0	0	0	0	1	0	3
Total	0	0	0	0	6	0	0	0	0	0	3	0	9
05:00 PM	0	0	0	0	3	0	0	0	0	0	0	0	3
05:15 PM	0	0	0	0	3	0	0	0	0	0	3	0	6
05:30 PM	0	0	0	0	0	0	0	0	0	0	2	0	2
05:45 PM	0	0	0	0	2	0	0	0	0	0	1	0	3
Total	0	0	0	0	8	0	0	0	0	0	6	0	14
06:00 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
06:15 PM	0	0	0	0	2	0	0	0	0	0	1	0	3
Grand Total	0	0	0	0	22	0	0	0	0	0	12	0	34
Apprch %	0	0	0	0	100	0	0	0	0	0	100	0	
Total %	0	0	0	0	64.7	0	0	0	0	0	35.3	0	

	Bremen St From North				Neptune Rd From East				Bremen St From South				Neptune Rd From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	1	2
04:45 PM	0	0	0	0	0	2	0	2	0	0	0	0	0	1	0	1	3
05:00 PM	0	0	0	0	0	**3**	0	**3**	0	0	0	0	0	0	0	0	3
05:15 PM	0	0	0	0	0	3	0	3	0	0	0	0	0	**3**	0	**3**	**6**
Total Volume	0	0	0	0	0	9	0	9	0	0	0	0	0	5	0	5	14
% App. Total	0	0	0		0	100	0		0	0	0		0	100	0		
PHF	.000	.000	.000	.000	.000	.750	.000	.750	.000	.000	.000	.000	.000	.417	.000	.417	.583

Accurate Counts
978-664-2565

N/S Street : Bremen Street
E/W Street : Neptune Road
City/State : Revere, MA
Weather : Clear

File Name : 10271FR8
Site Code : 10271008
Start Date : 4/26/2013
Page No : 1

Groups Printed- Buses

	Bremen St From North			Neptune Rd From East			Bremen St From South			Neptune Rd From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
03:30 PM	0	0	0	0	0	0	0	0	0	0	2	0	2
03:45 PM	0	0	0	0	0	0	0	0	0	0	2	0	2
Total	0	0	0	0	0	0	0	0	0	0	4	0	4
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	1	0	0	0	0	0	1	0	2
04:45 PM	0	0	0	0	1	0	0	0	0	0	1	0	2
Total	0	0	0	0	2	0	0	0	0	0	2	0	4
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
Total	0	0	0	0	0	0	0	0	0	0	2	0	2
06:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
06:15 PM	0	0	0	0	0	0	0	0	0	0	2	0	2
Grand Total	0	0	0	0	2	0	0	0	0	0	10	0	12
Apprch %	0	0	0	0	100	0	0	0	0	0	100	0	
Total %	0	0	0	0	16.7	0	0	0	0	0	83.3	0	

	Bremen St From North				Neptune Rd From East				Bremen St From South				Neptune Rd From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	0	0	0	0	0	**1**	0	**1**	0	0	0	0	0	**1**	0	**1**	**2**
04:45 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	1	2
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Total Volume	0	0	0	0	0	2	0	2	0	0	0	0	0	3	0	3	5
% App. Total	0	0	0		0	100	0		0	0	0		0	100	0		
PHF	.000	.000	.000	.000	.000	.500	.000	.500	.000	.000	.000	.000	.000	.750	.000	.750	.625

Accurate Counts
978-664-2565

N/S Street : Bremen Street
E/W Street : Neptune Road
City/State : Revere, MA
Weather : Clear

File Name : 10271FR8
Site Code : 10271008
Start Date : 4/26/2013
Page No : 1

Groups Printed- Bikes Peds

	Bremen St From North				Neptune Rd From East				Bremen St From South				Neptune Rd From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
03:30 PM	0	0	0	11	0	0	0	1	0	0	0	1	0	0	0	6	19	0	19
03:45 PM	0	0	0	7	0	0	0	2	0	0	0	1	0	0	0	2	12	0	12
Total	0	0	0	18	0	0	0	3	0	0	0	2	0	0	0	8	31	0	31
04:00 PM	0	0	0	13	0	0	0	0	0	0	0	1	0	0	0	6	20	0	20
04:15 PM	0	0	0	11	0	0	0	0	0	1	0	1	0	0	0	2	14	1	15
04:30 PM	0	0	0	14	0	0	0	4	0	0	0	0	0	0	0	12	30	0	30
04:45 PM	0	0	0	11	0	0	0	0	0	0	0	8	0	0	0	8	27	0	27
Total	0	0	0	49	0	0	0	4	0	1	0	10	0	0	0	28	91	1	92
05:00 PM	0	0	0	17	0	0	0	0	0	0	0	1	0	0	0	8	26	0	26
05:15 PM	0	0	0	12	0	0	0	1	0	0	0	0	0	0	0	8	21	0	21
05:30 PM	0	0	0	7	0	0	0	2	0	0	0	0	0	0	0	6	15	0	15
05:45 PM	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	5	6	1	7
Total	0	0	0	36	0	1	0	3	0	0	0	2	0	0	0	27	68	1	69
06:00 PM	0	0	0	9	0	0	0	0	0	0	0	2	0	1	0	5	16	1	17
06:15 PM	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	5	10	0	10
Grand Total	0	0	0	117	0	1	0	10	0	1	0	16	0	1	0	73	216	3	219
Apprch %	0	0	0		0	100	0		0	100	0		0	100	0				
Total %	0	0	0		0	33.3	0		0	33.3	0		0	33.3	0		98.6	1.4	

	Bremen St From North				Neptune Rd From East				Bremen St From South				Neptune Rd From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:15 PM																	
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	**1**	0	**1**	0	0	0	0	0	0	0	0	**1**
06:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	**1**	1
Total Volume	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	1	2
% App. Total	0	0	0		0	100	0		0	0	0		0	100	0		
PHF	.000	.000	.000	.000	.000	.250	.000	.250	.000	.000	.000	.000	.000	.250	.000	.250	.500

Accurate Counts
978-664-2565

N/S Street : Sigourney Street
E/W Street: Route 60 (Squire Road)
City/State : Revere, MA
Weather : Clear

File Name : 10271SA1
Site Code : 10271001
Start Date : 4/27/2013
Page No : 1

Groups Printed- Cars - Trucks - Buses

	Sigourney St From North				Squire Rd From East				Sigourney St From South				Squire Rd From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
02:30 PM	59	0	59	0	0	362	36	0	23	9	6	0	55	317	0	3	929
02:45 PM	59	0	40	0	0	333	46	7	18	13	9	0	54	340	0	0	919
Total	118	0	99	0	0	695	82	7	41	22	15	0	109	657	0	3	1848
03:00 PM	49	0	46	0	0	338	32	2	22	7	6	0	64	478	0	0	1044
03:15 PM	39	0	52	0	0	268	31	4	14	14	7	0	70	447	0	0	946
03:30 PM	51	0	50	0	0	306	32	6	28	19	5	0	51	344	0	0	892
03:45 PM	44	0	45	0	0	318	28	1	20	14	9	0	77	340	0	0	896
Total	183	0	193	0	0	1230	123	13	84	54	27	0	262	1609	0	0	3778
04:00 PM	56	0	50	0	0	364	32	3	22	11	2	0	61	328	0	0	929
04:15 PM	42	0	56	0	0	351	32	4	24	13	2	0	70	338	0	0	932
04:30 PM	59	0	56	0	0	397	35	0	25	14	9	0	70	331	0	0	996
04:45 PM	55	0	44	0	0	338	38	7	21	12	8	0	76	325	0	2	926
Total	212	0	206	0	0	1450	137	14	92	50	21	0	277	1322	0	2	3783
05:00 PM	62	0	37	0	0	422	42	0	29	12	10	0	56	324	0	0	994
05:15 PM	45	0	46	0	0	415	30	4	22	11	7	0	69	341	0	2	992
Grand Total	620	0	581	0	0	4212	414	38	268	149	80	0	773	4253	0	7	11395
Apprch %	51.6	0	48.4	0	0	90.3	8.9	0.8	53.9	30	16.1	0	15.4	84.5	0	0.1	
Total %	5.4	0	5.1	0	0	37	3.6	0.3	2.4	1.3	0.7	0	6.8	37.3	0	0.1	
Cars	619	0	570	0	0	4145	413	38	267	148	80	0	773	4176	0	7	11236
% Cars	99.8	0	98.1	0	0	98.4	99.8	100	99.6	99.3	100	0	100	98.2	0	100	98.6
Trucks	1	0	0	0	0	48	0	0	0	1	0	0	0	54	0	0	104
% Trucks	0.2	0	0	0	0	1.1	0	0	0	0.7	0	0	0	1.3	0	0	0.9
Buses	0	0	11	0	0	19	1	0	1	0	0	0	0	23	0	0	55
% Buses	0	0	1.9	0	0	0.5	0.2	0	0.4	0	0	0	0	0.5	0	0	0.5

	Sigourney St From North					Squire Rd From East					Sigourney St From South					Squire Rd From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	59	0	**56**	0	**115**	0	397	35	0	432	25	**14**	9	0	48	70	331	0	0	401	**996**
04:45 PM	55	0	44	0	99	0	338	38	**7**	383	21	12	8	0	41	**76**	325	0	**2**	403	926
05:00 PM	**62**	0	37	0	99	0	**422**	**42**	0	**464**	**29**	12	**10**	0	**51**	56	324	0	0	380	994
05:15 PM	45	0	46	0	91	0	415	30	4	449	22	11	7	0	40	69	**341**	0	2	**412**	992
Total Volume	221	0	183	0	404	0	1572	145	11	1728	97	49	34	0	180	271	1321	0	4	1596	3908
% App. Total	54.7	0	45.3	0		0	91	8.4	0.6		53.9	27.2	18.9	0		17	82.8	0	0.3		
PHF	.891	.000	.817	.000	.878	.000	.931	.863	.393	.931	.836	.875	.850	.000	.882	.891	.968	.000	.500	.968	.981
Cars	221	0	179	0	400	0	1542	145	11	1698	97	48	34	0	179	271	1298	0	4	1573	3850
% Cars	100	0	97.8	0	99.0	0	98.1	100	100	98.3	100	98.0	100	0	99.4	100	98.3	0	100	98.6	98.5
Trucks	0	0	0	0	0	0	20	0	0	20	0	1	0	0	1	0	16	0	0	16	37
% Trucks	0	0	0	0	0	0	1.3	0	0	1.2	0	2.0	0	0	0.6	0	1.2	0	0	1.0	0.9
Buses	0	0	4	0	4	0	10	0	0	10	0	0	0	0	0	0	7	0	0	7	21
% Buses	0	0	2.2	0	1.0	0	0.6	0	0	0.6	0	0	0	0	0	0	0.5	0	0	0.4	0.5

Accurate Counts
978-664-2565

N/S Street : Sigourney Street
E/W Street: Route 60 (Squire Road)
City/State : Revere, MA
Weather : Clear

File Name : 10271SA1
Site Code : 10271001
Start Date : 4/27/2013
Page No : 1

Groups Printed- Trucks

	Sigourney St From North				Squire Rd From East				Sigourney St From South				Squire Rd From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
02:30 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	4	0	0	5
02:45 PM	0	0	0	0	0	4	0	0	0	0	0	0	0	4	0	0	8
Total	0	0	0	0	0	5	0	0	0	0	0	0	0	8	0	0	13
03:00 PM	0	0	0	0	0	6	0	0	0	0	0	0	0	6	0	0	12
03:15 PM	0	0	0	0	0	4	0	0	0	0	0	0	0	5	0	0	9
03:30 PM	0	0	0	0	0	5	0	0	0	0	0	0	0	4	0	0	9
03:45 PM	1	0	0	0	0	1	0	0	0	0	0	0	0	3	0	0	5
Total	1	0	0	0	0	16	0	0	0	0	0	0	0	18	0	0	35
04:00 PM	0	0	0	0	0	4	0	0	0	0	0	0	0	6	0	0	10
04:15 PM	0	0	0	0	0	3	0	0	0	0	0	0	0	6	0	0	9
04:30 PM	0	0	0	0	0	3	0	0	0	0	0	0	0	6	0	0	9
04:45 PM	0	0	0	0	0	7	0	0	0	1	0	0	0	5	0	0	13
Total	0	0	0	0	0	17	0	0	0	1	0	0	0	23	0	0	41
05:00 PM	0	0	0	0	0	2	0	0	0	0	0	0	0	3	0	0	5
05:15 PM	0	0	0	0	0	8	0	0	0	0	0	0	0	2	0	0	10
Grand Total	1	0	0	0	0	48	0	0	0	1	0	0	0	54	0	0	104
Apprch %	100	0	0	0	0	100	0	0	0	100	0	0	0	100	0	0	
Total %	1	0	0	0	0	46.2	0	0	0	1	0	0	0	51.9	0	0	

	Sigourney St From North					Squire Rd From East					Sigourney St From South					Squire Rd From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	**6**	0	0	**6**	10
04:15 PM	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	6	0	0	6	9
04:30 PM	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	6	0	0	6	9
04:45 PM	0	0	0	0	0	0	**7**	0	0	**7**	0	**1**	0	0	**1**	0	5	0	0	5	**13**
Total Volume	0	0	0	0	0	0	17	0	0	17	0	1	0	0	1	0	23	0	0	23	41
% App. Total	0	0	0	0		0	100	0	0		0	100	0	0		0	100	0	0		
PHF	.000	.000	.000	.000	.000	.000	.607	.000	.000	.607	.000	.250	.000	.000	.250	.000	.958	.000	.000	.958	.788

Accurate Counts
978-664-2565

N/S Street : Sigourney Street
E/W Street: Route 60 (Squire Road)
City/State : Revere, MA
Weather : Clear

File Name : 10271SA1
Site Code : 10271001
Start Date : 4/27/2013
Page No : 1

Groups Printed- Buses

	Sigourney St From North				Squire Rd From East				Sigourney St From South				Squire Rd From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
02:30 PM	0	0	2	0	0	1	0	0	0	0	0	0	0	1	0	0	4
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Total	0	0	2	0	0	1	0	0	0	0	0	0	0	2	0	0	5
03:00 PM	0	0	1	0	0	1	0	0	0	0	0	0	0	2	0	0	4
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
03:30 PM	0	0	2	0	0	1	0	0	0	0	0	0	0	1	0	0	4
03:45 PM	0	0	1	0	0	1	0	0	0	0	0	0	0	3	0	0	5
Total	0	0	4	0	0	3	0	0	0	0	0	0	0	8	0	0	15
04:00 PM	0	0	0	0	0	2	1	0	1	0	0	0	0	2	0	0	6
04:15 PM	0	0	1	0	0	3	0	0	0	0	0	0	0	4	0	0	8
04:30 PM	0	0	1	0	0	2	0	0	0	0	0	0	0	1	0	0	4
04:45 PM	0	0	1	0	0	4	0	0	0	0	0	0	0	0	0	0	5
Total	0	0	3	0	0	11	1	0	1	0	0	0	0	7	0	0	23
05:00 PM	0	0	0	0	0	3	0	0	0	0	0	0	0	5	0	0	8
05:15 PM	0	0	2	0	0	1	0	0	0	0	0	0	0	1	0	0	4
Grand Total	0	0	11	0	0	19	1	0	1	0	0	0	0	23	0	0	55
Apprch %	0	0	100	0	0	95	5	0	100	0	0	0	0	100	0	0	
Total %	0	0	20	0	0	34.5	1.8	0	1.8	0	0	0	0	41.8	0	0	

	Sigourney St From North					Squire Rd From East					Sigourney St From South					Squire Rd From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	0	**1**	0	**1**	0	3	0	0	3	0	0	0	0	0	0	4	0	0	4	**8**
04:30 PM	0	0	1	0	1	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	4
04:45 PM	0	0	1	0	1	0	**4**	0	0	**4**	0	0	0	0	0	0	0	0	0	0	5
05:00 PM	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	**5**	0	0	**5**	8
Total Volume	0	0	3	0	3	0	12	0	0	12	0	0	0	0	0	0	10	0	0	10	25
% App. Total	0	0	100	0		0	100	0	0		0	0	0	0		0	100	0	0		
PHF	.000	.000	.750	.000	.750	.000	.750	.000	.000	.750	.000	.000	.000	.000	.000	.000	.500	.000	.000	.500	.781

Accurate Counts
978-664-2565

N/S Street : Sigourney Street
E/W Street: Route 60 (Squire Road)
City/State : Revere, MA
Weather : Clear

File Name : 10271SA1
Site Code : 10271001
Start Date : 4/27/2013
Page No : 1

Groups Printed- Bikes Peds

	Sigourney St From North				Squire Rd From East				Sigourney St From South				Squire Rd From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	2	7	0	7
02:45 PM	0	0	0	3	0	0	0	0	0	0	0	2	0	0	0	4	9	0	9
Total	0	0	0	3	0	0	0	0	0	0	0	7	0	0	0	6	16	0	16
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	0	5
03:15 PM	0	0	0	4	0	0	0	0	0	0	0	0	0	1	0	3	7	1	8
03:30 PM	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	7	9	0	9
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	5	7	0	7
Total	0	0	0	6	0	0	0	0	0	0	0	2	0	1	0	20	28	1	29
04:00 PM	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	10	12	0	12
04:15 PM	0	0	0	3	0	0	0	0	0	0	0	1	0	0	0	6	10	0	10
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	8	0	8
04:45 PM	0	0	0	2	0	0	0	0	0	0	0	2	0	0	0	4	8	0	8
Total	0	0	0	7	0	0	0	0	0	0	0	3	0	0	0	28	38	0	38
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	9	0	9
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	8	9	0	9
Grand Total	0	0	0	16	0	0	0	0	0	0	0	13	0	1	0	71	100	1	101
Apprch %	0	0	0		0	0	0		0	0	0		0	100	0				
Total %	0	0	0		0	0	0		0	0	0		0	100	0		99	1	

	Sigourney St From North				Squire Rd From East				Sigourney St From South				Squire Rd From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 02:30 PM																	
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	**1**	**1**
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
% App. Total	0	0	0		0	0	0		0	0	0		0	100	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.000	.250	.250

Accurate Counts
978-664-2565

N/S Street : Charger Street
E/W Street: Route 60 (Squire Road)
City/State : Revere, MA
Weather : Clear

File Name : 10271sa2
Site Code : 10271002
Start Date : 4/27/2013
Page No : 1

Groups Printed- Cars - Trucks - Buses

	Charger St From North				Squire Rd From East				Charger St From South				Squire Rd From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
02:30 PM	73	0	35	0	0	326	52	0	8	13	4	0	39	341	0	1	892
02:45 PM	46	0	33	0	0	354	46	0	6	14	4	0	37	365	0	3	908
Total	119	0	68	0	0	680	98	0	14	27	8	0	76	706	0	4	1800
03:00 PM	57	0	42	0	0	318	41	0	15	20	2	0	27	445	0	1	968
03:15 PM	59	0	35	0	0	260	49	1	10	13	10	0	35	524	0	1	997
03:30 PM	40	0	52	0	0	288	50	0	8	11	7	0	56	288	0	5	805
03:45 PM	42	0	43	0	0	313	65	0	6	13	9	0	45	383	0	2	921
Total	198	0	172	0	0	1179	205	1	39	57	28	0	163	1640	0	9	3691
04:00 PM	42	0	18	0	0	356	54	0	12	16	10	0	42	336	0	0	886
04:15 PM	50	0	28	0	0	377	45	0	5	19	9	0	34	336	0	1	904
04:30 PM	49	0	37	0	0	356	52	0	14	14	5	0	45	338	0	0	910
04:45 PM	53	0	44	0	0	373	50	0	5	17	7	0	42	357	0	1	949
Total	194	0	127	0	0	1462	201	0	36	66	31	0	163	1367	0	2	3649
05:00 PM	60	0	45	0	0	382	46	0	8	16	8	0	37	358	0	1	961
05:15 PM	58	0	39	0	0	434	51	0	6	17	10	0	42	360	0	1	1018
Grand Total	629	0	451	0	0	4137	601	1	103	183	85	0	481	4431	0	17	11119
Apprch %	58.2	0	41.8	0	0	87.3	12.7	0	27.8	49.3	22.9	0	9.8	89.9	0	0.3	
Total %	5.7	0	4.1	0	0	37.2	5.4	0	0.9	1.6	0.8	0	4.3	39.9	0	0.2	
Cars	628	0	451	0	0	4077	600	1	103	183	84	0	471	4360	0	17	10975
% Cars	99.8	0	100	0	0	98.5	99.8	100	100	100	98.8	0	97.9	98.4	0	100	98.7
Trucks	1	0	0	0	0	47	1	0	0	0	1	0	1	56	0	0	107
% Trucks	0.2	0	0	0	0	1.1	0.2	0	0	0	1.2	0	0.2	1.3	0	0	1
Buses	0	0	0	0	0	13	0	0	0	0	0	0	9	15	0	0	37
% Buses	0	0	0	0	0	0.3	0	0	0	0	0	0	1.9	0.3	0	0	0.3

	Charger St From North					Squire Rd From East					Charger St From South					Squire Rd From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	49	0	37	0	86	0	356	**52**	0	408	**14**	14	5	0	**33**	**45**	338	0	0	383	910
04:45 PM	53	0	44	0	97	0	373	50	0	423	5	**17**	7	0	29	42	357	0	**1**	400	949
05:00 PM	**60**	0	**45**	0	**105**	0	382	46	0	428	8	16	8	0	32	37	358	0	1	396	961
05:15 PM	58	0	39	0	97	0	**434**	51	0	**485**	6	17	**10**	0	33	42	**360**	0	1	**403**	**1018**
Total Volume	220	0	165	0	385	0	1545	199	0	1744	33	64	30	0	127	166	1413	0	3	1582	3838
% App. Total	57.1	0	42.9	0		0	88.6	11.4	0		26	50.4	23.6	0		10.5	89.3	0	0.2		
PHF	.917	.000	.917	.000	.917	.000	.890	.957	.000	.899	.589	.941	.750	.000	.962	.922	.981	.000	.750	.981	.943
Cars	220	0	165	0	385	0	1522	199	0	1721	33	64	30	0	127	162	1394	0	3	1559	3792
% Cars	100	0	100	0	100	0	98.5	100	0	98.7	100	100	100	0	100	97.6	98.7	0	100	98.5	98.8
Trucks	0	0	0	0	0	0	19	0	0	19	0	0	0	0	0	1	15	0	0	16	35
% Trucks	0	0	0	0	0	0	1.2	0	0	1.1	0	0	0	0	0	0.6	1.1	0	0	1.0	0.9
Buses	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	3	4	0	0	7	11
% Buses	0	0	0	0	0	0	0.3	0	0	0.2	0	0	0	0	0	1.8	0.3	0	0	0.4	0.3

Accurate Counts
978-664-2565

N/S Street : Charger Street
E/W Street: Route 60 (Squire Road)
City/State : Revere, MA
Weather : Clear

File Name : 10271sa2
Site Code : 10271002
Start Date : 4/27/2013
Page No : 1

Groups Printed- Trucks

	Charger St From North				Squire Rd From East				Charger St From South				Squire Rd From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
02:30 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	5	0	0	6
02:45 PM	0	0	0	0	0	4	0	0	0	0	0	0	0	6	0	0	10
Total	0	0	0	0	0	5	0	0	0	0	0	0	0	11	0	0	16
03:00 PM	0	0	0	0	0	5	0	0	0	0	0	0	0	6	0	0	11
03:15 PM	0	0	0	0	0	2	0	0	0	0	1	0	0	5	0	0	8
03:30 PM	0	0	0	0	0	7	0	0	0	0	0	0	0	6	0	0	13
03:45 PM	1	0	0	0	0	3	1	0	0	0	0	0	0	3	0	0	8
Total	1	0	0	0	0	17	1	0	0	0	1	0	0	20	0	0	40
04:00 PM	0	0	0	0	0	2	0	0	0	0	0	0	0	6	0	0	8
04:15 PM	0	0	0	0	0	4	0	0	0	0	0	0	0	4	0	0	8
04:30 PM	0	0	0	0	0	2	0	0	0	0	0	0	0	4	0	0	6
04:45 PM	0	0	0	0	0	5	0	0	0	0	0	0	1	6	0	0	12
Total	0	0	0	0	0	13	0	0	0	0	0	0	1	20	0	0	34
05:00 PM	0	0	0	0	0	4	0	0	0	0	0	0	0	3	0	0	7
05:15 PM	0	0	0	0	0	8	0	0	0	0	0	0	0	2	0	0	10
Grand Total	1	0	0	0	0	47	1	0	0	0	1	0	1	56	0	0	107
Apprch %	100	0	0	0	0	97.9	2.1	0	0	0	100	0	1.8	98.2	0	0	
Total %	0.9	0	0	0	0	43.9	0.9	0	0	0	0.9	0	0.9	52.3	0	0	

	Charger St From North					Squire Rd From East					Charger St From South					Squire Rd From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 02:45 PM																					
02:45 PM	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	**6**	0	0	**6**	10
03:00 PM	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	0	6	0	0	6	11
03:15 PM	0	0	0	0	0	0	2	0	0	2	0	0	**1**	0	**1**	0	5	0	0	5	8
03:30 PM	0	0	0	0	0	0	**7**	0	0	**7**	0	0	0	0	0	0	6	0	0	6	**13**
Total Volume	0	0	0	0	0	0	18	0	0	18	0	0	1	0	1	0	23	0	0	23	42
% App. Total	0	0	0	0		0	100	0	0		0	0	100	0		0	100	0	0		
PHF	.000	.000	.000	.000	.000	.000	.643	.000	.000	.643	.000	.000	.250	.000	.250	.000	.958	.000	.000	.958	.808

Accurate Counts
978-664-2565

N/S Street : Charger Street
E/W Street: Route 60 (Squire Road)
City/State : Revere, MA
Weather : Clear

File Name : 10271sa2
Site Code : 10271002
Start Date : 4/27/2013
Page No : 1

Groups Printed- Buses

	Charger St From North				Squire Rd From East				Charger St From South				Squire Rd From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
02:30 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	2
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2
Total	0	0	0	0	0	1	0	0	0	0	0	0	1	2	0	0	4
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2
03:30 PM	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	2
03:45 PM	0	0	0	0	0	2	0	0	0	0	0	0	1	2	0	0	5
Total	0	0	0	0	0	3	0	0	0	0	0	0	3	6	0	0	12
04:00 PM	0	0	0	0	0	3	0	0	0	0	0	0	0	2	0	0	5
04:15 PM	0	0	0	0	0	2	0	0	0	0	0	0	2	1	0	0	5
04:30 PM	0	0	0	0	0	2	0	0	0	0	0	0	1	1	0	0	4
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Total	0	0	0	0	0	7	0	0	0	0	0	0	3	5	0	0	15
05:00 PM	0	0	0	0	0	2	0	0	0	0	0	0	2	2	0	0	6
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	13	0	0	0	0	0	0	9	15	0	0	37
Apprch %	0	0	0	0	0	100	0	0	0	0	0	0	37.5	62.5	0	0	
Total %	0	0	0	0	0	35.1	0	0	0	0	0	0	24.3	40.5	0	0	

	Charger St From North					Squire Rd From East					Charger St From South					Squire Rd From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:45 PM																					
03:45 PM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	1	**2**	0	0	**3**	**5**
04:00 PM	0	0	0	0	0	0	**3**	0	0	**3**	0	0	0	0	0	0	2	0	0	2	5
04:15 PM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	**2**	1	0	0	3	5
04:30 PM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	1	1	0	0	2	4
Total Volume	0	0	0	0	0	0	9	0	0	9	0	0	0	0	0	4	6	0	0	10	19
% App. Total	0	0	0	0		0	100	0	0		0	0	0	0		40	60	0	0		
PHF	.000	.000	.000	.000	.000	.000	.750	.000	.000	.750	.000	.000	.000	.000	.000	.500	.750	.000	.000	.833	.950

Accurate Counts
978-664-2565

N/S Street : Charger Street
E/W Street: Route 60 (Squire Road)
City/State : Revere, MA
Weather : Clear

File Name : 10271sa2
Site Code : 10271002
Start Date : 4/27/2013
Page No : 1

Groups Printed- Bikes Peds

	Charger St From North				Squire Rd From East				Charger St From South				Squire Rd From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
02:30 PM	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	1	12	0	12
02:45 PM	1	0	0	4	0	0	0	2	0	0	0	0	0	0	0	0	6	1	7
Total	1	0	0	15	0	0	0	2	0	0	0	0	0	0	0	1	18	1	19
03:00 PM	0	0	0	3	0	0	0	3	0	0	0	0	0	0	0	0	6	0	6
03:15 PM	0	0	0	0	0	0	0	2	0	0	0	4	0	0	0	0	6	0	6
03:30 PM	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	5	8	0	8
03:45 PM	0	0	0	3	0	1	0	3	0	0	0	0	0	0	0	0	6	1	7
Total	0	0	0	7	0	1	0	8	0	0	0	6	0	0	0	5	26	1	27
04:00 PM	0	0	0	6	0	1	0	4	0	0	0	0	0	0	0	0	10	1	11
04:15 PM	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	1	4	0	4
04:30 PM	0	0	0	2	0	2	0	7	0	0	0	3	0	0	0	0	12	2	14
04:45 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1
Total	0	0	0	10	0	3	0	12	0	0	0	4	0	0	0	1	27	3	30
05:00 PM	0	0	0	2	0	0	0	6	0	0	0	0	0	0	0	0	8	0	8
05:15 PM	0	0	0	3	0	0	0	2	0	0	0	0	0	0	0	0	5	0	5
Grand Total	1	0	0	37	0	4	0	30	0	0	0	10	0	0	0	7	84	5	89
Apprch %	100	0	0		0	100	0		0	0	0		0	0	0				
Total %	20	0	0		0	80	0		0	0	0		0	0	0		94.4	5.6	

	Charger St From North				Squire Rd From East				Charger St From South				Squire Rd From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:45 PM																	
03:45 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
04:00 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	**2**	0	**2**	0	0	0	0	0	0	0	0	**2**
Total Volume	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0	0	4
% App. Total	0	0	0		0	100	0		0	0	0		0	0	0		
PHF	.000	.000	.000	.000	.000	.500	.000	.500	.000	.000	.000	.000	.000	.000	.000	.000	.500

Accurate Counts
978-664-2565

N/S Street : Route 1A (North Shore Road)
E/W Street: Revere Street
City/State : Revere, MA
Weather : Clear

File Name : 10271SA3
Site Code : 10271003
Start Date : 4/27/2013
Page No : 1

Groups Printed- Cars - Trucks - Buses

	Route 1A From North				Revere St From East				Route 1A From South				Revere St From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
02:30 PM	11	244	85	0	6	71	13	0	29	198	3	1	57	36	6	0	760
02:45 PM	5	153	62	0	11	66	7	0	24	302	7	0	59	34	20	0	750
Total	16	397	147	0	17	137	20	0	53	500	10	1	116	70	26	0	1510
03:00 PM	5	79	31	0	22	20	8	0	13	204	7	0	96	25	20	0	530
03:15 PM	1	37	32	0	1	643	5	0	8	75	7	2	27	19	5	0	862
03:30 PM	41	218	85	0	5	69	23	0	41	241	8	1	56	54	26	0	868
03:45 PM	8	240	79	0	9	72	10	0	43	211	5	0	45	32	19	0	773
Total	55	574	227	0	37	804	46	0	105	731	27	3	224	130	70	0	3033
04:00 PM	18	219	94	0	6	69	24	0	44	267	4	0	53	52	12	0	862
04:15 PM	11	223	90	0	2	76	9	0	44	301	6	1	54	40	13	0	870
04:30 PM	49	194	62	0	5	70	12	0	31	252	2	1	63	38	19	0	798
04:45 PM	13	277	78	0	11	70	10	0	31	273	4	0	56	44	16	0	883
Total	91	913	324	0	24	285	55	0	150	1093	16	2	226	174	60	0	3413
05:00 PM	18	287	58	0	7	94	7	0	24	269	4	2	72	68	15	0	925
05:15 PM	12	282	77	0	5	68	13	0	34	251	5	1	65	34	15	0	862
Grand Total	192	2453	833	0	90	1388	141	0	366	2844	62	9	703	476	186	0	9743
Apprch %	5.5	70.5	24	0	5.6	85.7	8.7	0	11.2	86.7	1.9	0.3	51.5	34.9	13.6	0	
Total %	2	25.2	8.5	0	0.9	14.2	1.4	0	3.8	29.2	0.6	0.1	7.2	4.9	1.9	0	
Cars	192	2436	827	0	89	1385	141	0	353	2799	61	9	692	475	180	0	9639
% Cars	100	99.3	99.3	0	98.9	99.8	100	0	96.4	98.4	98.4	100	98.4	99.8	96.8	0	98.9
Trucks	0	8	0	0	1	1	0	0	0	18	1	0	3	0	0	0	32
% Trucks	0	0.3	0	0	1.1	0.1	0	0	0	0.6	1.6	0	0.4	0	0	0	0.3
Buses	0	9	6	0	0	2	0	0	13	27	0	0	8	1	6	0	72
% Buses	0	0.4	0.7	0	0	0.1	0	0	3.6	0.9	0	0	1.1	0.2	3.2	0	0.7

	Route 1A From North					Revere St From East					Route 1A From South					Revere St From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	11	223	**90**	0	324	2	76	9	0	87	**44**	**301**	**6**	1	**352**	54	40	13	0	107	870
04:30 PM	**49**	194	62	0	305	5	70	**12**	0	87	31	252	2	1	286	63	38	**19**	0	120	798
04:45 PM	13	277	78	0	**368**	**11**	70	10	0	91	31	273	4	0	308	56	44	16	0	116	883
05:00 PM	18	**287**	58	0	363	7	**94**	7	0	**108**	24	269	4	**2**	299	**72**	**68**	15	0	**155**	**925**
Total Volume	91	981	288	0	1360	25	310	38	0	373	130	1095	16	4	1245	245	190	63	0	498	3476
% App. Total	6.7	72.1	21.2	0		6.7	83.1	10.2	0		10.4	88	1.3	0.3		49.2	38.2	12.7	0		
PHF	.464	.855	.800	.000	.924	.568	.824	.792	.000	.863	.739	.909	.667	.500	.884	.851	.699	.829	.000	.803	.939
Cars	91	976	286	0	1353	25	309	38	0	372	126	1076	16	4	1222	241	190	62	0	493	3440
% Cars	100	99.5	99.3	0	99.5	100	99.7	100	0	99.7	96.9	98.3	100	100	98.2	98.4	100	98.4	0	99.0	99.0
Trucks	0	1	0	0	1	0	1	0	0	1	0	9	0	0	9	1	0	0	0	1	12
% Trucks	0	0.1	0	0	0.1	0	0.3	0	0	0.3	0	0.8	0	0	0.7	0.4	0	0	0	0.2	0.3
Buses	0	4	2	0	6	0	0	0	0	0	4	10	0	0	14	3	0	1	0	4	24
% Buses	0	0.4	0.7	0	0.4	0	0	0	0	0	3.1	0.9	0	0	1.1	1.2	0	1.6	0	0.8	0.7

Accurate Counts
978-664-2565

N/S Street : Route 1A (North Shore Road)
E/W Street: Revere Street
City/State : Revere, MA
Weather : Clear

File Name : 10271SA3
Site Code : 10271003
Start Date : 4/27/2013
Page No : 1

Groups Printed- Trucks

	Route 1A From North				Revere St From East				Route 1A From South				Revere St From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
02:30 PM	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	4
02:45 PM	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	3
Total	0	1	0	0	1	0	0	0	0	3	1	0	1	0	0	0	7
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
03:30 PM	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
03:45 PM	0	1	0	0	0	0	0	0	0	3	0	0	1	0	0	0	5
Total	0	3	0	0	0	0	0	0	0	5	0	0	1	0	0	0	9
04:00 PM	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3
04:15 PM	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	3
04:30 PM	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	6
04:45 PM	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2
Total	0	3	0	0	0	1	0	0	0	9	0	0	1	0	0	0	14
05:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
05:15 PM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Grand Total	0	8	0	0	1	1	0	0	0	18	1	0	3	0	0	0	32
Apprch %	0	100	0	0	50	50	0	0	0	94.7	5.3	0	100	0	0	0	
Total %	0	25	0	0	3.1	3.1	0	0	0	56.2	3.1	0	9.4	0	0	0	

	Route 1A From North					Revere St From East					Route 1A From South					Revere St From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:45 PM																					
03:45 PM	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	**1**	0	0	0	**1**	5
04:00 PM	0	**2**	0	0	**2**	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	3
04:15 PM	0	1	0	0	1	0	**1**	0	0	**1**	0	1	0	0	1	0	0	0	0	0	3
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	**6**	0	0	**6**	0	0	0	0	0	**6**
Total Volume	0	4	0	0	4	0	1	0	0	1	0	11	0	0	11	1	0	0	0	1	17
% App. Total	0	100	0	0		0	100	0	0		0	100	0	0		100	0	0	0		
PHF	.000	.500	.000	.000	.500	.000	.250	.000	.000	.250	.000	.458	.000	.000	.458	.250	.000	.000	.000	.250	.708

Accurate Counts
978-664-2565

N/S Street : Route 1A (North Shore Road)
E/W Street: Revere Street
City/State : Revere, MA
Weather : Clear

File Name : 10271SA3
Site Code : 10271003
Start Date : 4/27/2013
Page No : 1

Groups Printed- Buses

	Route 1A From North				Revere St From East				Route 1A From South				Revere St From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
02:30 PM	0	2	1	0	0	1	0	0	3	1	0	0	0	0	1	0	9
02:45 PM	0	1	0	0	0	0	0	0	1	1	0	0	0	0	1	0	4
Total	0	3	1	0	0	1	0	0	4	2	0	0	0	0	2	0	13
03:00 PM	0	0	0	0	0	0	0	0	2	3	0	0	0	0	0	0	5
03:15 PM	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	3
03:30 PM	0	0	1	0	0	0	0	0	0	1	0	0	1	0	1	0	4
03:45 PM	0	2	0	0	0	0	0	0	0	3	0	0	0	0	1	0	6
Total	0	2	1	0	0	1	0	0	3	8	0	0	1	0	2	0	18
04:00 PM	0	0	1	0	0	0	0	0	1	2	0	0	1	1	1	0	7
04:15 PM	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	3
04:30 PM	0	2	2	0	0	0	0	0	1	1	0	0	0	0	0	0	6
04:45 PM	0	2	0	0	0	0	0	0	2	5	0	0	1	0	0	0	10
Total	0	4	3	0	0	0	0	0	5	9	0	0	2	1	2	0	26
05:00 PM	0	0	0	0	0	0	0	0	0	3	0	0	2	0	0	0	5
05:15 PM	0	0	1	0	0	0	0	0	1	5	0	0	3	0	0	0	10
Grand Total	0	9	6	0	0	2	0	0	13	27	0	0	8	1	6	0	72
Apprch %	0	60	40	0	0	100	0	0	32.5	67.5	0	0	53.3	6.7	40	0	
Total %	0	12.5	8.3	0	0	2.8	0	0	18.1	37.5	0	0	11.1	1.4	8.3	0	

	Route 1A From North					Revere St From East					Route 1A From South					Revere St From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	0	**2**	**2**	0	**4**	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	6
04:45 PM	0	2	0	0	2	0	0	0	0	0	**2**	**5**	0	0	**7**	1	0	0	0	1	**10**
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	2	0	0	0	2	5
05:15 PM	0	0	1	0	1	0	0	0	0	0	1	5	0	0	6	**3**	0	0	0	**3**	10
Total Volume	0	4	3	0	7	0	0	0	0	0	4	14	0	0	18	6	0	0	0	6	31
% App. Total	0	57.1	42.9	0		0	0	0	0		22.2	77.8	0	0		100	0	0	0		
PHF	.000	.500	.375	.000	.438	.000	.000	.000	.000	.000	.500	.700	.000	.000	.643	.500	.000	.000	.000	.500	.775

Accurate Counts
978-664-2565

N/S Street : Route 1A (North Shore Road)
E/W Street: Revere Street
City/State : Revere, MA
Weather : Clear

File Name : 10271SA3
Site Code : 10271003
Start Date : 4/27/2013
Page No : 1

Groups Printed- Bikes Peds

	Route 1A From North				Revere St From East				Route 1A From South				Revere St From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
02:30 PM	0	0	0	1	0	0	0	4	0	3	0	3	0	0	0	1	9	3	12
02:45 PM	0	0	0	0	0	0	0	1	0	1	0	4	0	1	0	0	5	2	7
Total	0	0	0	1	0	0	0	5	0	4	0	7	0	1	0	1	14	5	19
03:00 PM	0	0	0	1	0	0	0	5	0	0	0	6	0	2	0	0	12	2	14
03:15 PM	0	0	0	0	0	1	0	7	0	0	0	4	0	0	0	1	12	1	13
03:30 PM	0	0	0	3	0	1	0	10	0	0	0	3	0	0	0	0	16	1	17
03:45 PM	0	0	0	2	0	1	0	4	0	0	0	1	0	0	0	0	7	1	8
Total	0	0	0	6	0	3	0	26	0	0	0	14	0	2	0	1	47	5	52
04:00 PM	0	0	0	9	0	3	0	7	0	0	0	7	0	0	0	3	26	3	29
04:15 PM	0	0	0	0	0	1	0	3	0	0	0	4	0	2	0	1	8	3	11
04:30 PM	0	0	0	2	0	0	0	4	0	0	0	0	0	0	0	0	6	0	6
04:45 PM	0	0	0	2	0	0	0	7	0	0	0	3	0	0	0	0	12	0	12
Total	0	0	0	13	0	4	0	21	0	0	0	14	0	2	0	4	52	6	58
05:00 PM	0	0	0	1	0	0	0	2	0	0	0	3	0	0	0	0	6	0	6
05:15 PM	0	0	0	2	0	0	0	0	0	0	0	2	0	0	0	1	5	0	5
Grand Total	0	0	0	23	0	7	0	54	0	4	0	40	0	5	0	7	124	16	140
Apprch %	0	0	0		0	100	0		0	100	0		0	100	0				
Total %	0	0	0		0	43.8	0		0	25	0		0	31.2	0		88.6	11.4	

	Route 1A From North				Revere St From East				Route 1A From South				Revere St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 02:30 PM																	
02:30 PM	0	0	0	0	0	0	0	0	0	**3**	0	**3**	0	0	0	0	**3**
02:45 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1	2
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	**2**	0	**2**	2
03:15 PM	0	0	0	0	0	**1**	0	**1**	0	0	0	0	0	0	0	0	1
Total Volume	0	0	0	0	0	1	0	1	0	4	0	4	0	3	0	3	8
% App. Total	0	0	0		0	100	0		0	100	0		0	100	0		
PHF	.000	.000	.000	.000	.000	.250	.000	.250	.000	.333	.000	.333	.000	.375	.000	.375	.667

Accurate Counts
978-664-2565

N/S Street : Route 1A (North Shore Road
E/W Street : MBTA Driveway
City/State : Revere, MA
Weather : Clear

File Name : 10271SA4
Site Code : 10271004
Start Date : 4/27/2013
Page No : 1

Groups Printed- Cars - Trucks - Buses

	Route 1A From North			MBTA From East			Route 1A From South			
Start Time	Left	Thru	U-TR	Left	Right	U-TR	Thru	Right	U-TR	Int. Total
02:30 PM	7	262	0	12	12	0	244	13	0	550
02:45 PM	7	163	0	6	11	0	282	6	0	475
Total	14	425	0	18	23	0	526	19	0	1025
03:00 PM	1	121	0	4	5	0	218	2	0	351
03:15 PM	1	63	0	2	4	0	205	1	10	286
03:30 PM	9	274	0	6	16	0	193	5	0	503
03:45 PM	12	237	0	6	10	0	253	7	1	526
Total	23	695	0	18	35	0	869	15	11	1666
04:00 PM	9	217	0	7	9	0	336	7	0	585
04:15 PM	11	233	1	2	20	0	309	5	0	581
04:30 PM	11	239	0	3	12	0	278	6	0	549
04:45 PM	9	268	0	2	14	0	267	3	0	563
Total	40	957	1	14	55	0	1190	21	0	2278
05:00 PM	11	290	0	7	11	0	264	3	0	586
05:15 PM	6	258	0	6	12	0	255	4	0	541
Grand Total	94	2625	1	63	136	0	3104	62	11	6096
Apprch %	3.5	96.5	0	31.7	68.3	0	97.7	2	0.3	
Total %	1.5	43.1	0	1	2.2	0	50.9	1	0.2	
Cars	94	2598	1	42	117	0	3069	62	11	5994
% Cars	100	99	100	66.7	86	0	98.9	100	100	98.3
Trucks	0	12	0	1	0	0	24	0	0	37
% Trucks	0	0.5	0	1.6	0	0	0.8	0	0	0.6
Buses	0	15	0	20	19	0	11	0	0	65
% Buses	0	0.6	0	31.7	14	0	0.4	0	0	1.1

	Route 1A From North				MBTA From East				Route 1A From South				
Start Time	Left	Thru	U-TR	App. Total	Left	Right	U-TR	App. Total	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:15 PM													
04:15 PM	**11**	233	**1**	245	2	**20**	0	**22**	**309**	5	0	**314**	581
04:30 PM	11	239	0	250	3	12	0	15	278	**6**	0	284	549
04:45 PM	9	268	0	277	2	14	0	16	267	3	0	270	563
05:00 PM	11	**290**	0	**301**	**7**	11	0	18	264	3	0	267	**586**
Total Volume	42	1030	1	1073	14	57	0	71	1118	17	0	1135	2279
% App. Total	3.9	96	0.1		19.7	80.3	0		98.5	1.5	0		
PHF	.955	.888	.250	.891	.500	.713	.000	.807	.905	.708	.000	.904	.972
Cars	42	1023	1	1066	9	51	0	60	1102	17	0	1119	2245
% Cars	100	99.3	100	99.3	64.3	89.5	0	84.5	98.6	100	0	98.6	98.5
Trucks	0	2	0	2	0	0	0	0	11	0	0	11	13
% Trucks	0	0.2	0	0.2	0	0	0	0	1.0	0	0	1.0	0.6
Buses	0	5	0	5	5	6	0	11	5	0	0	5	21
% Buses	0	0.5	0	0.5	35.7	10.5	0	15.5	0.4	0	0	0.4	0.9

Accurate Counts
978-664-2565

N/S Street : Route 1A (North Shore Road
E/W Street : MBTA Driveway
City/State : Revere, MA
Weather : Clear

File Name : 10271SA4
Site Code : 10271004
Start Date : 4/27/2013
Page No : 1

Groups Printed- Trucks

	Route 1A From North			MBTA From East			Route 1A From South			
Start Time	Left	Thru	U-TR	Left	Right	U-TR	Thru	Right	U-TR	Int. Total
02:30 PM	0	1	0	0	0	0	3	0	0	4
02:45 PM	0	2	0	0	0	0	2	0	0	4
Total	0	3	0	0	0	0	5	0	0	8
03:00 PM	0	0	0	1	0	0	1	0	0	2
03:15 PM	0	1	0	0	0	0	1	0	0	2
03:30 PM	0	1	0	0	0	0	0	0	0	1
03:45 PM	0	2	0	0	0	0	4	0	0	6
Total	0	4	0	1	0	0	6	0	0	11
04:00 PM	0	2	0	0	0	0	2	0	0	4
04:15 PM	0	1	0	0	0	0	2	0	0	3
04:30 PM	0	1	0	0	0	0	8	0	0	9
04:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	4	0	0	0	0	12	0	0	16
05:00 PM	0	0	0	0	0	0	1	0	0	1
05:15 PM	0	1	0	0	0	0	0	0	0	1
Grand Total	0	12	0	1	0	0	24	0	0	37
Apprch %	0	100	0	100	0	0	100	0	0	
Total %	0	32.4	0	2.7	0	0	64.9	0	0	

	Route 1A From North				MBTA From East				Route 1A From South				
Start Time	Left	Thru	U-TR	App. Total	Left	Right	U-TR	App. Total	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 03:45 PM													
03:45 PM	0	**2**	0	**2**	0	0	0	0	4	0	0	4	6
04:00 PM	0	2	0	2	0	0	0	0	2	0	0	2	4
04:15 PM	0	1	0	1	0	0	0	0	2	0	0	2	3
04:30 PM	0	1	0	1	0	0	0	0	**8**	0	0	**8**	**9**
Total Volume	0	6	0	6	0	0	0	0	16	0	0	16	22
% App. Total	0	100	0		0	0	0		100	0	0		
PHF	.000	.750	.000	.750	.000	.000	.000	.000	.500	.000	.000	.500	.611

Accurate Counts
978-664-2565

N/S Street : Route 1A (North Shore Road
E/W Street : MBTA Driveway
City/State : Revere, MA
Weather : Clear

File Name : 10271SA4
Site Code : 10271004
Start Date : 4/27/2013
Page No : 1

Groups Printed- Buses

	Route 1A From North			MBTA From East			Route 1A From South			
Start Time	Left	Thru	U-TR	Left	Right	U-TR	Thru	Right	U-TR	Int. Total
02:30 PM	0	3	0	2	3	0	0	0	0	8
02:45 PM	0	1	0	1	2	0	0	0	0	4
Total	0	4	0	3	5	0	0	0	0	12
03:00 PM	0	0	0	1	1	0	1	0	0	3
03:15 PM	0	0	0	1	1	0	1	0	0	3
03:30 PM	0	1	0	3	0	0	0	0	0	4
03:45 PM	0	3	0	2	1	0	1	0	0	7
Total	0	4	0	7	3	0	3	0	0	17
04:00 PM	0	1	0	3	3	0	0	0	0	7
04:15 PM	0	2	0	1	1	0	0	0	0	4
04:30 PM	0	1	0	1	3	0	1	0	0	6
04:45 PM	0	2	0	0	2	0	3	0	0	7
Total	0	6	0	5	9	0	4	0	0	24
05:00 PM	0	0	0	3	0	0	1	0	0	4
05:15 PM	0	1	0	2	2	0	3	0	0	8
Grand Total	0	15	0	20	19	0	11	0	0	65
Apprch %	0	100	0	51.3	48.7	0	100	0	0	
Total %	0	23.1	0	30.8	29.2	0	16.9	0	0	

	Route 1A From North				MBTA From East				Route 1A From South				
Start Time	Left	Thru	U-TR	App. Total	Left	Right	U-TR	App. Total	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	0	1	0	1	1	**3**	0	**4**	1	0	0	1	6
04:45 PM	0	**2**	0	**2**	0	2	0	2	**3**	0	0	**3**	7
05:00 PM	0	0	0	0	**3**	0	0	3	1	0	0	1	4
05:15 PM	0	1	0	1	2	2	0	4	3	0	0	3	**8**
Total Volume	0	4	0	4	6	7	0	13	8	0	0	8	25
% App. Total	0	100	0		46.2	53.8	0		100	0	0		
PHF	.000	.500	.000	.500	.500	.583	.000	.813	.667	.000	.000	.667	.781

Accurate Counts
978-664-2565

N/S Street : Route 1A (North Shore Road
E/W Street : MBTA Driveway
City/State : Revere, MA
Weather : Clear

File Name : 10271SA4
Site Code : 10271004
Start Date : 4/27/2013
Page No : 1

Groups Printed- Bikes Peds

	Route 1A From North			MBTA From East			Route 1A From South					
Start Time	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
02:30 PM	0	0	1	0	0	6	0	0	0	7	0	7
02:45 PM	0	0	6	0	0	3	0	0	1	10	0	10
Total	0	0	7	0	0	9	0	0	1	17	0	17
03:00 PM	0	0	1	0	0	6	0	0	1	8	0	8
03:15 PM	1	0	1	0	0	2	0	0	0	3	1	4
03:30 PM	0	0	9	0	0	4	0	0	2	15	0	15
03:45 PM	0	0	3	0	0	0	0	0	1	4	0	4
Total	1	0	14	0	0	12	0	0	4	30	1	31
04:00 PM	0	0	2	0	0	5	0	0	0	7	0	7
04:15 PM	0	0	2	0	0	3	0	0	1	6	0	6
04:30 PM	0	0	0	0	0	1	0	0	0	1	0	1
04:45 PM	0	0	3	0	0	2	0	0	0	5	0	5
Total	0	0	7	0	0	11	0	0	1	19	0	19
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	1	0	0	0	0	0	1	2	0	2
Grand Total	1	0	29	0	0	32	0	0	7	68	1	69
Apprch %	100	0		0	0		0	0				
Total %	100	0		0	0		0	0		98.6	1.4	

	Route 1A From North			MBTA From East			Route 1A From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 02:30 PM										
02:30 PM	0	0	0	0	0	0	0	0	0	0
02:45 PM	0	0	0	0	0	0	0	0	0	0
03:00 PM	0	0	0	0	0	0	0	0	0	0
03:15 PM	**1**	0	**1**	0	0	0	0	0	0	**1**
Total Volume	1	0	1	0	0	0	0	0	0	1
% App. Total	100	0		0	0		0	0		
PHF	.250	.000	.250	.000	.000	.000	.000	.000	.000	.250

Accurate Counts
978-664-2565

N/S Street : Bennington Street
E/W Street : Crescent Avenue
City/State : Revere, MA
Weather : Clear

File Name : 10271SA5
Site Code : 10271005
Start Date : 4/27/2013
Page No : 1

Groups Printed- Cars - Trucks - Buses

	Bennington St From North		Crescent Ave From East		Bennington St From South		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
02:30 PM	0	120	15	45	68	0	248
02:45 PM	0	91	15	35	101	0	242
Total	0	211	30	80	169	0	490
03:00 PM	0	86	19	45	99	0	249
03:15 PM	0	129	17	30	109	0	285
03:30 PM	0	152	15	37	193	0	397
03:45 PM	0	163	9	45	240	0	457
Total	0	530	60	157	641	0	1388
04:00 PM	0	135	12	40	204	0	391
04:15 PM	0	109	22	45	153	0	329
04:30 PM	0	100	18	47	97	0	262
04:45 PM	0	131	14	39	91	0	275
Total	0	475	66	171	545	0	1257
05:00 PM	0	104	16	43	94	0	257
05:15 PM	0	97	8	37	96	0	238
Grand Total	0	1417	180	488	1545	0	3630
Apprch %	0	100	26.9	73.1	100	0	
Total %	0	39	5	13.4	42.6	0	
Cars	0	1408	180	488	1543	0	3619
% Cars	0	99.4	100	100	99.9	0	99.7
Trucks	0	7	0	0	1	0	8
% Trucks	0	0.5	0	0	0.1	0	0.2
Buses	0	2	0	0	1	0	3
% Buses	0	0.1	0	0	0.1	0	0.1

	Bennington St From North			Crescent Ave From East			Bennington St From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 03:30 PM										
03:30 PM	0	152	152	15	37	52	193	0	193	397
03:45 PM	0	**163**	**163**	9	**45**	54	**240**	0	**240**	**457**
04:00 PM	0	135	135	12	40	52	204	0	204	391
04:15 PM	0	109	109	**22**	45	**67**	153	0	153	329
Total Volume	0	559	559	58	167	225	790	0	790	1574
% App. Total	0	100		25.8	74.2		100	0		
PHF	.000	.857	.857	.659	.928	.840	.823	.000	.823	.861
Cars	0	556	556	58	167	225	789	0	789	1570
% Cars	0	99.5	99.5	100	100	100	99.9	0	99.9	99.7
Trucks	0	3	3	0	0	0	0	0	0	3
% Trucks	0	0.5	0.5	0	0	0	0	0	0	0.2
Buses	0	0	0	0	0	0	1	0	1	1
% Buses	0	0	0	0	0	0	0.1	0	0.1	0.1

Accurate Counts
978-664-2565

N/S Street : Bennington Street
E/W Street : Crescent Avenue
City/State : Revere, MA
Weather : Clear

File Name : 10271SA5
Site Code : 10271005
Start Date : 4/27/2013
Page No : 1

Groups Printed- Trucks

	Bennington St From North		Crescent Ave From East		Bennington St From South		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
02:30 PM	0	0	0	0	0	0	0
02:45 PM	0	2	0	0	1	0	3
Total	0	2	0	0	1	0	3
03:00 PM	0	0	0	0	0	0	0
03:15 PM	0	1	0	0	0	0	1
03:30 PM	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0
Total	0	1	0	0	0	0	1
04:00 PM	0	3	0	0	0	0	3
04:15 PM	0	0	0	0	0	0	0
04:30 PM	0	1	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	0
Total	0	4	0	0	0	0	4
05:00 PM	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0
Grand Total	0	7	0	0	1	0	8
Apprch %	0	100	0	0	100	0	
Total %	0	87.5	0	0	12.5	0	

	Bennington St From North			Crescent Ave From East			Bennington St From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 02:30 PM										
02:30 PM	0	0	0	0	0	0	0	0	0	0
02:45 PM	0	**2**	**2**	0	0	0	**1**	0	**1**	**3**
03:00 PM	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	1	1	0	0	0	0	0	0	1
Total Volume	0	3	3	0	0	0	1	0	1	4
% App. Total	0	100		0	0		100	0		
PHF	.000	.375	.375	.000	.000	.000	.250	.000	.250	.333

Accurate Counts
978-664-2565

N/S Street : Bennington Street
E/W Street : Crescent Avenue
City/State : Revere, MA
Weather : Clear

File Name : 10271SA5
Site Code : 10271005
Start Date : 4/27/2013
Page No : 1

Groups Printed- Buses

	Bennington St From North		Crescent Ave From East		Bennington St From South		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
02:30 PM	0	0	0	0	0	0	0
02:45 PM	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
03:00 PM	0	1	0	0	0	0	1
03:15 PM	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	1	0	1
Total	0	1	0	0	1	0	2
04:00 PM	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0
04:45 PM	0	1	0	0	0	0	1
Total	0	1	0	0	0	0	1
05:00 PM	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0
Grand Total	0	2	0	0	1	0	3
Apprch %	0	100	0	0	100	0	
Total %	0	66.7	0	0	33.3	0	

	Bennington St From North			Crescent Ave From East			Bennington St From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 03:00 PM										
03:00 PM	0	**1**	**1**	0	0	0	0	0	0	**1**
03:15 PM	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	**1**	0	**1**	1
Total Volume	0	1	1	0	0	0	1	0	1	2
% App. Total	0	100		0	0		100	0		
PHF	.000	.250	.250	.000	.000	.000	.250	.000	.250	.500

Accurate Counts
978-664-2565

N/S Street : Bennington Street
E/W Street : Crescent Avenue
City/State : Revere, MA
Weather : Clear

File Name : 10271SA5
Site Code : 10271005
Start Date : 4/27/2013
Page No : 1

Groups Printed- Bikes Peds

	Bennington St From North			Crescent Ave From East			Bennington St From South					
Start Time	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
02:30 PM	0	0	5	0	0	3	1	0	1	9	1	10
02:45 PM	0	0	0	0	0	1	0	0	0	1	0	1
Total	0	0	5	0	0	4	1	0	1	10	1	11
03:00 PM	0	1	1	0	0	4	0	0	2	7	1	8
03:15 PM	0	0	1	0	0	0	1	0	0	1	1	2
03:30 PM	0	1	2	0	0	2	3	0	0	4	4	8
03:45 PM	0	1	0	0	0	2	0	0	0	2	1	3
Total	0	3	4	0	0	8	4	0	2	14	7	21
04:00 PM	0	0	0	0	0	1	0	0	2	3	0	3
04:15 PM	0	2	0	0	0	1	0	0	0	1	2	3
04:30 PM	0	1	1	0	0	5	1	0	1	7	2	9
04:45 PM	0	2	1	0	0	3	0	0	3	7	2	9
Total	0	5	2	0	0	10	1	0	6	18	6	24
05:00 PM	0	1	3	0	0	1	0	0	0	4	1	5
05:15 PM	0	1	2	0	0	7	0	0	0	9	1	10
Grand Total	0	10	16	0	0	30	6	0	9	55	16	71
Apprch %	0	100		0	0		100	0				
Total %	0	62.5		0	0		37.5	0		77.5	22.5	

	Bennington St From North			Crescent Ave From East			Bennington St From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 03:00 PM										
03:00 PM	0	**1**	**1**	0	0	0	0	0	0	1
03:15 PM	0	0	0	0	0	0	1	0	1	1
03:30 PM	0	1	1	0	0	0	**3**	0	**3**	**4**
03:45 PM	0	1	1	0	0	0	0	0	0	1
Total Volume	0	3	3	0	0	0	4	0	4	7
% App. Total	0	100		0	0		100	0		
PHF	.000	.750	.750	.000	.000	.000	.333	.000	.333	.438

Accurate Counts
978-664-2565

N/S Street : Route 1A
E/W Street : Curtis Road / Rte 1A Ramp
City/State : Revere, MA
Weather : Clear

File Name : 10271SA6
Site Code : 10271006
Start Date : 4/27/2013
Page No : 1

Groups Printed- Cars - Trucks - Buses

	Route 1A From North			Route 1A From South			Off Ramp From Southwest			Curtis St From West			
Start Time	Thru	BrRt	Right	HdLt	Left	Thru	HdLt	BrLt	HdRt	Left	Right	HdRt	Int. Total
02:30 PM	321	76	29	0	0	0	0	0	0	0	35	34	495
02:45 PM	283	105	30	0	0	0	0	0	0	0	32	36	486
Total	604	181	59	0	0	0	0	0	0	0	67	70	981
03:00 PM	759	17	6	0	0	0	0	0	0	0	17	10	809
03:15 PM	390	59	15	0	0	0	0	0	0	0	42	58	564
03:30 PM	50	24	17	0	0	0	0	0	0	0	38	41	170
03:45 PM	378	60	34	0	0	0	0	0	0	0	32	39	543
Total	1577	160	72	0	0	0	0	0	0	0	129	148	2086
04:00 PM	412	55	29	0	0	0	0	0	0	0	33	32	561
04:15 PM	385	79	35	0	0	0	0	0	0	0	33	35	567
04:30 PM	424	83	28	0	0	0	0	0	0	0	38	27	600
04:45 PM	457	90	33	0	0	0	0	0	0	0	25	20	625
Total	1678	307	125	0	0	0	0	0	0	0	129	114	2353
05:00 PM	408	61	36	0	0	0	0	0	0	0	31	34	570
05:15 PM	507	85	19	0	0	0	0	0	0	0	31	25	667
Grand Total	4774	794	311	0	0	0	0	0	0	0	387	391	6657
Apprch %	81.2	13.5	5.3	0	0	0	0	0	0	0	49.7	50.3	
Total %	71.7	11.9	4.7	0	0	0	0	0	0	0	5.8	5.9	
Cars	4717	790	308	0	0	0	0	0	0	0	350	381	6546
% Cars	98.8	99.5	99	0	0	0	0	0	0	0	90.4	97.4	98.3
Trucks	36	2	3	0	0	0	0	0	0	0	7	9	57
% Trucks	0.8	0.3	1	0	0	0	0	0	0	0	1.8	2.3	0.9
Buses	21	2	0	0	0	0	0	0	0	0	30	1	54
% Buses	0.4	0.3	0	0	0	0	0	0	0	0	7.8	0.3	0.8

	Route 1A From North				Route 1A From South				Off Ramp From Southwest				Curtis St From West				
Start Time	Thru	BrRt	Right	App. Total	HdLt	Left	Thru	App. Total	HdLt	BrLt	HdRt	App. Total	Left	Right	HdRt	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	424	83	28	535	0	0	0	0	0	0	0	0	0	**38**	27	**65**	600
04:45 PM	457	**90**	33	580	0	0	0	0	0	0	0	0	0	25	20	45	625
05:00 PM	408	61	**36**	505	0	0	0	0	0	0	0	0	0	31	**34**	65	570
05:15 PM	**507**	85	19	**611**	0	0	0	0	0	0	0	0	0	31	25	56	**667**
Total Volume	1796	319	116	2231	0	0	0	0	0	0	0	0	0	125	106	231	2462
% App. Total	80.5	14.3	5.2		0	0	0		0	0	0		0	54.1	45.9		
PHF	.886	.886	.806	.913	.000	.000	.000	.000	.000	.000	.000	.000	.000	.822	.779	.888	.923
Cars	1779	317	115	2211	0	0	0	0	0	0	0	0	0	114	103	217	2428
% Cars	99.1	99.4	99.1	99.1	0	0	0	0	0	0	0	0	0	91.2	97.2	93.9	98.6
Trucks	12	2	1	15	0	0	0	0	0	0	0	0	0	1	3	4	19
% Trucks	0.7	0.6	0.9	0.7	0	0	0	0	0	0	0	0	0	0.8	2.8	1.7	0.8
Buses	5	0	0	5	0	0	0	0	0	0	0	0	0	10	0	10	15
% Buses	0.3	0	0	0.2	0	0	0	0	0	0	0	0	0	8.0	0	4.3	0.6

Accurate Counts
978-664-2565

N/S Street : Route 1A
E/W Street : Curtis Road / Rte 1A Ramp
City/State : Revere, MA
Weather : Clear

File Name : 10271SA6
Site Code : 10271006
Start Date : 4/27/2013
Page No : 1

Groups Printed- Trucks

	Route 1A From North			Route 1A From South			Off Ramp From Southwest			Curtis St From West			
Start Time	Thru	BrRt	Right	HdLt	Left	Thru	HdLt	BrLt	HdRt	Left	Right	HdRt	Int. Total
02:30 PM	4	0	1	0	0	0	0	0	0	0	0	2	7
02:45 PM	3	0	0	0	0	0	0	0	0	0	1	0	4
Total	7	0	1	0	0	0	0	0	0	0	1	2	11
03:00 PM	3	0	0	0	0	0	0	0	0	0	0	1	4
03:15 PM	2	0	0	0	0	0	0	0	0	0	1	0	3
03:30 PM	1	0	0	0	0	0	0	0	0	0	2	1	4
03:45 PM	4	0	1	0	0	0	0	0	0	0	1	0	6
Total	10	0	1	0	0	0	0	0	0	0	4	2	17
04:00 PM	3	0	0	0	0	0	0	0	0	0	0	1	4
04:15 PM	4	0	0	0	0	0	0	0	0	0	1	1	6
04:30 PM	4	1	0	0	0	0	0	0	0	0	1	1	7
04:45 PM	3	0	1	0	0	0	0	0	0	0	0	1	5
Total	14	1	1	0	0	0	0	0	0	0	2	4	22
05:00 PM	4	0	0	0	0	0	0	0	0	0	0	0	4
05:15 PM	1	1	0	0	0	0	0	0	0	0	0	1	3
Grand Total	36	2	3	0	0	0	0	0	0	0	7	9	57
Apprch %	87.8	4.9	7.3	0	0	0	0	0	0	0	43.8	56.2	
Total %	63.2	3.5	5.3	0	0	0	0	0	0	0	12.3	15.8	

	Route 1A From North				Route 1A From South				Off Ramp From Southwest				Curtis St From West				
Start Time	Thru	BrRt	Right	App. Total	HdLt	Left	Thru	App. Total	HdLt	BrLt	HdRt	App. Total	Left	Right	HdRt	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:45 PM																	
03:45 PM	**4**	0	**1**	**5**	0	0	0	0	0	0	0	0	0	**1**	0	1	6
04:00 PM	3	0	0	3	0	0	0	0	0	0	0	0	0	0	**1**	1	4
04:15 PM	4	0	0	4	0	0	0	0	0	0	0	0	0	1	1	**2**	6
04:30 PM	4	**1**	0	5	0	0	0	0	0	0	0	0	0	1	1	2	**7**
Total Volume	15	1	1	17	0	0	0	0	0	0	0	0	0	3	3	6	23
% App. Total	88.2	5.9	5.9		0	0	0		0	0	0		0	50	50		
PHF	.938	.250	.250	.850	.000	.000	.000	.000	.000	.000	.000	.000	.000	.750	.750	.750	.821

Accurate Counts
978-664-2565

N/S Street : Route 1A
E/W Street : Curtis Road / Rte 1A Ramp
City/State : Revere, MA
Weather : Clear

File Name : 10271SA6
Site Code : 10271006
Start Date : 4/27/2013
Page No : 1

Groups Printed- Buses

	Route 1A From North			Route 1A From South			Off Ramp From Southwest			Curtis St From West			
Start Time	Thru	BrRt	Right	HdLt	Left	Thru	HdLt	BrLt	HdRt	Left	Right	HdRt	Int. Total
02:30 PM	2	1	0	0	0	0	0	0	0	0	3	0	6
02:45 PM	0	0	0	0	0	0	0	0	0	0	2	1	3
Total	2	1	0	0	0	0	0	0	0	0	5	1	9
03:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
03:15 PM	5	0	0	0	0	0	0	0	0	0	3	0	8
03:30 PM	0	0	0	0	0	0	0	0	0	0	3	0	3
03:45 PM	0	0	0	0	0	0	0	0	0	0	2	0	2
Total	5	0	0	0	0	0	0	0	0	0	9	0	14
04:00 PM	5	0	0	0	0	0	0	0	0	0	4	0	9
04:15 PM	4	1	0	0	0	0	0	0	0	0	2	0	7
04:30 PM	3	0	0	0	0	0	0	0	0	0	3	0	6
04:45 PM	0	0	0	0	0	0	0	0	0	0	2	0	2
Total	12	1	0	0	0	0	0	0	0	0	11	0	24
05:00 PM	1	0	0	0	0	0	0	0	0	0	3	0	4
05:15 PM	1	0	0	0	0	0	0	0	0	0	2	0	3
Grand Total	21	2	0	0	0	0	0	0	0	0	30	1	54
Apprch %	91.3	8.7	0	0	0	0	0	0	0	0	96.8	3.2	
Total %	38.9	3.7	0	0	0	0	0	0	0	0	55.6	1.9	

	Route 1A From North				Route 1A From South				Off Ramp From Southwest				Curtis St From West				
Start Time	Thru	BrRt	Right	App. Total	HdLt	Left	Thru	App. Total	HdLt	BrLt	HdRt	App. Total	Left	Right	HdRt	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:45 PM																	
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2
04:00 PM	**5**	0	0	**5**	0	0	0	0	0	0	0	0	0	**4**	0	**4**	**9**
04:15 PM	4	**1**	0	5	0	0	0	0	0	0	0	0	0	2	0	2	7
04:30 PM	3	0	0	3	0	0	0	0	0	0	0	0	0	3	0	3	6
Total Volume	12	1	0	13	0	0	0	0	0	0	0	0	0	11	0	11	24
% App. Total	92.3	7.7	0		0	0	0		0	0	0		0	100	0		
PHF	.600	.250	.000	.650	.000	.000	.000	.000	.000	.000	.000	.000	.000	.688	.000	.688	.667

Accurate Counts
978-664-2565

N/S Street : Saratoga Street
E/W Street: Neptune Road
City/State : East Boston, MA
Weather : Clear

File Name : 10271SA7
Site Code : 10271007
Start Date : 4/27/2013
Page No : 1

Groups Printed- Cars - Trucks - Buses

	Saratoga St From North			Neptune Rd From East			Saratoga St From South			Neptune Rd From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
02:30 PM	1	0	70	0	72	0	0	110	8	36	30	0	327
02:45 PM	5	0	59	0	69	4	0	55	8	33	24	0	257
Total	6	0	129	0	141	4	0	165	16	69	54	0	584
03:00 PM	1	0	38	0	74	2	0	53	11	43	14	0	236
03:15 PM	1	0	115	0	18	2	0	2	3	30	13	0	184
03:30 PM	4	0	97	0	125	5	0	27	13	36	33	0	340
03:45 PM	2	0	85	0	91	1	0	37	14	53	34	0	317
Total	8	0	335	0	308	10	0	119	41	162	94	0	1077
04:00 PM	3	0	86	0	88	2	1	25	12	49	23	0	289
04:15 PM	5	0	72	0	53	2	1	33	13	35	21	0	235
04:30 PM	8	0	80	0	44	4	2	29	9	23	16	0	215
04:45 PM	2	0	109	0	58	3	0	45	20	38	24	0	299
Total	18	0	347	0	243	11	4	132	54	145	84	0	1038
05:00 PM	1	0	62	0	53	4	0	49	16	29	8	0	222
05:15 PM	5	0	75	0	57	2	0	28	12	26	16	0	221
Grand Total	38	0	948	0	802	31	4	493	139	431	256	0	3142
Apprch %	3.9	0	96.1	0	96.3	3.7	0.6	77.5	21.9	62.7	37.3	0	
Total %	1.2	0	30.2	0	25.5	1	0.1	15.7	4.4	13.7	8.1	0	
Cars	37	0	945	0	787	31	4	491	138	429	250	0	3112
% Cars	97.4	0	99.7	0	98.1	100	100	99.6	99.3	99.5	97.7	0	99
Trucks	1	0	3	0	11	0	0	2	1	2	1	0	21
% Trucks	2.6	0	0.3	0	1.4	0	0	0.4	0.7	0.5	0.4	0	0.7
Buses	0	0	0	0	4	0	0	0	0	0	5	0	9
% Buses	0	0	0	0	0.5	0	0	0	0	0	2	0	0.3

	Saratoga St From North				Neptune Rd From East				Saratoga St From South				Neptune Rd From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:30 PM																	
03:30 PM	4	0	**97**	**101**	0	**125**	**5**	**130**	0	27	13	40	36	33	0	69	**340**
03:45 PM	2	0	85	87	0	91	1	92	0	**37**	**14**	**51**	**53**	**34**	0	**87**	317
04:00 PM	3	0	86	89	0	88	2	90	**1**	25	12	38	49	23	0	72	289
04:15 PM	**5**	0	72	77	0	53	2	55	1	33	13	47	35	21	0	56	235
Total Volume	14	0	340	354	0	357	10	367	2	122	52	176	173	111	0	284	1181
% App. Total	4	0	96		0	97.3	2.7		1.1	69.3	29.5		60.9	39.1	0		
PHF	.700	.000	.876	.876	.000	.714	.500	.706	.500	.824	.929	.863	.816	.816	.000	.816	.868
Cars	14	0	339	353	0	348	10	358	2	122	52	176	172	108	0	280	1167
% Cars	100	0	99.7	99.7	0	97.5	100	97.5	100	100	100	100	99.4	97.3	0	98.6	98.8
Trucks	0	0	1	1	0	6	0	6	0	0	0	0	1	1	0	2	9
% Trucks	0	0	0.3	0.3	0	1.7	0	1.6	0	0	0	0	0.6	0.9	0	0.7	0.8
Buses	0	0	0	0	0	3	0	3	0	0	0	0	0	2	0	2	5
% Buses	0	0	0	0	0	0.8	0	0.8	0	0	0	0	0	1.8	0	0.7	0.4

Accurate Counts
978-664-2565

N/S Street : Saratoga Street
E/W Street: Neptune Road
City/State : East Boston, MA
Weather : Clear

File Name : 10271SA7
Site Code : 10271007
Start Date : 4/27/2013
Page No : 1

Groups Printed- Trucks

	Saratoga St From North			Neptune Rd From East			Saratoga St From South			Neptune Rd From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
02:30 PM	0	0	0	0	0	0	0	1	0	1	0	0	2
02:45 PM	0	0	1	0	0	0	0	1	0	0	0	0	2
Total	0	0	1	0	0	0	0	2	0	1	0	0	4
03:00 PM	0	0	0	0	1	0	0	0	1	0	0	0	2
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
03:45 PM	0	0	0	0	2	0	0	0	0	0	0	0	2
Total	0	0	0	0	4	0	0	0	1	0	0	0	5
04:00 PM	0	0	1	0	2	0	0	0	0	0	0	0	3
04:15 PM	0	0	0	0	1	0	0	0	0	1	1	0	3
04:30 PM	1	0	0	0	0	0	0	0	0	0	0	0	1
04:45 PM	0	0	1	0	2	0	0	0	0	0	0	0	3
Total	1	0	2	0	5	0	0	0	0	1	1	0	10
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	2	0	0	0	0	0	0	0	2
Grand Total	1	0	3	0	11	0	0	2	1	2	1	0	21
Apprch %	25	0	75	0	100	0	0	66.7	33.3	66.7	33.3	0	
Total %	4.8	0	14.3	0	52.4	0	0	9.5	4.8	9.5	4.8	0	

	Saratoga St From North				Neptune Rd From East				Saratoga St From South				Neptune Rd From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	0	**1**	**1**	0	**2**	0	**2**	0	0	0	0	0	0	0	0	**3**
04:15 PM	0	0	0	0	0	1	0	1	0	0	0	0	**1**	**1**	0	**2**	3
04:30 PM	**1**	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
04:45 PM	0	0	1	1	0	2	0	2	0	0	0	0	0	0	0	0	3
Total Volume	1	0	2	3	0	5	0	5	0	0	0	0	1	1	0	2	10
% App. Total	33.3	0	66.7		0	100	0		0	0	0		50	50	0		
PHF	.250	.000	.500	.750	.000	.625	.000	.625	.000	.000	.000	.000	.250	.250	.000	.250	.833

Accurate Counts
978-664-2565

N/S Street : Saratoga Street
E/W Street: Neptune Road
City/State : East Boston, MA
Weather : Clear

File Name : 10271SA7
Site Code : 10271007
Start Date : 4/27/2013
Page No : 1

Groups Printed- Buses

	Saratoga St From North			Neptune Rd From East			Saratoga St From South			Neptune Rd From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	1	0	0	0	0	0	1	0	2
03:45 PM	0	0	0	0	1	0	0	0	0	0	1	0	2
Total	0	0	0	0	2	0	0	0	0	0	3	0	5
04:00 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
Total	0	0	0	0	1	0	0	0	0	0	1	0	2
05:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
05:15 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
Grand Total	0	0	0	0	4	0	0	0	0	0	5	0	9
Apprch %	0	0	0	0	100	0	0	0	0	0	100	0	
Total %	0	0	0	0	44.4	0	0	0	0	0	55.6	0	

	Saratoga St From North				Neptune Rd From East				Saratoga St From South				Neptune Rd From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:00 PM																	
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	**1**	1
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	**1**	0	**1**	0	0	0	0	0	1	0	1	**2**
03:45 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	1	2
Total Volume	0	0	0	0	0	2	0	2	0	0	0	0	0	3	0	3	5
% App. Total	0	0	0		0	100	0		0	0	0		0	100	0		
PHF	.000	.000	.000	.000	.000	.500	.000	.500	.000	.000	.000	.000	.000	.750	.000	.750	.625

Accurate Counts
978-664-2565

N/S Street : Saratoga Street
E/W Street: Neptune Road
City/State : East Boston, MA
Weather : Clear

File Name : 10271SA7
Site Code : 10271007
Start Date : 4/27/2013
Page No : 1

Groups Printed- Bikes Peds

	Saratoga St From North				Neptune Rd From East				Saratoga St From South				Neptune Rd From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
02:30 PM	0	0	0	0	0	0	0	12	0	0	0	1	0	0	0	1	14	0	14
02:45 PM	0	1	0	2	0	0	0	14	0	0	0	3	0	0	0	0	19	1	20
Total	0	1	0	2	0	0	0	26	0	0	0	4	0	0	0	1	33	1	34
03:00 PM	0	0	0	2	0	0	0	3	0	0	0	0	0	0	0	0	5	0	5
03:15 PM	0	0	0	3	0	0	0	3	0	0	0	0	0	0	0	0	6	0	6
03:30 PM	0	0	0	5	0	0	0	4	0	0	0	2	0	0	0	0	11	0	11
03:45 PM	0	0	0	3	0	0	0	3	0	0	0	1	0	0	0	0	7	0	7
Total	0	0	0	13	0	0	0	13	0	0	0	3	0	0	0	0	29	0	29
04:00 PM	0	0	0	6	0	0	0	7	0	0	0	8	0	0	0	0	21	0	21
04:15 PM	0	0	1	2	0	0	0	8	0	1	0	4	0	0	0	0	14	2	16
04:30 PM	0	0	0	2	0	0	0	3	0	0	0	2	0	0	0	0	7	0	7
04:45 PM	0	0	0	1	0	0	0	9	0	0	0	3	0	0	0	0	13	0	13
Total	0	0	1	11	0	0	0	27	0	1	0	17	0	0	0	0	55	2	57
05:00 PM	0	0	0	4	0	0	0	10	0	0	0	4	3	0	0	0	18	3	21
05:15 PM	0	0	0	5	0	0	0	5	0	0	0	5	0	0	1	0	15	1	16
Grand Total	0	1	1	35	0	0	0	81	0	1	0	33	3	0	1	1	150	7	157
Apprch %	0	50	50		0	0	0		0	100	0		75	0	25				
Total %	0	14.3	14.3		0	0	0		0	14.3	0		42.9	0	14.3		95.5	4.5	

	Saratoga St From North				Neptune Rd From East				Saratoga St From South				Neptune Rd From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	0	0	**1**	**1**	0	0	0	0	0	**1**	0	**1**	0	0	0	0	2
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	**3**	0	0	**3**	**3**
Total Volume	0	0	1	1	0	0	0	0	0	1	0	1	3	0	0	3	5
% App. Total	0	0	100		0	0	0		0	100	0		100	0	0		
PHF	.000	.000	.250	.250	.000	.000	.000	.000	.000	.250	.000	.250	.250	.000	.000	.250	.417

Accurate Counts
978-664-2565

N/S Street : Bremen Street
E/W Street : Neptune Road
City/State : Revere, MA
Weather : Clear

File Name : 10271SA8
Site Code : 10271008
Start Date : 4/27/2013
Page No : 1

Groups Printed- Cars - Trucks - Buses

	Bremen St From North			Neptune Rd From East			Bremen St From South			Neptune Rd From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
02:30 PM	1	21	1	3	68	0	0	0	0	3	28	9	134
02:45 PM	5	11	3	8	71	2	0	0	0	1	29	7	137
Total	6	32	4	11	139	2	0	0	0	4	57	16	271
03:00 PM	1	5	2	2	71	1	0	0	0	1	18	9	110
03:15 PM	3	2	6	0	15	0	0	0	0	1	13	4	44
03:30 PM	8	15	0	2	124	7	0	0	0	0	43	6	205
03:45 PM	7	16	4	1	92	5	0	0	0	2	35	13	175
Total	19	38	12	5	302	13	0	0	0	4	109	32	534
04:00 PM	5	13	4	2	83	3	0	0	0	1	30	7	148
04:15 PM	5	23	1	1	53	2	0	0	0	0	34	4	123
04:30 PM	4	20	3	0	47	2	0	0	0	3	25	7	111
04:45 PM	3	20	4	1	53	3	0	0	0	4	29	12	129
Total	17	76	12	4	236	10	0	0	0	8	118	30	511
05:00 PM	2	18	2	4	53	0	0	0	0	1	16	9	105
05:15 PM	3	15	3	0	59	1	0	0	0	1	21	9	112
Grand Total	47	179	33	24	789	26	0	0	0	18	321	96	1533
Apprch %	18.1	69.1	12.7	2.9	94	3.1	0	0	0	4.1	73.8	22.1	
Total %	3.1	11.7	2.2	1.6	51.5	1.7	0	0	0	1.2	20.9	6.3	
Cars	47	179	33	24	774	26	0	0	0	18	313	96	1510
% Cars	100	100	100	100	98.1	100	0	0	0	100	97.5	100	98.5
Trucks	0	0	0	0	11	0	0	0	0	0	3	0	14
% Trucks	0	0	0	0	1.4	0	0	0	0	0	0.9	0	0.9
Buses	0	0	0	0	4	0	0	0	0	0	5	0	9
% Buses	0	0	0	0	0.5	0	0	0	0	0	1.6	0	0.6

	Bremen St From North				Neptune Rd From East				Bremen St From South				Neptune Rd From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:30 PM																	
03:30 PM	**8**	15	0	23	**2**	**124**	**7**	**133**	0	0	0	0	0	**43**	6	49	**205**
03:45 PM	7	16	**4**	27	1	92	5	98	0	0	0	0	**2**	35	**13**	**50**	175
04:00 PM	5	13	4	22	2	83	3	88	0	0	0	0	1	30	7	38	148
04:15 PM	5	**23**	1	**29**	1	53	2	56	0	0	0	0	0	34	4	38	123
Total Volume	25	67	9	101	6	352	17	375	0	0	0	0	3	142	30	175	651
% App. Total	24.8	66.3	8.9		1.6	93.9	4.5		0	0	0		1.7	81.1	17.1		
PHF	.781	.728	.563	.871	.750	.710	.607	.705	.000	.000	.000	.000	.375	.826	.577	.875	.794
Cars	25	67	9	101	6	343	17	366	0	0	0	0	3	139	30	172	639
% Cars	100	100	100	100	100	97.4	100	97.6	0	0	0	0	100	97.9	100	98.3	98.2
Trucks	0	0	0	0	0	6	0	6	0	0	0	0	0	1	0	1	7
% Trucks	0	0	0	0	0	1.7	0	1.6	0	0	0	0	0	0.7	0	0.6	1.1
Buses	0	0	0	0	0	3	0	3	0	0	0	0	0	2	0	2	5
% Buses	0	0	0	0	0	0.9	0	0.8	0	0	0	0	0	1.4	0	1.1	0.8

Accurate Counts
978-664-2565

N/S Street : Bremen Street
E/W Street : Neptune Road
City/State : Revere, MA
Weather : Clear

File Name : 10271SA8
Site Code : 10271008
Start Date : 4/27/2013
Page No : 1

Groups Printed- Trucks

	Bremen St From North			Neptune Rd From East			Bremen St From South			Neptune Rd From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00 PM	0	0	0	0	1	0	0	0	0	0	1	0	2
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
03:45 PM	0	0	0	0	2	0	0	0	0	0	0	0	2
Total	0	0	0	0	4	0	0	0	0	0	1	0	5
04:00 PM	0	0	0	0	2	0	0	0	0	0	0	0	2
04:15 PM	0	0	0	0	1	0	0	0	0	0	1	0	2
04:30 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
04:45 PM	0	0	0	0	2	0	0	0	0	0	0	0	2
Total	0	0	0	0	5	0	0	0	0	0	2	0	7
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	2	0	0	0	0	0	0	0	2
Grand Total	0	0	0	0	11	0	0	0	0	0	3	0	14
Apprch %	0	0	0	0	100	0	0	0	0	0	100	0	
Total %	0	0	0	0	78.6	0	0	0	0	0	21.4	0	

	Bremen St From North				Neptune Rd From East				Bremen St From South				Neptune Rd From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:30 PM																	
03:30 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
03:45 PM	0	0	0	0	0	**2**	0	**2**	0	0	0	0	0	0	0	0	**2**
04:00 PM	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	2
04:15 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	**1**	0	**1**	2
Total Volume	0	0	0	0	0	6	0	6	0	0	0	0	0	1	0	1	7
% App. Total	0	0	0		0	100	0		0	0	0		0	100	0		
PHF	.000	.000	.000	.000	.000	.750	.000	.750	.000	.000	.000	.000	.000	.250	.000	.250	.875

Accurate Counts
978-664-2565

N/S Street : Bremen Street
E/W Street : Neptune Road
City/State : Revere, MA
Weather : Clear

File Name : 10271SA8
Site Code : 10271008
Start Date : 4/27/2013
Page No : 1

Groups Printed- Buses

	Bremen St From North			Neptune Rd From East			Bremen St From South			Neptune Rd From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	1	0	0	0	0	0	1	0	2
03:45 PM	0	0	0	0	1	0	0	0	0	0	1	0	2
Total	0	0	0	0	2	0	0	0	0	0	3	0	5
04:00 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
Total	0	0	0	0	1	0	0	0	0	0	1	0	2
05:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
05:15 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
Grand Total	0	0	0	0	4	0	0	0	0	0	5	0	9
Apprch %	0	0	0	0	100	0	0	0	0	0	100	0	
Total %	0	0	0	0	44.4	0	0	0	0	0	55.6	0	

	Bremen St From North				Neptune Rd From East				Bremen St From South				Neptune Rd From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:00 PM																	
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	**1**	1
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	**1**	0	**1**	0	0	0	0	0	1	0	1	**2**
03:45 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	1	2
Total Volume	0	0	0	0	0	2	0	2	0	0	0	0	0	3	0	3	5
% App. Total	0	0	0		0	100	0		0	0	0		0	100	0		
PHF	.000	.000	.000	.000	.000	.500	.000	.500	.000	.000	.000	.000	.000	.750	.000	.750	.625

Accurate Counts
978-664-2565

N/S Street : Bremen Street
E/W Street : Neptune Road
City/State : Revere, MA
Weather : Clear

File Name : 10271SA8
Site Code : 10271008
Start Date : 4/27/2013
Page No : 1

Groups Printed- Bikes Peds

	Bremen St From North				Neptune Rd From East				Bremen St From South				Neptune Rd From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
02:30 PM	0	0	0	8	0	0	0	1	0	0	0	0	0	0	0	3	12	0	12
02:45 PM	0	0	0	5	0	0	0	3	0	0	0	4	0	0	0	1	13	0	13
Total	0	0	0	13	0	0	0	4	0	0	0	4	0	0	0	4	25	0	25
03:00 PM	0	0	0	5	0	0	0	3	0	0	0	4	0	0	0	2	14	0	14
03:15 PM	0	0	0	4	0	0	0	6	0	0	0	2	0	0	0	5	17	0	17
03:30 PM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2	0	2
03:45 PM	0	0	0	3	0	0	0	1	0	0	0	2	0	0	0	4	10	0	10
Total	0	0	0	13	0	0	0	10	0	0	0	8	0	0	0	12	43	0	43
04:00 PM	0	0	0	6	0	0	0	1	0	0	0	1	0	0	0	6	14	0	14
04:15 PM	0	0	0	6	0	0	0	2	0	0	0	4	0	0	0	2	14	0	14
04:30 PM	0	0	0	5	0	0	0	0	0	0	0	3	0	0	0	1	9	0	9
04:45 PM	0	0	0	9	0	0	0	1	0	0	0	1	0	0	0	8	19	0	19
Total	0	0	0	26	0	0	0	4	0	0	0	9	0	0	0	17	56	0	56
05:00 PM	0	0	0	10	0	0	0	0	0	0	0	1	0	0	0	5	16	0	16
05:15 PM	0	0	0	3	0	0	0	1	0	0	0	0	0	0	0	4	8	0	8
Grand Total	0	0	0	65	0	0	0	19	0	0	0	22	0	0	0	42	148	0	148
Apprch %	0	0	0		0	0	0		0	0	0		0	0	0				
Total %																	100	0	

	Bremen St From North				Neptune Rd From East				Bremen St From South				Neptune Rd From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 02:30 PM																	
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0		0	0	0		0	0	0		0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

N/S/NW: North Shore Rd/ Wonderland Lot
E/W: Bus Access/ VFW Parkway
City, State: Revere, MA
Client: VHB/ R. White

File Name : 133332 (Butler Circle) B
Site Code : 10271.07
Start Date : 5/10/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles - Buses

	North Shore Road (Route 1A) From North					MBTA Bus Access From East					North Shore Road From South					VFW Parkway (Route 1A) From West					Wonderland Parking Lot From Northwest					
Start Time	Hard Right	Right	Thru	Left	U-Turn	Right	Bear Right	Thru	Left	U-Turn	Right	Thru	Bear Left	Left	U-Turn	Right	Thru	Left	Hard Left	U-Turn	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	Int. Total
03:30 PM	0	222	68	3	4	0	0	0	0	0	1	98	0	0	5	11	1	257	0	0	0	0	0	0	0	670
03:45 PM	0	244	63	1	5	0	0	0	0	0	0	89	2	3	1	5	0	253	0	3	0	0	0	0	0	669
Total	0	466	131	4	9	0	0	0	0	0	1	187	2	3	6	16	1	510	0	3	0	0	0	0	0	1339
04:00 PM	0	163	62	3	6	0	0	0	0	0	3	95	0	5	3	10	1	237	0	2	0	0	0	0	0	590
04:15 PM	0	207	65	2	7	0	0	0	0	0	1	109	0	1	2	7	1	219	0	8	0	0	0	0	0	629
04:30 PM	0	192	62	3	6	0	0	0	0	0	0	102	1	6	0	17	0	266	1	0	4	1	0	0	0	661
04:45 PM	1	197	67	2	6	0	0	0	0	0	2	106	0	1	1	7	2	219	2	6	1	0	0	0	0	620
Total	1	759	256	10	25	0	0	0	0	0	6	412	1	13	6	41	4	941	3	16	5	1	0	0	0	2500
05:00 PM	0	168	57	2	4	0	0	0	0	0	1	114	0	4	0	5	1	248	0	1	1	0	0	0	0	606
05:15 PM	0	182	68	4	7	0	0	0	0	0	2	103	1	0	1	3	0	229	0	1	5	1	0	1	0	608
05:30 PM	0	192	48	3	9	0	0	0	0	0	2	107	0	0	3	8	1	252	0	3	0	0	0	0	0	628
05:45 PM	0	190	54	2	3	0	0	0	0	0	1	100	1	1	1	13	0	282	0	3	5	0	0	0	0	656
Total	0	732	227	11	23	0	0	0	0	0	6	424	2	5	5	29	2	1011	0	8	11	1	0	1	0	2498
06:00 PM	0	207	65	2	3	0	0	0	0	0	1	84	0	8	1	15	1	239	0	3	0	0	0	0	0	629
06:15 PM	0	167	55	4	4	0	0	0	0	0	2	76	0	7	0	6	1	239	0	0	0	0	0	0	0	561
Grand Total	1	2331	734	31	64	0	0	0	0	0	16	1183	5	36	18	107	9	2940	3	30	16	2	0	1	0	7527
Apprch %	0	73.7	23.2	1	2	0	0	0	0	0	1.3	94	0.4	2.9	1.4	3.5	0.3	95.2	0.1	1	84.2	10.5	0	5.3	0	
Total %	0	31	9.8	0.4	0.9	0	0	0	0	0	0.2	15.7	0.1	0.5	0.2	1.4	0.1	39.1	0	0.4	0.2	0	0	0	0	
Cars	1	2273	691	0	62	0	0	0	0	0	0	1158	2	36	17	106	0	2852	3	30	15	2	0	1	0	7249
% Cars	100	97.5	94.1	0	96.9	0	0	0	0	0	0	97.9	40	100	94.4	99.1	0	97	100	100	93.8	100	0	100	0	96.3
Heavy Vehicles	0	44	22	0	2	0	0	0	0	0	0	16	2	0	1	1	0	74	0	0	0	0	0	0	0	162
% Heavy Vehicles	0	1.9	3	0	3.1	0	0	0	0	0	0	1.4	40	0	5.6	0.9	0	2.5	0	0	0	0	0	0	0	2.2
Buses	0	14	21	31	0	0	0	0	0	0	16	9	1	0	0	0	9	14	0	0	1	0	0	0	0	116
% Buses	0	0.6	2.9	100	0	0	0	0	0	0	100	0.8	20	0	0	0	100	0.5	0	0	6.2	0	0	0	0	1.5

	North Shore Road (Route 1A) From North						MBTA Bus Access From East						North Shore Road From South						VFW Parkway (Route 1A) From West						Wonderland Parking Lot From Northwest						
Start Time	Hard Right	Right	Thru	Left	U-Turn	App. Total	Right	Bear Right	Thru	Left	U-Turn	App. Total	Right	Thru	Bear Left	Left	U-Turn	App. Total	Right	Thru	Left	Hard Left	U-Turn	App. Total	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																															
Peak Hour for Entire Intersection Begins at 03:30 PM																															
03:30 PM	0	222	**68**	**3**	4	297	0	0	0	0	0	0	1	98	0	0	**5**	104	**11**	**1**	**257**	0	0	**269**	0	0	0	0	0	0	**670**
03:45 PM	0	**244**	63	1	5	**313**	0	0	0	0	0	0	0	89	**2**	3	1	95	5	0	253	0	3	261	0	0	0	0	0	0	669
04:00 PM	0	163	62	3	6	234	0	0	0	0	0	0	**3**	95	0	**5**	3	106	10	1	237	0	2	250	0	0	0	0	0	0	590
04:15 PM	0	207	65	2	**7**	281	0	0	0	0	0	0	1	**109**	0	1	2	**113**	7	1	219	0	**8**	235	0	0	0	0	0	0	629
Total Volume	0	836	258	9	22	1125	0	0	0	0	0	0	5	391	2	9	11	418	33	3	966	0	13	1015	0	0	0	0	0	0	2558
% App. Total	0	74.3	22.9	0.8	2		0	0	0	0	0		1.2	93.5	0.5	2.2	2.6		3.3	0.3	95.2	0	1.3		0	0	0	0	0		
PHF	.000	.857	.949	.750	.786	.899	.000	.000	.000	.000	.000	.000	.417	.897	.250	.450	.550	.925	.750	.750	.940	.000	.406	.943	.000	.000	.000	.000	.000	.000	.954
Cars	0	808	244	0	21	1073	0	0	0	0	0	0	0	384	0	9	10	403	32	0	928	0	13	973	0	0	0	0	0	0	2449
% Cars	0	96.7	94.6	0	95.5	95.4	0	0	0	0	0	0	0	98.2	0	100	90.9	96.4	97.0	0	96.1	0	100	95.9	0	0	0	0	0	0	95.7
Heavy Vehicles	0	24	6	0	1	31	0	0	0	0	0	0	0	5	1	0	1	7	1	0	36	0	0	37	0	0	0	0	0	0	75
% Heavy Vehicles	0	2.9	2.3	0	4.5	2.8	0	0	0	0	0	0	0	1.3	50.0	0	9.1	1.7	3.0	0	3.7	0	0	3.6	0	0	0	0	0	0	2.9
Buses	0	4	8	9	0	21	0	0	0	0	0	0	5	2	1	0	0	8	0	3	2	0	0	5	0	0	0	0	0	0	34
% Buses	0	0.5	3.1	100	0	1.9	0	0	0	0	0	0	100	0.5	50.0	0	0	1.9	0	100	0.2	0	0	0.5	0	0	0	0	0	0	1.3

N/S/NW: North Shore Rd/ Wonderland Lot
E/W: Bus Access/ VFW Parkway
City, State: Revere, MA
Client: VHB/ R. White

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
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File Name : 133332 (Butler Circle) B
Site Code : 10271.07
Start Date : 5/10/2013
Page No : 1

Groups Printed- Heavy Vehicles

	North Shore Road (Route 1A) From North					MBTA Bus Access From East					North Shore Road From South					VFW Parkway (Route 1A) From West					Wonderland Parking Lot From Northwest					
Start Time	Hard Right	Right	Thru	Left	U-Turn	Right	Bear Right	Thru	Left	U-Turn	Right	Thru	Bear Left	Left	U-Turn	Right	Thru	Left	Hard Left	U-Turn	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	Int. Total
03:30 PM	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	6
03:45 PM	0	8	2	0	0	0	0	0	0	0	0	3	1	0	0	0	0	12	0	0	0	0	0	0	0	26
Total	0	13	2	0	0	0	0	0	0	0	0	3	1	0	0	0	0	13	0	0	0	0	0	0	0	32
04:00 PM	0	4	1	0	0	0	0	0	0	0	0	1	0	0	1	1	0	10	0	0	0	0	0	0	0	18
04:15 PM	0	7	3	0	1	0	0	0	0	0	0	1	0	0	0	0	0	13	0	0	0	0	0	0	0	25
04:30 PM	0	1	5	0	0	0	0	0	0	0	0	1	1	0	0	0	0	8	0	0	0	0	0	0	0	16
04:45 PM	0	3	3	0	0	0	0	0	0	0	0	5	0	0	0	0	0	4	0	0	0	0	0	0	0	15
Total	0	15	12	0	1	0	0	0	0	0	0	8	1	0	1	1	0	35	0	0	0	0	0	0	0	74
05:00 PM	0	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	11
05:15 PM	0	3	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	3	0	0	0	0	0	0	0	9
05:30 PM	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	6	0	0	0	0	0	0	0	8
05:45 PM	0	3	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	4	0	0	0	0	0	0	0	10
Total	0	9	7	0	0	0	0	0	0	0	0	3	0	0	0	0	0	19	0	0	0	0	0	0	0	38
06:00 PM	0	3	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	4	0	0	0	0	0	0	0	9
06:15 PM	0	4	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	9
Grand Total	0	44	22	0	2	0	0	0	0	0	0	16	2	0	1	1	0	74	0	0	0	0	0	0	0	162
Apprch %	0	64.7	32.4	0	2.9	0	0	0	0	0	0	84.2	10.5	0	5.3	1.3	0	98.7	0	0	0	0	0	0	0	
Total %	0	27.2	13.6	0	1.2	0	0	0	0	0	0	9.9	1.2	0	0.6	0.6	0	45.7	0	0	0	0	0	0	0	

	North Shore Road (Route 1A) From North						MBTA Bus Access From East						North Shore Road From South						VFW Parkway (Route 1A) From West						Wonderland Parking Lot From Northwest						
Start Time	Hard Right	Right	Thru	Left	U-Turn	App. Total	Right	Bear Right	Thru	Left	U-Turn	App. Total	Right	Thru	Bear Left	Left	U-Turn	App. Total	Right	Thru	Left	Hard Left	U-Turn	App. Total	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																														
Peak Hour for Entire Intersection Begins at 03:45 PM																														
03:45 PM	0	**8**	2	0	0	10	0	0	0	0	0	0	0	**3**	**1**	0	0	**4**	0	0	12	0	0	12	0	0	0	0	0	0	**26**
04:00 PM	0	4	1	0	0	5	0	0	0	0	0	0	0	1	0	0	**1**	2	**1**	0	10	0	0	11	0	0	0	0	0	0	18
04:15 PM	0	7	3	0	**1**	**11**	0	0	0	0	0	0	0	1	0	0	0	1	0	0	**13**	0	0	**13**	0	0	0	0	0	0	25
04:30 PM	0	1	**5**	0	0	6	0	0	0	0	0	0	0	1	1	0	0	2	0	0	8	0	0	8	0	0	0	0	0	0	16
Total Volume	0	20	11	0	1	32	0	0	0	0	0	0	0	6	2	0	1	9	1	0	43	0	0	44	0	0	0	0	0	0	85
% App. Total	0	62.5	34.4	0	3.1		0	0	0	0	0		0	66.7	22.2	0	11.1		2.3	0	97.7	0	0		0	0	0	0	0		
PHF	.000	.625	.550	.000	.250	.727	.000	.000	.000	.000	.000	.000	.000	.500	.500	.000	.250	.563	.250	.000	.827	.000	.000	.846	.000	.000	.000	.000	.000	.000	.817

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N/S/NW: North Shore Rd/ Wonderland Lot
E/W: Bus Access/ VFW Parkway
City, State: Revere, MA
Client: VHB/ R. White

File Name : 133332 (Butler Circle) B
Site Code : 10271.07
Start Date : 5/10/2013

Groups Printed- Buses

	North Shore Road (Route 1A) From North					MBTA Bus Access From East					North Shore Road From South					VFW Parkway (Route 1A) From West					Wonderland Parking Lot From Northwest					
Start Time	Hard Right	Right	Thru	Left	U-Turn	Right	Bear Right	Thru	Left	U-Turn	Right	Thru	Bear Left	Left	U-Turn	Right	Thru	Left	Hard Left	U-Turn	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	Int. Total
03:30 PM	0	2	3	3	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	11
03:45 PM	0	1	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	6
Total	0	3	4	4	0	0	0	0	0	0	1	1	1	0	0	0	1	2	0	0	0	0	0	0	0	17
04:00 PM	0	1	1	3	0	0	0	0	0	0	3	1	0	0	0	0	1	0	0	0	0	0	0	0	0	10
04:15 PM	0	0	3	2	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	7
04:30 PM	0	1	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	8
04:45 PM	0	2	2	2	0	0	0	0	0	0	2	0	0	0	0	0	2	2	0	0	0	0	0	0	0	12
Total	0	4	9	10	0	0	0	0	0	0	6	1	0	0	0	0	4	3	0	0	0	0	0	0	0	37
05:00 PM	0	2	1	2	0	0	0	0	0	0	1	1	0	0	0	0	1	3	0	0	1	0	0	0	0	12
05:15 PM	0	0	2	4	0	0	0	0	0	0	2	2	0	0	0	0	0	1	0	0	0	0	0	0	0	11
05:30 PM	0	1	1	3	0	0	0	0	0	0	2	1	0	0	0	0	1	1	0	0	0	0	0	0	0	10
05:45 PM	0	2	2	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Total	0	5	6	11	0	0	0	0	0	0	6	4	0	0	0	0	2	5	0	0	1	0	0	0	0	40
06:00 PM	0	1	0	2	0	0	0	0	0	0	1	1	0	0	0	0	1	2	0	0	0	0	0	0	0	8
06:15 PM	0	1	2	4	0	0	0	0	0	0	2	2	0	0	0	0	1	2	0	0	0	0	0	0	0	14
Grand Total	0	14	21	31	0	0	0	0	0	0	16	9	1	0	0	0	9	14	0	0	1	0	0	0	0	116
Apprch %	0	21.2	31.8	47	0	0	0	0	0	0	61.5	34.6	3.8	0	0	0	39.1	60.9	0	0	100	0	0	0	0	
Total %	0	12.1	18.1	26.7	0	0	0	0	0	0	13.8	7.8	0.9	0	0	0	7.8	12.1	0	0	0.9	0	0	0	0	

	North Shore Road (Route 1A) From North						MBTA Bus Access From East						North Shore Road From South						VFW Parkway (Route 1A) From West						Wonderland Parking Lot From Northwest						
Start Time	Hard Right	Right	Thru	Left	U-Turn	App. Total	Right	Bear Right	Thru	Left	U-Turn	App. Total	Right	Thru	Bear Left	Left	U-Turn	App. Total	Right	Thru	Left	Hard Left	U-Turn	App. Total	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																														
Peak Hour for Entire Intersection Begins at 04:45 PM																														
04:45 PM	0	**2**	**2**	2	0	**6**	0	0	0	0	0	0	**2**	0	0	0	0	2	0	**2**	2	0	0	**4**	0	0	0	0	0	0	**12**
05:00 PM	0	2	1	2	0	5	0	0	0	0	0	0	1	1	0	0	0	2	0	1	**3**	0	0	4	**1**	0	0	0	0	**1**	12
05:15 PM	0	0	2	**4**	0	6	0	0	0	0	0	0	2	**2**	0	0	0	**4**	0	0	1	0	0	1	0	0	0	0	0	0	11
05:30 PM	0	1	1	3	0	5	0	0	0	0	0	0	2	1	0	0	0	3	0	1	1	0	0	2	0	0	0	0	0	0	10
Total Volume	0	5	6	11	0	22	0	0	0	0	0	0	7	4	0	0	0	11	0	4	7	0	0	11	1	0	0	0	0	1	45
% App. Total	0	22.7	27.3	50	0		0	0	0	0	0		63.6	36.4	0	0	0		0	36.4	63.6	0	0		100	0	0	0	0		
PHF	.000	.625	.750	.688	.000	.917	.000	.000	.000	.000	.000	.000	.875	.500	.000	.000	.000	.688	.000	.500	.583	.000	.000	.688	.250	.000	.000	.000	.000	.250	.938

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N/S/NW: North Shore Rd/ Wonderland Lot
E/W: Bus Access/ VFW Parkway
City, State: Revere, MA
Client: VHB/ R. White

File Name : 133332 (Butler Circle) B
Site Code : 10271.07
Start Date : 5/10/2013
Page No : 1

Groups Printed- Peds and Bicycles

	North Shore Road (Route 1A) From North					MBTA Bus Access From East					North Shore Road From South					VFW Parkway (Route 1A) From West					Wonderland Parking Lot From Northwest					
Start Time	Hard Right	Right	Thru	Left	Peds	Right	Bear Right	Thru	Left	Peds	Right	Thru	Bear Left	Left	Peds	Right	Thru	Left	Hard Left	Peds	Hard Right	Bear Right	Bear Left	Hard Left	Peds	Int. Total
03:30 PM	0	0	0	0	1	0	0	0	0	14	0	0	0	0	2	0	0	0	0	1	0	0	0	0	2	20
03:45 PM	0	0	0	0	0	0	0	0	0	15	0	0	0	0	4	0	0	0	0	0	1	0	0	0	1	21
Total	0	0	0	0	1	0	0	0	0	29	0	0	0	0	6	0	0	0	0	1	1	0	0	0	3	41
04:00 PM	0	0	0	0	0	0	0	0	0	13	0	0	0	0	6	0	0	0	0	2	0	0	0	0	4	25
04:15 PM	0	0	0	0	0	0	0	0	0	17	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	22
04:30 PM	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
04:45 PM	0	0	0	0	0	0	0	0	0	13	0	0	0	0	1	0	0	2	0	0	0	0	0	0	1	17
Total	0	0	0	0	0	0	0	0	0	57	0	0	0	0	12	0	0	2	0	2	0	0	0	0	5	78
05:00 PM	0	0	1	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
05:15 PM	0	0	0	0	0	0	0	0	0	16	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	18
05:30 PM	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2	24
05:45 PM	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	1	0	2	0	0	0	0	1	12
Total	0	0	1	0	0	0	0	0	0	56	0	0	0	0	2	0	0	2	0	2	1	0	0	0	3	67
06:00 PM	0	0	0	0	0	0	0	0	0	10	0	1	0	0	0	0	0	0	0	1	1	0	0	0	2	15
06:15 PM	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Grand Total	0	0	1	0	1	0	0	0	0	157	0	1	0	0	20	0	0	4	0	6	3	0	0	0	13	206
Apprch %	0	0	50	0	50	0	0	0	0	100	0	4.8	0	0	95.2	0	0	40	0	60	18.8	0	0	0	81.2	
Total %	0	0	0.5	0	0.5	0	0	0	0	76.2	0	0.5	0	0	9.7	0	0	1.9	0	2.9	1.5	0	0	0	6.3	

	North Shore Road (Route 1A) From North						MBTA Bus Access From East						North Shore Road From South						VFW Parkway (Route 1A) From West						Wonderland Parking Lot From Northwest						
Start Time	Hard Right	Right	Thru	Left	Peds	App. Total	Right	Bear Right	Thru	Left	Peds	App. Total	Right	Thru	Bear Left	Left	Peds	App. Total	Right	Thru	Left	Hard Left	Peds	App. Total	Hard Right	Bear Right	Bear Left	Hard Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																															
Peak Hour for Entire Intersection Begins at 03:30 PM																															
03:30 PM	0	0	0	0	**1**	**1**	0	0	0	0	14	14	0	0	0	0	2	2	0	0	0	0	1	1	0	0	0	0	2	2	20
03:45 PM	0	0	0	0	0	0	0	0	0	0	15	15	0	0	0	0	4	4	0	0	0	0	0	0	**1**	0	0	0	1	2	21
04:00 PM	0	0	0	0	0	0	0	0	0	0	13	13	0	0	0	0	**6**	**6**	0	0	0	0	**2**	**2**	0	0	0	0	**4**	**4**	**25**
04:15 PM	0	0	0	0	0	0	0	0	0	0	**17**	**17**	0	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	22
Total Volume	0	0	0	0	1	1	0	0	0	0	59	59	0	0	0	0	17	17	0	0	0	0	3	3	1	0	0	0	7	8	88
% App. Total	0	0	0	0	100		0	0	0	0	100		0	0	0	0	100		0	0	0	0	100		12.5	0	0	0	87.5		
PHF	.000	.000	.000	.000	.250	.250	.000	.000	.000	.000	.868	.868	.000	.000	.000	.000	.708	.708	.000	.000	.000	.000	.375	.375	.250	.000	.000	.000	.438	.500	.880

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N/S/NW: North Shore Rd/ Wonderland Lot
E/W: Bus Access/ VFW Parkway
City, State: Revere, MA
Client: VHB/ R. White

File Name : 133332 (Butler Circle) BB
Site Code : 10271.07
Start Date : 5/11/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles - Buses

	North Shore Road (Route 1A) From North					MBTA Bus Access From East					North Shore Road From South					VFW Parkway (Route 1A) From West					Wonderland Parking Lot From Northwest					
Start Time	Hard Right	Right	Thru	Left	U-Turn	Right	Bear Right	Thru	Left	U-Turn	Right	Thru	Bear Left	Left	U-Turn	Right	Thru	Left	Hard Left	U-Turn	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	Int. Total
02:30 PM	0	190	53	3	2	0	0	0	0	0	1	71	0	5	1	10	2	196	0	3	0	1	0	0	0	538
02:45 PM	1	219	34	2	10	0	0	0	0	0	1	70	0	2	2	5	0	185	4	0	1	0	0	0	0	536
Total	1	409	87	5	12	0	0	0	0	0	2	141	0	7	3	15	2	381	4	3	1	1	0	0	0	1074
03:00 PM	0	193	41	0	6	0	0	0	0	0	1	66	0	5	2	8	2	188	0	9	1	0	0	0	0	522
03:15 PM	1	198	58	1	5	0	0	0	0	0	1	63	0	2	2	6	1	213	2	1	6	0	0	0	0	560
03:30 PM	0	185	44	2	2	0	0	0	0	0	0	52	2	6	0	6	1	226	1	0	0	0	0	0	0	527
03:45 PM	0	196	50	2	1	0	0	0	0	0	1	45	0	3	0	4	0	241	0	2	3	0	0	0	0	548
Total	1	772	193	5	14	0	0	0	0	0	3	226	2	16	4	24	4	868	3	12	10	0	0	0	0	2157
04:00 PM	0	180	49	0	3	0	0	0	0	0	2	46	0	5	1	10	1	208	0	6	0	0	0	0	0	511
04:15 PM	1	189	33	3	4	0	0	0	0	0	0	55	1	3	0	12	4	201	0	5	4	0	0	1	0	516
04:30 PM	0	215	55	2	7	0	0	0	0	0	2	68	0	6	1	4	0	186	1	0	1	0	0	0	0	548
04:45 PM	0	206	44	0	1	0	0	0	0	0	0	55	0	9	0	8	1	196	1	1	3	2	0	0	0	527
Total	1	790	181	5	15	0	0	0	0	0	4	224	1	23	2	34	6	791	2	12	8	2	0	1	0	2102
05:00 PM	0	174	37	3	7	0	0	0	0	0	2	58	0	3	1	3	0	216	0	6	1	0	0	0	0	511
05:15 PM	0	219	42	1	4	0	0	0	0	0	0	60	0	1	1	7	2	191	0	1	3	1	0	0	0	533
Grand Total	3	2364	540	19	52	0	0	0	0	0	11	709	3	50	11	83	14	2447	9	34	23	4	0	1	0	6377
Apprch %	0.1	79.4	18.1	0.6	1.7	0	0	0	0	0	1.4	90.4	0.4	6.4	1.4	3.2	0.5	94.6	0.3	1.3	82.1	14.3	0	3.6	0	
Total %	0	37.1	8.5	0.3	0.8	0	0	0	0	0	0.2	11.1	0	0.8	0.2	1.3	0.2	38.4	0.1	0.5	0.4	0.1	0	0	0	
Cars	3	2317	524	0	52	0	0	0	0	0	0	701	3	50	11	83	0	2412	9	34	23	4	0	1	0	6227
% Cars	100	98	97	0	100	0	0	0	0	0	0	98.9	100	100	100	100	0	98.6	100	100	100	100	0	100	0	97.6
Heavy Vehicles	0	33	5	0	0	0	0	0	0	0	1	7	0	0	0	0	0	28	0	0	0	0	0	0	0	74
% Heavy Vehicles	0	1.4	0.9	0	0	0	0	0	0	0	9.1	1	0	0	0	0	0	1.1	0	0	0	0	0	0	0	1.2
Buses	0	14	11	19	0	0	0	0	0	0	10	1	0	0	0	0	14	7	0	0	0	0	0	0	0	76
% Buses	0	0.6	2	100	0	0	0	0	0	0	90.9	0.1	0	0	0	0	100	0.3	0	0	0	0	0	0	0	1.2

	North Shore Road (Route 1A) From North						MBTA Bus Access From East						North Shore Road From South						VFW Parkway (Route 1A) From West						Wonderland Parking Lot From Northwest						
Start Time	Hard Right	Right	Thru	Left	U-Turn	App. Total	Right	Bear Right	Thru	Left	U-Turn	App. Total	Right	Thru	Bear Left	Left	U-Turn	App. Total	Right	Thru	Left	Hard Left	U-Turn	App. Total	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																														
Peak Hour for Entire Intersection Begins at 03:00 PM																														
03:00 PM	0	193	41	0	**6**	240	0	0	0	0	0	0	**1**	**66**	0	5	**2**	**74**	**8**	**2**	188	0	**9**	207	1	0	0	0	0	1	522
03:15 PM	**1**	**198**	**58**	1	5	**263**	0	0	0	0	0	0	1	63	0	2	2	68	6	1	213	**2**	1	223	**6**	0	0	0	0	**6**	**560**
03:30 PM	0	185	44	**2**	2	233	0	0	0	0	0	0	0	52	**2**	**6**	0	60	6	1	226	1	0	234	0	0	0	0	0	0	527
03:45 PM	0	196	50	2	1	249	0	0	0	0	0	0	1	45	0	3	0	49	4	0	**241**	0	2	**247**	3	0	0	0	0	3	548
Total Volume	1	772	193	5	14	985	0	0	0	0	0	0	3	226	2	16	4	251	24	4	868	3	12	911	10	0	0	0	0	10	2157
% App. Total	0.1	78.4	19.6	0.5	1.4		0	0	0	0	0		1.2	90	0.8	6.4	1.6		2.6	0.4	95.3	0.3	1.3		100	0	0	0	0		
PHF	.250	.975	.832	.625	.583	.936	.000	.000	.000	.000	.000	.000	.750	.856	.250	.667	.500	.848	.750	.500	.900	.375	.333	.922	.417	.000	.000	.000	.000	.417	.963
Cars	1	756	187	0	14	958	0	0	0	0	0	0	0	223	2	16	4	245	24	0	853	3	12	892	10	0	0	0	0	10	2105
% Cars	100	97.9	96.9	0	100	97.3	0	0	0	0	0	0	0	98.7	100	100	100	97.6	100	0	98.3	100	100	97.9	100	0	0	0	0	100	97.6
Heavy Vehicles	0	11	3	0	0	14	0	0	0	0	0	0	0	2	0	0	0	2	0	0	13	0	0	13	0	0	0	0	0	0	29
% Heavy Vehicles	0	1.4	1.6	0	0	1.4	0	0	0	0	0	0	0	0.9	0	0	0	0.8	0	0	1.5	0	0	1.4	0	0	0	0	0	0	1.3
Buses	0	5	3	5	0	13	0	0	0	0	0	0	3	1	0	0	0	4	0	4	2	0	0	6	0	0	0	0	0	0	23
% Buses	0	0.6	1.6	100	0	1.3	0	0	0	0	0	0	100	0.4	0	0	0	1.6	0	100	0.2	0	0	0.7	0	0	0	0	0	0	1.1

N/S/NW: North Shore Rd/ Wonderland Lot
E/W: Bus Access/ VFW Parkway
City, State: Revere, MA
Client: VHB/ R. White

PRECISION DATA INDUSTRIES, LLC
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File Name : 133332 (Butler Circle) BB
Site Code : 10271.07
Start Date : 5/11/2013
Page No : 1

Groups Printed- Heavy Vehicles

	North Shore Road (Route 1A) From North					MBTA Bus Access From East					North Shore Road From South					VFW Parkway (Route 1A) From West					Wonderland Parking Lot From Northwest					
Start Time	Hard Right	Right	Thru	Left	U-Turn	Right	Bear Right	Thru	Left	U-Turn	Right	Thru	Bear Left	Left	U-Turn	Right	Thru	Left	Hard Left	U-Turn	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	Int. Total
02:30 PM	0	2	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	6
02:45 PM	0	3	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2	0	0	0	0	0	0	0	8
Total	0	5	1	0	0	0	0	0	0	0	1	4	0	0	0	0	0	3	0	0	0	0	0	0	0	14
03:00 PM	0	7	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	3	0	0	0	0	0	0	0	11
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	7
03:30 PM	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3
03:45 PM	0	4	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	8
Total	0	11	3	0	0	0	0	0	0	0	0	2	0	0	0	0	0	13	0	0	0	0	0	0	0	29
04:00 PM	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3
04:15 PM	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	4	0	0	0	0	0	0	0	6
04:30 PM	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
04:45 PM	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	7
Total	0	9	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	9	0	0	0	0	0	0	0	20
05:00 PM	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	5
05:15 PM	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	6
Grand Total	0	33	5	0	0	0	0	0	0	0	1	7	0	0	0	0	0	28	0	0	0	0	0	0	0	74
Apprch %	0	86.8	13.2	0	0	0	0	0	0	0	12.5	87.5	0	0	0	0	0	100	0	0	0	0	0	0	0	
Total %	0	44.6	6.8	0	0	0	0	0	0	0	1.4	9.5	0	0	0	0	0	37.8	0	0	0	0	0	0	0	

	North Shore Road (Route 1A) From North						MBTA Bus Access From East						North Shore Road From South						VFW Parkway (Route 1A) From West						Wonderland Parking Lot From Northwest						
Start Time	Hard Right	Right	Thru	Left	U-Turn	App. Total	Right	Bear Right	Thru	Left	U-Turn	App. Total	Right	Thru	Bear Left	Left	U-Turn	App. Total	Right	Thru	Left	Hard Left	U-Turn	App. Total	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																															
Peak Hour for Entire Intersection Begins at 02:30 PM																															
02:30 PM	0	2	0	0	0	2	0	0	0	0	0	0	0	**3**	0	0	0	**3**	0	0	1	0	0	1	0	0	0	0	0	0	6
02:45 PM	0	3	**1**	0	0	4	0	0	0	0	0	0	**1**	1	0	0	0	2	0	0	2	0	0	2	0	0	0	0	0	0	8
03:00 PM	0	**7**	0	0	0	**7**	0	0	0	0	0	0	0	1	0	0	0	1	0	0	3	0	0	3	0	0	0	0	0	0	**11**
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**7**	0	0	**7**	0	0	0	0	0	0	7
Total Volume	0	12	1	0	0	13	0	0	0	0	0	0	1	5	0	0	0	6	0	0	13	0	0	13	0	0	0	0	0	0	32
% App. Total	0	92.3	7.7	0	0		0	0	0	0	0		16.7	83.3	0	0	0		0	0	100	0	0		0	0	0	0	0		
PHF	.000	.429	.250	.000	.000	.464	.000	.000	.000	.000	.000	.000	.250	.417	.000	.000	.000	.500	.000	.000	.464	.000	.000	.464	.000	.000	.000	.000	.000	.000	.727

N/S/NW: North Shore Rd/ Wonderland Lot
E/W: Bus Access/ VFW Parkway
City, State: Revere, MA
Client: VHB/ R. White

PRECISION DATA INDUSTRIES, LLC
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File Name : 133332 (Butler Circle) BB
Site Code : 10271.07
Start Date : 5/11/2013
Page No : 1

Groups Printed- Buses

	North Shore Road (Route 1A) From North					MBTA Bus Access From East					North Shore Road From South					VFW Parkway (Route 1A) From West					Wonderland Parking Lot From Northwest					
Start Time	Hard Right	Right	Thru	Left	U-Turn	Right	Bear Right	Thru	Left	U-Turn	Right	Thru	Bear Left	Left	U-Turn	Right	Thru	Left	Hard Left	U-Turn	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	Int. Total
02:30 PM	0	1	1	3	0	0	0	0	0	0	1	0	0	0	0	0	2	2	0	0	0	0	0	0	0	10
02:45 PM	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	5
Total	0	2	2	5	0	0	0	0	0	0	1	0	0	0	0	0	2	3	0	0	0	0	0	0	0	15
03:00 PM	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	4
03:15 PM	0	4	1	1	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	10
03:30 PM	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	5
03:45 PM	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	4
Total	0	5	3	5	0	0	0	0	0	0	3	1	0	0	0	0	4	2	0	0	0	0	0	0	0	23
04:00 PM	0	1	2	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	6
04:15 PM	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	10
04:30 PM	0	2	2	2	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	9
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Total	0	6	4	5	0	0	0	0	0	0	4	0	0	0	0	0	6	1	0	0	0	0	0	0	0	26
05:00 PM	0	1	2	3	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
05:15 PM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	4
Grand Total	0	14	11	19	0	0	0	0	0	0	10	1	0	0	0	0	14	7	0	0	0	0	0	0	0	76
Apprch %	0	31.8	25	43.2	0	0	0	0	0	0	90.9	9.1	0	0	0	0	66.7	33.3	0	0	0	0	0	0	0	
Total %	0	18.4	14.5	25	0	0	0	0	0	0	13.2	1.3	0	0	0	0	18.4	9.2	0	0	0	0	0	0	0	

	North Shore Road (Route 1A) From North						MBTA Bus Access From East						North Shore Road From South						VFW Parkway (Route 1A) From West						Wonderland Parking Lot From Northwest						
Start Time	Hard Right	Right	Thru	Left	U-Turn	App. Total	Right	Bear Right	Thru	Left	U-Turn	App. Total	Right	Thru	Bear Left	Left	U-Turn	App. Total	Right	Thru	Left	Hard Left	U-Turn	App. Total	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																															
Peak Hour for Entire Intersection Begins at 02:30 PM																															
02:30 PM	0	1	**1**	**3**	0	5	0	0	0	0	0	0	**1**	0	0	0	0	1	0	**2**	**2**	0	0	**4**	0	0	0	0	0	0	**10**
02:45 PM	0	1	1	2	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	5
03:00 PM	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	2	0	0	0	2	0	0	0	0	0	0	4
03:15 PM	0	**4**	1	1	0	**6**	0	0	0	0	0	0	1	**1**	0	0	0	**2**	0	1	1	0	0	2	0	0	0	0	0	0	10
Total Volume	0	6	4	6	0	16	0	0	0	0	0	0	3	1	0	0	0	4	0	5	4	0	0	9	0	0	0	0	0	0	29
% App. Total	0	37.5	25	37.5	0		0	0	0	0	0		75	25	0	0	0		0	55.6	44.4	0	0		0	0	0	0	0		
PHF	.000	.375	1.00	.500	.000	.667	.000	.000	.000	.000	.000	.000	.750	.250	.000	.000	.000	.500	.000	.625	.500	.000	.000	.563	.000	.000	.000	.000	.000	.000	.725

N/S/NW: North Shore Rd/ Wonderland Lot
E/W: Bus Access/ VFW Parkway
City, State: Revere, MA
Client: VHB/ R. White

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File Name : 133332 (Butler Circle) BB
Site Code : 10271.07
Start Date : 5/11/2013
Page No : 1

Groups Printed- Peds and Bicycles

	North Shore Road (Route 1A) From North					MBTA Bus Access From East					North Shore Road From South					VFW Parkway (Route 1A) From West					Wonderland Parking Lot From Northwest					
Start Time	Hard Right	Right	Thru	Left	Peds	Right	Bear Right	Thru	Left	Peds	Right	Thru	Bear Left	Left	Peds	Right	Thru	Left	Hard Left	Peds	Hard Right	Bear Right	Bear Left	Hard Left	Peds	Int. Total
02:30 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3	0	0	0	0	1	0	0	0	0	2	9
02:45 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3	0	0	0	0	0	0	0	0	0	1	7
Total	0	0	0	0	0	0	0	0	0	6	0	0	0	0	6	0	0	0	0	1	0	0	0	0	3	16
03:00 PM	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	8
03:15 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	5
03:30 PM	0	1	0	0	0	0	0	0	0	11	0	0	0	0	5	0	0	0	0	1	0	0	0	0	1	19
03:45 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	4
Total	0	1	0	0	0	0	0	0	0	21	0	0	0	0	10	0	0	0	0	1	0	0	0	0	3	36
04:00 PM	0	0	0	0	1	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5
04:15 PM	0	0	0	0	0	0	0	0	0	17	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	19
04:30 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	6
04:45 PM	0	0	0	0	0	0	0	0	0	8	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	10
Total	0	0	0	0	1	0	0	0	0	30	0	0	0	0	7	0	0	0	0	1	0	0	0	0	1	40
05:00 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	3
05:15 PM	0	0	1	0	0	0	0	0	0	4	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	7
Grand Total	0	1	1	0	1	0	0	0	0	63	0	0	0	0	25	0	0	0	0	4	0	0	0	0	7	102
Apprch %	0	33.3	33.3	0	33.3	0	0	0	0	100	0	0	0	0	100	0	0	0	0	100	0	0	0	0	100	
Total %	0	1	1	0	1	0	0	0	0	61.8	0	0	0	0	24.5	0	0	0	0	3.9	0	0	0	0	6.9	

	North Shore Road (Route 1A) From North						MBTA Bus Access From East						North Shore Road From South						VFW Parkway (Route 1A) From West						Wonderland Parking Lot From Northwest						
Start Time	Hard Right	Right	Thru	Left	Peds	App. Total	Right	Bear Right	Thru	Left	Peds	App. Total	Right	Thru	Bear Left	Left	Peds	App. Total	Right	Thru	Left	Hard Left	Peds	App. Total	Hard Right	Bear Right	Bear Left	Hard Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1																															
Peak Hour for Entire Intersection Begins at 03:30 PM																															
03:30 PM	0	**1**	0	0	0	**1**	0	0	0	0	11	11	0	0	0	0	**5**	**5**	0	0	0	0	**1**	**1**	0	0	0	0	**1**	**1**	**19**
03:45 PM	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	4
04:00 PM	0	0	0	0	**1**	1	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	5
04:15 PM	0	0	0	0	0	0	0	0	0	0	**17**	**17**	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	19
Total Volume	0	1	0	0	1	2	0	0	0	0	33	33	0	0	0	0	9	9	0	0	0	0	1	1	0	0	0	0	2	2	47
% App. Total	0	50	0	0	50		0	0	0	0	100		0	0	0	0	100		0	0	0	0	100		0	0	0	0	100		
PHF	.000	.250	.000	.000	.250	.500	.000	.000	.000	.000	.485	.485	.000	.000	.000	.000	.450	.450	.000	.000	.000	.000	.250	.250	.000	.000	.000	.000	.500	.500	.618

N/S: Revere Beach Blvd/ Winthrop Parkway
W: Revere Beach Parkway (Route 145)
City, State: Revere, MA
Client: VHB/ R. White

PRECISION DATA INDUSTRIES, LLC
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File Name : 133332 (Eliot Circle) A
Site Code : 10271.07
Start Date : 5/10/2013

Groups Printed- Cars - Heavy Vehicles

	Revere Beach Boulevard From North			Winthrop Parkway (Route 145) From South			Revere Beach Parkway (Route 145) From West			
Start Time	Right	Thru	U-Turn	Thru	Left	U-Turn	Right	Left	U-Turn	Int. Total
03:30 PM	0	0	0	60	81	1	143	163	7	455
03:45 PM	0	0	0	53	65	0	180	221	0	519
Total	0	0	0	113	146	1	323	384	7	974
04:00 PM	0	0	0	66	72	0	139	169	6	452
04:15 PM	1	0	0	55	59	0	187	154	4	460
04:30 PM	0	0	0	60	56	0	157	136	9	418
04:45 PM	0	0	0	69	56	0	157	152	15	449
Total	1	0	0	250	243	0	640	611	34	1779
05:00 PM	0	0	0	73	60	0	152	186	16	487
05:15 PM	0	0	0	69	63	2	171	175	8	488
05:30 PM	0	0	0	51	63	0	146	165	11	436
05:45 PM	0	0	0	58	66	2	144	151	5	426
Total	0	0	0	251	252	4	613	677	40	1837
06:00 PM	0	0	0	56	55	0	174	148	14	447
06:15 PM	0	0	0	59	64	0	124	138	14	399
Grand Total	1	0	0	729	760	5	1874	1958	109	5436
Apprch %	100	0	0	48.8	50.9	0.3	47.6	49.7	2.8	
Total %	0	0	0	13.4	14	0.1	34.5	36	2	
Cars	1	0	0	725	752	5	1862	1950	105	5400
% Cars	100	0	0	99.5	98.9	100	99.4	99.6	96.3	99.3
Heavy Vehicles	0	0	0	4	8	0	12	8	4	36
% Heavy Vehicles	0	0	0	0.5	1.1	0	0.6	0.4	3.7	0.7

	Revere Beach Boulevard From North				Winthrop Parkway (Route 145) From South				Revere Beach Parkway (Route 145) From West				
Start Time	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 03:30 PM													
03:30 PM	0	0	0	0	60	**81**	**1**	**142**	143	163	**7**	313	455
03:45 PM	0	0	0	0	53	65	0	118	180	**221**	0	**401**	**519**
04:00 PM	0	0	0	0	**66**	72	0	138	139	169	6	314	452
04:15 PM	**1**	0	0	**1**	55	59	0	114	**187**	154	4	345	460
Total Volume	1	0	0	1	234	277	1	512	649	707	17	1373	1886
% App. Total	100	0	0		45.7	54.1	0.2		47.3	51.5	1.2		
PHF	.250	.000	.000	.250	.886	.855	.250	.901	.868	.800	.607	.856	.908
Cars	1	0	0	1	231	274	1	506	641	702	15	1358	1865
% Cars	100	0	0	100	98.7	98.9	100	98.8	98.8	99.3	88.2	98.9	98.9
Heavy Vehicles	0	0	0	0	3	3	0	6	8	5	2	15	21
% Heavy Vehicles	0	0	0	0	1.3	1.1	0	1.2	1.2	0.7	11.8	1.1	1.1

N/S: Revere Beach Blvd/ Winthrop Parkway
W: Revere Beach Parkway (Route 145)
City, State: Revere, MA
Client: VHB/ R. White

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File Name : 133332 (Eliot Circle) A
Site Code : 10271.07
Start Date : 5/10/2013

Groups Printed- Heavy Vehicles

	Revere Beach Boulevard From North			Winthrop Parkway (Route 145) From South			Revere Beach Parkway (Route 145) From West			
Start Time	Right	Thru	U-Turn	Thru	Left	U-Turn	Right	Left	U-Turn	Int. Total
03:30 PM	0	0	0	0	2	0	4	0	1	7
03:45 PM	0	0	0	2	0	0	1	2	0	5
Total	0	0	0	2	2	0	5	2	1	12
04:00 PM	0	0	0	0	0	0	2	2	0	4
04:15 PM	0	0	0	1	1	0	1	1	1	5
04:30 PM	0	0	0	0	0	0	2	0	0	2
04:45 PM	0	0	0	0	2	0	0	0	2	4
Total	0	0	0	1	3	0	5	3	3	15
05:00 PM	0	0	0	0	1	0	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	1	0	1
05:30 PM	0	0	0	1	0	0	0	1	0	2
05:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	1	1	0	0	2	0	4
06:00 PM	0	0	0	0	1	0	0	1	0	2
06:15 PM	0	0	0	0	1	0	2	0	0	3
Grand Total	0	0	0	4	8	0	12	8	4	36
Apprch %	0	0	0	33.3	66.7	0	50	33.3	16.7	
Total %	0	0	0	11.1	22.2	0	33.3	22.2	11.1	

	Revere Beach Boulevard From North				Winthrop Parkway (Route 145) From South				Revere Beach Parkway (Route 145) From West				
Start Time	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 03:30 PM													
03:30 PM	0	0	0	0	0	**2**	0	**2**	**4**	0	**1**	**5**	**7**
03:45 PM	0	0	0	0	**2**	0	0	2	1	**2**	0	3	5
04:00 PM	0	0	0	0	0	0	0	0	2	2	0	4	4
04:15 PM	0	0	0	0	1	1	0	2	1	1	1	3	5
Total Volume	0	0	0	0	3	3	0	6	8	5	2	15	21
% App. Total	0	0	0		50	50	0		53.3	33.3	13.3		
PHF	.000	.000	.000	.000	.375	.375	.000	.750	.500	.625	.500	.750	.750

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W: Revere Beach Parkway (Route 145)
City, State: Revere, MA
Client: VHB/ R. White

File Name : 133332 (Eliot Circle) A
Site Code : 10271.07
Start Date : 5/10/2013

Groups Printed- Peds and Bicycles

	Revere Beach Boulevard From North			Winthrop Parkway (Route 145) From South			Revere Beach Parkway (Route 145) From West			
Start Time	Right	Thru	Peds	Thru	Left	Peds	Right	Left	Peds	Int. Total
03:30 PM	0	0	4	0	0	9	0	0	1	14
03:45 PM	0	0	2	0	0	8	0	0	6	16
Total	0	0	6	0	0	17	0	0	7	30
04:00 PM	0	0	2	0	0	5	0	0	6	13
04:15 PM	0	0	3	0	0	10	0	0	6	19
04:30 PM	0	0	9	0	0	14	1	0	0	24
04:45 PM	0	0	0	1	0	3	0	2	3	9
Total	0	0	14	1	0	32	1	2	15	65
05:00 PM	0	0	0	0	0	6	0	2	0	8
05:15 PM	0	0	2	0	0	8	0	1	2	13
05:30 PM	0	0	0	1	0	11	0	0	2	14
05:45 PM	0	0	1	0	0	3	0	0	2	6
Total	0	0	3	1	0	28	0	3	6	41
06:00 PM	0	0	1	0	0	9	0	0	2	12
06:15 PM	0	0	0	0	0	8	0	0	0	8
Grand Total	0	0	24	2	0	94	1	5	30	156
Apprch %	0	0	100	2.1	0	97.9	2.8	13.9	83.3	
Total %	0	0	15.4	1.3	0	60.3	0.6	3.2	19.2	

	Revere Beach Boulevard From North				Winthrop Parkway (Route 145) From South				Revere Beach Parkway (Route 145) From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 03:45 PM													
03:45 PM	0	0	2	2	0	0	8	8	0	0	**6**	**6**	16
04:00 PM	0	0	2	2	0	0	5	5	0	0	6	6	13
04:15 PM	0	0	3	3	0	0	10	10	0	0	6	6	19
04:30 PM	0	0	**9**	**9**	0	0	**14**	**14**	**1**	0	0	1	**24**
Total Volume	0	0	16	16	0	0	37	37	1	0	18	19	72
% App. Total	0	0	100		0	0	100		5.3	0	94.7		
PHF	.000	.000	.444	.444	.000	.000	.661	.661	.250	.000	.750	.792	.750

N/S: Revere Beach Blvd/ Winthrop Parkway
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File Name : 133332 (Eliot Circle) AA
Site Code : 10271.07
Start Date : 5/11/2013

Groups Printed- Cars - Heavy Vehicles

	Revere Beach Boulevard From North			Winthrop Parkway (Route 145) From South			Revere Beach Parkway (Route 145) From West			
Start Time	Right	Thru	U-Turn	Thru	Left	U-Turn	Right	Left	U-Turn	Int. Total
02:30 PM	0	0	0	60	73	0	121	72	4	330
02:45 PM	0	0	0	45	60	1	137	81	8	332
Total	0	0	0	105	133	1	258	153	12	662
03:00 PM	0	0	0	50	54	0	125	87	3	319
03:15 PM	0	0	0	62	59	1	121	72	8	323
03:30 PM	0	0	0	70	54	1	132	76	3	336
03:45 PM	0	0	0	77	65	0	149	75	6	372
Total	0	0	0	259	232	2	527	310	20	1350
04:00 PM	0	0	0	34	63	0	132	89	2	320
04:15 PM	0	0	0	51	56	1	109	91	3	311
04:30 PM	0	0	0	59	60	0	119	83	4	325
04:45 PM	0	0	0	60	49	1	114	83	3	310
Total	0	0	0	204	228	2	474	346	12	1266
05:00 PM	0	0	0	49	62	0	106	100	6	323
05:15 PM	0	0	0	53	60	0	120	63	3	299
Grand Total	0	0	0	670	715	5	1485	972	53	3900
Apprch %	0	0	0	48.2	51.4	0.4	59.2	38.7	2.1	
Total %	0	0	0	17.2	18.3	0.1	38.1	24.9	1.4	
Cars	0	0	0	668	712	5	1479	970	53	3887
% Cars	0	0	0	99.7	99.6	100	99.6	99.8	100	99.7
Heavy Vehicles	0	0	0	2	3	0	6	2	0	13
% Heavy Vehicles	0	0	0	0.3	0.4	0	0.4	0.2	0	0.3

	Revere Beach Boulevard From North				Winthrop Parkway (Route 145) From South				Revere Beach Parkway (Route 145) From West				
Start Time	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 03:15 PM													
03:15 PM	0	0	0	0	62	59	**1**	122	121	72	**8**	201	323
03:30 PM	0	0	0	0	70	54	1	125	132	76	3	211	336
03:45 PM	0	0	0	0	**77**	**65**	0	**142**	**149**	75	6	**230**	**372**
04:00 PM	0	0	0	0	34	63	0	97	132	**89**	2	223	320
Total Volume	0	0	0	0	243	241	2	486	534	312	19	865	1351
% App. Total	0	0	0		50	49.6	0.4		61.7	36.1	2.2		
PHF	.000	.000	.000	.000	.789	.927	.500	.856	.896	.876	.594	.940	.908
Cars	0	0	0	0	243	240	2	485	532	312	19	863	1348
% Cars	0	0	0	0	100	99.6	100	99.8	99.6	100	100	99.8	99.8
Heavy Vehicles	0	0	0	0	0	1	0	1	2	0	0	2	3
% Heavy Vehicles	0	0	0	0	0	0.4	0	0.2	0.4	0	0	0.2	0.2

N/S: Revere Beach Blvd/ Winthrop Parkway
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Site Code : 10271.07
Start Date : 5/11/2013

Groups Printed- Heavy Vehicles

	Revere Beach Boulevard From North			Winthrop Parkway (Route 145) From South			Revere Beach Parkway (Route 145) From West			
Start Time	Right	Thru	U-Turn	Thru	Left	U-Turn	Right	Left	U-Turn	Int. Total
02:30 PM	0	0	0	0	0	0	2	0	0	2
02:45 PM	0	0	0	0	0	0	1	0	0	1
Total	0	0	0	0	0	0	3	0	0	3
03:00 PM	0	0	0	1	1	0	0	0	0	2
03:15 PM	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	0	1	0	0	1
03:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	1	1	0	1	0	0	3
04:00 PM	0	0	0	0	1	0	1	0	0	2
04:15 PM	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	1	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	1	2	0	3
Total	0	0	0	0	2	0	2	2	0	6
05:00 PM	0	0	0	1	0	0	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	2	3	0	6	2	0	13
Apprch %	0	0	0	40	60	0	75	25	0	
Total %	0	0	0	15.4	23.1	0	46.2	15.4	0	

	Revere Beach Boulevard From North				Winthrop Parkway (Route 145) From South				Revere Beach Parkway (Route 145) From West				
Start Time	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	0	0	0	0	0	**1**	0	**1**	**1**	0	0	1	2
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	1	0	1	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	0	0	1	**2**	0	**3**	**3**
Total Volume	0	0	0	0	0	2	0	2	2	2	0	4	6
% App. Total	0	0	0		0	100	0		50	50	0		
PHF	.000	.000	.000	.000	.000	.500	.000	.500	.500	.250	.000	.333	.500

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Groups Printed- Peds and Bicycles

	Revere Beach Boulevard From North			Winthrop Parkway (Route 145) From South			Revere Beach Parkway (Route 145) From West			
Start Time	Right	Thru	Peds	Thru	Left	Peds	Right	Left	Peds	Int. Total
02:30 PM	0	0	0	0	0	4	0	0	0	4
02:45 PM	0	0	1	0	0	1	0	0	2	4
Total	0	0	1	0	0	5	0	0	2	8
03:00 PM	0	0	0	0	0	4	0	0	3	7
03:15 PM	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	1	0	0	0	1
03:45 PM	0	0	0	0	0	1	0	0	3	4
Total	0	0	0	0	0	6	0	0	6	12
04:00 PM	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	4	0	0	0	4
04:45 PM	0	0	0	0	0	1	0	0	2	3
Total	0	0	0	0	0	5	0	0	2	7
05:00 PM	0	0	2	1	0	7	0	1	0	11
05:15 PM	0	0	2	0	0	2	0	0	0	4
Grand Total	0	0	5	1	0	25	0	1	10	42
Apprch %	0	0	100	3.8	0	96.2	0	9.1	90.9	
Total %	0	0	11.9	2.4	0	59.5	0	2.4	23.8	

	Revere Beach Boulevard From North				Winthrop Parkway (Route 145) From South				Revere Beach Parkway (Route 145) From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 02:30 PM to 05:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	0	0	0	0	0	0	4	4	0	0	0	0	4
04:45 PM	0	0	0	0	0	0	1	1	0	0	**2**	**2**	3
05:00 PM	0	0	**2**	**2**	**1**	0	**7**	**8**	0	**1**	0	1	**11**
05:15 PM	0	0	2	2	0	0	2	2	0	0	0	0	4
Total Volume	0	0	4	4	1	0	14	15	0	1	2	3	22
% App. Total	0	0	100		6.7	0	93.3		0	33.3	66.7		
PHF	.000	.000	.500	.500	.250	.000	.500	.469	.000	.250	.250	.375	.500

Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

Massport Tunnel Data

Sumner/Callahan Tunnel Hourly Traffic Volumes
Ted Williams Tunnel Eastbound Hourly Traffic Volumes
Tunnel Volume Calcs

Sumner Tunnel Traffic Volumes
Week of June 7-11, 2010

	Initials	Date
Prepared By		
Approved By		

Hour	Monday June 7 2010	Tuesday June 8 2010	Wednesday June 9 2010	Thursday June 10 2010	Friday June 11 2010	Five Day Average
12-1	468	455	853	421	1,366	713
1-2	332	139	303	133	729	327
2-3	60	49	70	74	140	79
3-4	65	59	121	63	175	97
4-5	310	243	324	246	388	302
5-6	1002	807	818	860	813	860
6-7	1628	1453	1487	1491	1479	1508
7-8	2041	2016	1994	1996	2005	2010
8-9	1915	1900	1853	1944	1826	1888
9-10	1441	1420	1430	1493	1387	1434
10-11	1235	1169	1231	1249	1268	1230
11-12	1048	988	1102	1087	1082	1045
12-1	949	935	1040	1077	1248	1050
1-2	1139	1117	1176	1264	1212	1181
2-3	1386	1305	1426	1461	1596	1435
3-4	1470	1409	1519	1491	1581	1494
4-5	1590	1675	1722	1713	1789	1698
5-6	1416	1526	1439	1620	1687	1538
6-7	1134	1323	1437	1234	1505	1327
7-8	956	1015	1179	1146	1223	1104
8-9	926	1082	1071	1005	1150	1047
9-10	898	736	979	1051	939	921
10-11	715	872	919	1192	997	939
11-12	560	489	611	947	727	659
24 Hour Total	24684	24137	26104	26178	28312	25883

Callahan Tunnel Volumes
Week of June 7-11, 2010

	Initials	Date
Prepared By		
Approved By		

Hour	Rt 1A NB N. of Perth Sta #107	Perth Street Off-Ramp NB Station #105	Haverstreet On-Ramp NB Station #106	Callahan Total 107+105-106
12-1	514	139	208	445
1-2	237	84	122	199
2-3	143	65	71	137
3-4	208	34	98	144
4-5	707	40	131	616
5-6	1089	96	147	1038
6-7	1130	186	206	1110
7-8	1045	265	280	1030
8-9	1022	262	329	955
9-10	1052	243	276	1019
10-11	1128	290	301	1117
11-12	1175	312	296	1191
12-1	1246	343	326	1263
1-2	1307	334	307	1334
2-3	1554	414	380	1588
3-4	1718	530	337	1911
4-5	1822	580	338	2064
5-6	1587	554	267	1874
6-7	1429	455	254	1630
7-8	1325	371	267	1429
8-9	1185	331	263	1253
9-10	1065	368	255	1178
10-11	1034	359	327	1066
11-12	761	245	287	719
24 Hour Total	25483	6900	6073	26310

TWT EB Traffic (Logan Airport & I-90 EB Thru)
Hourly Average By Day of the Week (June 2012)

Day of Week	Day	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	ADT
LOGAN AIRPORT																										
TWT Off-Ramp to Hotel Drive (Ramp T-S)																										
Monday	1	268	144	49	40	100	145	254	255	316	412	447	400	340	345	416	430	464	524	516	416	367	372	295	204	**7,511**
Tuesday	2	94	53	22	36	80	179	319	257	276	379	357	318	306	362	373	424	460	484	425	391	369	376	230	188	**6,751**
Wednesday	3	137	101	37	41	115	186	332	258	267	333	328	339	352	364	377	416	490	485	534	531	454	377	297	222	**7,367**
Thursday	4	123	63	32	49	96	209	335	435	696	390	591	366	408	477	504	554	618	641	618	520	398	386	302	265	**9,073**
Friday	5	194	106	36	61	112	205	333	278	315	291	321	354	401	467	480	502	503	604	588	484	469	428	385	312	**8,171**
Saturday	6	450	304	64	58	82	135	158	275	283	310	248	248	287	301	349	359	358	309	311	270	257	223	170	139	**5,941**
Sunday	0	73	43	27	47	85	130	158	278	164	170	223	298	305	365	440	500	470	536	478	375	318	354	322	297	**6,450**
Weekdays		163	93	35	45	100	184	314	297	374	361	408	355	361	409	434	468	516	560	547	474	415	391	309	246	**7,848**
Weekend Days		261	173	45	52	83	132	158	277	224	240	236	273	296	333	394	429	414	423	394	322	287	288	246	218	**6,195**
All Days		191	116	38	47	95	169	270	291	331	326	359	332	343	388	424	458	490	526	509	436	383	365	293	239	**7,411**
TWT off-ramp to Arrivals (Lower) Level																										
Monday	1	202	89	23	19	118	547	600	486	341	315	337	318	338	401	363	375	427	381	395	334	327	255	262	214	**7,466**
Tuesday	2	191	69	7	15	72	427	561	408	320	293	325	303	298	372	379	335	369	357	378	350	344	274	226	218	**6,890**
Wednesday	3	204	118	18	15	80	355	493	375	283	254	283	287	301	357	322	304	349	333	359	362	345	268	225	242	**6,532**
Thursday	4	195	77	23	18	66	291	390	298	251	249	241	244	262	331	371	304	316	362	366	350	335	250	220	240	**6,043**
Friday	5	184	93	30	31	59	186	277	265	256	244	222	279	283	317	311	298	344	335	492	422	431	318	281	290	**6,249**
Saturday	6	265	111	23	28	50	116	191	218	212	189	214	240	233	283	353	279	347	380	332	323	328	243	193	177	**5,328**
Sunday	0	192	62	13	20	43	111	200	210	200	222	242	250	269	328	395	382	432	452	419	305	329	270	199	197	**5,742**
Weekdays		195	90	20	20	80	366	469	371	293	273	284	289	299	357	348	324	364	353	400	364	358	274	244	241	**6,678**
Weekend days		229	86	18	24	47	114	196	214	206	206	228	245	251	305	374	331	390	416	375	314	329	257	196	187	**5,535**
All Days		205	89	19	21	70	290	387	324	267	253	268	276	285	342	356	326	372	372	393	349	349	269	230	225	**6,335**
TWT off-ramp to Departures (Upper) Level																										
Monday	1	26	21	14	44	318	1,076	1,137	914	634	585	586	454	524	558	550	686	831	716	564	412	270	112	59	36	**11,125**
Tuesday	2	28	15	10	41	272	770	915	722	514	529	527	417	510	581	593	755	841	739	554	432	281	104	64	34	**10,247**
Wednesday	3	24	24	10	55	335	767	947	734	554	525	536	505	573	634	687	821	861	740	605	440	304	118	54	44	**10,898**
Thursday	4	28	23	14	48	317	815	931	708	557	548	489	459	531	606	597	790	877	819	637	458	299	136	72	56	**10,809**
Friday	5	29	22	17	55	368	816	877	770	574	501	482	456	558	659	635	743	753	713	620	448	327	141	76	58	**10,699**
Saturday	6	37	28	18	59	320	643	721	617	477	460	419	359	387	439	447	540	521	453	312	210	238	112	54	37	**7,907**
Sunday	0	25	16	16	63	298	628	761	649	585	578	533	449	554	565	598	787	902	842	693	477	340	142	62	41	**10,604**
Weekdays		27	21	13	49	322	851	964	774	567	537	526	458	540	608	613	757	829	740	593	437	296	121	64	45	**10,752**
Weekend days		31	22	17	61	309	636	741	633	531	519	476	404	471	502	522	664	711	648	502	344	289	127	58	39	**9,256**
All Days		28	21	14	52	318	786	897	732	557	532	511	442	519	576	586	729	794	712	566	409	294	123	62	43	**10,303**
LOGAN AIRPORT (Combined Traffic)																										
Monday	1	496	253	86	103	535	1,767	1,991	1,654	1,291	1,312	1,370	1,172	1,202	1,303	1,329	1,490	1,722	1,621	1,474	1,162	964	738	615	454	**26,102**
Tuesday	2	313	137	39	92	423	1,375	1,795	1,387	1,110	1,200	1,209	1,037	1,113	1,316	1,345	1,514	1,670	1,579	1,357	1,173	995	754	519	440	**23,888**
Wednesday	3	365	243	65	112	530	1,308	1,771	1,368	1,104	1,111	1,147	1,131	1,226	1,355	1,386	1,541	1,700	1,558	1,497	1,333	1,102	762	576	508	**24,796**
Thursday	4	345	163	68	115	479	1,314	1,655	1,441	1,504	1,187	1,321	1,069	1,201	1,413	1,472	1,647	1,810	1,822	1,621	1,327	1,032	771	593	560	**25,924**
Friday	5	407	221	83	147	540	1,207	1,487	1,312	1,145	1,036	1,024	1,089	1,242	1,444	1,427	1,542	1,600	1,653	1,700	1,354	1,227	887	741	660	**25,120**
Saturday	6	752	443	104	145	452	894	1,069	1,109	972	959	881	847	907	1,023	1,148	1,178	1,225	1,143	954	803	823	578	416	353	**19,176**
Sunday	0	290	120	56	131	426	868	1,119	1,138	949	970	998	996	1,129	1,258	1,432	1,669	1,804	1,829	1,590	1,157	987	766	583	535	**22,796**
Weekdays		385	204	68	114	503	1,401	1,747	1,442	1,234	1,170	1,219	1,103	1,200	1,374	1,396	1,549	1,709	1,653	1,540	1,275	1,069	786	617	532	**25,278**
Weekend Days		521	281	80	138	439	881	1,094	1,124	961	965	940	922	1,018	1,140	1,290	1,423	1,515	1,486	1,272	980	905	672	499	444	**20,986**
All Days		424	226	71	121	484	1,246	1,553	1,346	1,154	1,110	1,138	1,050	1,146	1,306	1,365	1,513	1,656	1,610	1,467	1,194	1,026	757	585	507	**24,049**
I-90 EB (thru, non-Logan)																										
Monday	1	277	193	157	129	181	441	714	727	631	667	709	740	761	800	895	1,146	1,280	1,133	974	797	636	586	573	415	**15,562**
Tuesday	2	211	137	104	111	167	443	743	713	657	661	709	771	738	784	928	1,204	1,326	1,268	1,152	901	678	667	638	441	**16,146**
Wednesday	3	288	161	133	134	189	448	741	718	653	707	758	774	808	841	971	1,201	1,325	1,085	934	889	712	680	655	467	**16,272**
Thursday	4	248	151	137	126	166	448	745	742	644	681	735	791	785	872	895	1,155	1,264	1,340	1,209	1,042	741	720	749	556	**16,944**
Friday	5	316	208	165	153	184	444	718	716	661	683	720	821	874	953	1,159	1,183	1,295	1,159	1,149	917	734	703	735	635	**17,283**
Saturday	6	386	296	283	220	181	221	333	422	498	619	749	925	993	967	1,002	960	982	889	798	789	674	670	678	666	**15,199**
Sunday	0	434	325	270	220	142	155	218	289	350	477	635	797	852	957	968	963	931	935	866	813	765	654	625	436	**14,073**
Weekdays		268	170	140	132	178	445	732	722	651	681	726	783	800	857	987	1,181	1,301	1,191	1,086	908	703	675	674	512	**16,501**
Weekend days		410	311	277	220	162	188	275	355	424	548	692	861	923	962	985	961	957	912	832	801	720	662	651	551	**14,636**
All Days		313	214	180	158	173	368	596	613	584	641	716	806	836	888	987	1,116	1,199	1,108	1,011	877	708	671	667	523	**15,954**
TWT EB TRAFFIC																										
Monday	1	773	445	243	232	716	2,208	2,704	2,381	1,922	1,980	2,078	1,912	1,963	2,103	2,224	2,636	3,002	2,754	2,448	1,959	1,600	1,324	1,189	869	**41,664**
Tuesday	2	524	273	142	203	590	1,818	2,537	2,100	1,766	1,861	1,918	1,808	1,851	2,099	2,272	2,718	2,996	2,847	2,508	2,074	1,672	1,420	1,157	881	**40,033**
Wednesday	3	653	404	198	246	719	1,755	2,511	2,086	1,757	1,819	1,905	1,905	2,034	2,195	2,357	2,742	3,025	2,642	2,431	2,222	1,815	1,442	1,232	975	**41,068**
Thursday	4	593	314	205	240	645	1,761	2,400	2,183	2,148	1,868	2,055	1,859	1,986	2,285	2,367	2,802	3,074	**3,162**	2,830	2,370	1,773	1,491	1,342	1,116	**42,868**
Friday	5	723	429	248	300	723	1,651	2,206	2,029	1,806	1,719	1,744	1,910	2,116	2,396	2,586	2,725	2,894	2,812	2,848	2,271	1,961	1,590	1,476	1,295	**42,403**
Saturday	6	1,138	739	387	364	633	1,115	1,402	1,531	1,470	1,578	1,630	1,772	1,900	1,989	2,149	2,138	2,207	2,031	1,752	1,592	1,497	1,248	1,094	1,019	**34,374**
Sunday	0	724	445	326	350	568	1,023	1,336	1,426	1,299	1,447	1,633	1,793	1,981	2,214	2,400	2,632	2,735	2,764	2,456	1,970	1,752	1,419	1,207	971	**36,869**
Weekdays		653	374	207	246	681	1,846	2,479	2,163	1,885	1,851	1,945	1,885	1,999	2,230	2,383	2,730	3,010	2,844	2,626	2,183	1,772	1,461	1,292	1,044	**41,780**
Weekend days		931	592	356	357	600	1,069	1,369	1,479	1,385	1,512	1,632	1,783	1,940	2,102	2,275	2,385	2,471	2,398	2,104	1,781	1,624	1,334	1,151	995	**35,622**
All Days		738	440	251	279	657	1,615	2,150	1,960	1,738	1,751	1,854	1,856	1,982	2,194	2,352	2,629	2,854	2,718	2,478	2,071	1,734	1,428	1,252	1,030	**40,003**
Percent Logan Airpor																										
Monday	1	64.2%	56.8%	35.5%	44.5%	74.7%	80.0%	73.6%	69.5%	67.2%	66.3%	65.9%	61.3%	61.2%	62.0%	59.7%	56.5%	57.4%	58.9%	60.2%	59.3%	60.2%	55.7%	51.8%	52.2%	**62.6%**
Tuesday	2	59.8%	50.0%	27.1%	45.3%	71.7%	75.6%	70.7%	66.1%	62.8%	64.5%	63.0%	57.4%	60.1%	62.7%	59.2%	55.7%	55.7%	55.5%	54.1%	56.6%	59.5%	53.1%	44.9%	49.9%	**59.7%**
Wednesday	3	55.9%	60.2%	32.6%	45.4%	73.7%	74.5%	70.5%	65.6%	62.8%	61.1%	60.2%	59.4%	60.3%	61.7%	58.8%	56.2%	56.2%	59.0%	61.6%	60.0%	60.7%	52.9%	46.8%	52.1%	**60.4%**
Thursday	4	58.1%	51.8%	33.2%	47.7%	74.2%	74.6%	68.9%	66.0%	70.0%	63.5%	64.3%	57.5%	60.5%	61.8%	62.2%	58.8%	58.9%	57.6%	57.3%	56.0%	58.2%	51.7%	44.2%	50.2%	**60.5%**
Friday	5	56.3%	51.6%	33.4%	49.0%	74.6%	73.1%	67.4%	64.7%	63.4%	60.3%	58.7%	57.0%	58.7%	60.2%	55.2%	56.6%	55.3%	58.8%	59.7%	59.6%	62.6%	55.8%	50.2%	51.0%	**59.2%**
Saturday	6	66.1%	59.9%	26.8%	39.8%	71.4%	80.2%	76.2%	72.5%	66.1%	60.8%	54.1%	47.8%	47.7%	51.4%	53.4%	55.1%	55.5%	56.2%	54.4%	50.4%	55.0%	46.3%	38.1%	34.6%	**55.8%**
Sunday	0	40.0%	27.0%	17.2%	37.3%	75.0%	**84.9%**	83.7%	79.8%	73.0%	67.1%	61.1%	55.6%	57.0%	56.8%	59.7%	63.4%	66.0%	66.2%	64.7%	58.7%	56.3%	54.0%	48.3%	55.1%	**61.8%**
Weekdays		58.9%	54.5%	32.7%	46.3%	73.8%	75.9%	70.5%	66.6%	65.5%	63.2%	62.7%	58.5%	60.0%	61.6%	58.6%	56.7%	56.8%	58.1%	58.6%	58.4%	60.3%	53.8%	47.8%	51.0%	**60.5%**
Weekend days		56.0%	47.5%	22.4%	38.5%	73.1%	82.4%	79.9%	76.0%	69.4%	63.8%	57.6%	51.7%	52.4%	54.3%	56.7%	59.7%	61.3%	62.0%	60.4%	55.0%	55.7%	50.4%	43.4%	44.6%	**58.9%**
All Days		57.5%	51.4%	28.3%	43.4%	73.6%	77.2%	72.3%	68.7%	66.4%	63.4%	61.4%	56.6%	57.8%	59.5%	58.1%	57.5%	58.0%	59.2%	59.2%	57.7%	59.2%	53.0%	46.7%	49.2%	**60.1%**

max 84.9%
min 17.2%

Location Info	
Location ID	9101
Type	I-SECTION
Functional Class	1
Located On	MASSACHUSETTS TURNPIKE
Between	AND
Direction	2-WAY
Community	BOSTON
MPO_ID	
HPMS ID	035456906151
Agency	Massachusetts Highway Department

Count Data Info	
Start Date	6/10/2005
End Date	6/11/2005
Start Time	12:00 AM
End Time	12:00 AM
Direction	2-WAY
Notes	
Count Source	
File Name	
Weather	
Study	HPMS Permanent and Coverage Counts
Owner	mhd

Interval: 60 mins	
Time	**Hourly Count**
00:00 - 01:00	2524
01:00 - 02:00	2206
02:00 - 03:00	1053
03:00 - 04:00	561
04:00 - 05:00	652
05:00 - 06:00	1764
06:00 - 07:00	3051
07:00 - 08:00	4272
08:00 - 09:00	4474
09:00 - 10:00	4258
10:00 - 11:00	3474
11:00 - 12:00	3578
12:00 - 13:00	3666
13:00 - 14:00	3870
14:00 - 15:00	4343
15:00 - 16:00	4880
16:00 - 17:00	5144
17:00 - 18:00	5046
18:00 - 19:00	4928
19:00 - 20:00	3674
20:00 - 21:00	3284
21:00 - 22:00	2715
22:00 - 23:00	2580
23:00 - 24:00	2697
TOTAL	78694

Directional Distribution in Peak			
EB	3057	61%	2,812
WB	1989	39%	1,829
Total	5046		4,641

(calc'd values for graphics only)

WB	Sumner Average weekday	1538
EB	Callahan Average weekday	1874

TED WILLIAMS TUNNEL

				Growth	1.051140132								
			EX 2012 Massport EB volume		2022 NB grown	% BG projects	BG on link	Total 2022 NB	% employee trips	Employee trips	% patron trips	patron trips	2022 Build
EB	2955	58%	113	3069	24%	14	44%	405	3,488
WB	1923	52%	126	2049	24%	9	44%	374	2,432

SUMNER TUNNEL

	Growth	1.010025	1.051140132								
	EX 2010 Massport	EX 2012	2022 NB grown	% BG projects	BG on link	Total 2022 NB	% employee trips	Employee trips	% patron trips	patron trips	2022 Build
WB	1687	1704	1791	48%	117	1909	2%	1	14%	119	2,028

CALLAHAN TUNNEL

	EX 2010 Massport	EX 2012	2022 NB grown	% BG projects	BG on link	Total 2022 NB	% employee trips	Employee trips	% patron trips	patron trips	2022 Build
EB	2056	2076	2182	42%	84	2266	5%	3	25%	230	2,499

(no Friday available so applied weekday rate)

Location Info	
Location ID	9101
Type	I-SECTION
Functional Class	1
Located On	MASSACHUSETTS TURNPIKE
Between	AND
Direction	2-WAY
Community	BOSTON
MPO_ID	
HPMS ID	035456906151
Agency	Massachusetts Highway Department

Count Data Info	
Start Date	6/11/2005
End Date	6/12/2005
Start Time	12:00 AM
End Time	12:00 AM
Direction	2-WAY
Notes	
Count Source	
File Name	
Weather	
Study	HPMS Permanent and Coverage Counts
Owner	mhd

Interval: 60 mins	
Time	Hourly Count
00:00 - 01:00	1838
01:00 - 02:00	2159
02:00 - 03:00	1456
03:00 - 04:00	818
04:00 - 05:00	710
05:00 - 06:00	1207
06:00 - 07:00	2145
07:00 - 08:00	2726
08:00 - 09:00	2672
09:00 - 10:00	2435
10:00 - 11:00	2806
11:00 - 12:00	2769
12:00 - 13:00	3001
13:00 - 14:00	3293
14:00 - 15:00	3454
15:00 - 16:00	3619
16:00 - 17:00	3746
17:00 - 18:00	3871
18:00 - 19:00	3351
19:00 - 20:00	3079
20:00 - 21:00	2658
21:00 - 22:00	2242
22:00 - 23:00	2095
23:00 - 24:00	2182
TOTAL	60332

Directional Distribution in Peak		
EB	2184	58%
WB	1562	42%
Total	3746	

TED WILLIAMS TUNNEL

	EX 2012 Massport EB volume		2022 NB grown	% BG projects	BG on link	Total 2022 NB	% employee trips	Employee trips	% patron trips	patron trips	2022 Build
Growth 1.051140132											
EB	2,207	EB	2320	58%	110	2430	24%	28	44%	419	2,877
WB	1,579	WB	1659	52%	112	1771	24%	12	44%	351	2,134
	3,786		(assumes same distribution between two tunnels as Friday (no Callahan/Sumner data for weekend)								

(calc'd values for graphics only)

SUMNER TUNNEL

	% employee trips	Employee trips	% patron trips	patron trips
WB	2%	1	14%	112

CALLAHAN TUNNEL

	% employee trips	Employee trips	% patron trips	patron trips
EB	5%	6	25%	238

Location Info	
Location ID	9101_EB
Type	I-SECTION
Functional Class	-
Located On	MASSACHUSETTS TURNPIKE
Between	AND
Direction	EB
Community	BOSTON
MPO_ID	
HPMS ID	
Agency	Massachusetts Highway Department

Count Data Info	
Start Date	6/10/2005
End Date	6/11/2005
Start Time	12:00 AM
End Time	12:00 AM
Direction	3
Notes	
Count Source	
File Name	
Weather	
Study	HPMS Permanent and Coverage Counts
Owner	mhd

Interval: 60 mins	
Time	**Hourly Count**
00:00 - 01:00	1189
01:00 - 02:00	970
02:00 - 03:00	514
03:00 - 04:00	354
04:00 - 05:00	404
05:00 - 06:00	1233
06:00 - 07:00	1751
07:00 - 08:00	2148
08:00 - 09:00	1917
09:00 - 10:00	1624
10:00 - 11:00	1612
11:00 - 12:00	1857
12:00 - 13:00	1879
13:00 - 14:00	2156
14:00 - 15:00	2304
15:00 - 16:00	2598
16:00 - 17:00	2973
17:00 - 18:00	3057
18:00 - 19:00	3002
19:00 - 20:00	2105
20:00 - 21:00	1729
21:00 - 22:00	1366
22:00 - 23:00	1264
23:00 - 24:00	1329
TOTAL	41335

Location Info	
Location ID	9101_WB
Type	I-SECTION
Functional Class	-
Located On	MASSACHUSETTS TURNPIKE
Between	AND
Direction	WB
Community	BOSTON
MPO_ID	
HPMS ID	
Agency	Massachusetts Highway Department

Count Data Info	
Start Date	6/10/2005
End Date	6/11/2005
Start Time	12:00 AM
End Time	12:00 AM
Direction	4
Notes	
Count Source	
File Name	
Weather	
Study	HPMS Permanent and Coverage Counts
Owner	mhd

Interval: 60 mins	
Time	**Hourly Count**
00:00 - 01:00	1335
01:00 - 02:00	1236
02:00 - 03:00	539
03:00 - 04:00	207
04:00 - 05:00	248
05:00 - 06:00	531
06:00 - 07:00	1300
07:00 - 08:00	2124
08:00 - 09:00	2557
09:00 - 10:00	2634
10:00 - 11:00	1862
11:00 - 12:00	1721
12:00 - 13:00	1787
13:00 - 14:00	1714
14:00 - 15:00	2039
15:00 - 16:00	2282
16:00 - 17:00	2171
17:00 - 18:00	1989
18:00 - 19:00	1926
19:00 - 20:00	1569
20:00 - 21:00	1555
21:00 - 22:00	1349
22:00 - 23:00	1316
23:00 - 24:00	1368
TOTAL	37359

Location Info	
Location ID	9101_EB
Type	I-SECTION
Functional Class	-
Located On	MASSACHUSETTS TURNPIKE
Between	AND
Direction	EB
Community	BOSTON
MPO_ID	
HPMS ID	
Agency	Massachusetts Highway Department

Count Data Info	
Start Date	6/11/2005
End Date	6/12/2005
Start Time	12:00 AM
End Time	12:00 AM
Direction	3
Notes	
Count Source	
File Name	
Weather	
Study	HPMS Permanent and Coverage Counts
Owner	mhd

Interval: 60 mins	
Time	**Hourly Count**
00:00 - 01:00	957
01:00 - 02:00	954
02:00 - 03:00	683
03:00 - 04:00	537
04:00 - 05:00	487
05:00 - 06:00	864
06:00 - 07:00	1417
07:00 - 08:00	1530
08:00 - 09:00	1333
09:00 - 10:00	1276
10:00 - 11:00	1459
11:00 - 12:00	1448
12:00 - 13:00	1593
13:00 - 14:00	1917
14:00 - 15:00	1822
15:00 - 16:00	2032
16:00 - 17:00	2184
17:00 - 18:00	2115
18:00 - 19:00	1796
19:00 - 20:00	1511
20:00 - 21:00	1350
21:00 - 22:00	1140
22:00 - 23:00	1101
23:00 - 24:00	1115
TOTAL	32621

Location Info	
Location ID	9101_WB
Type	I-SECTION
Functional Class	-
Located On	MASSACHUSETTS TURNPIKE
Between	AND
Direction	WB
Community	BOSTON
MPO_ID	
HPMS ID	
Agency	Massachusetts Highway Department

Count Data Info	
Start Date	6/11/2005
End Date	6/12/2005
Start Time	12:00 AM
End Time	12:00 AM
Direction	4
Notes	
Count Source	
File Name	
Weather	
Study	HPMS Permanent and Coverage Counts
Owner	mhd

Interval: 60 mins	
Time	**Hourly Count**
00:00 - 01:00	881
01:00 - 02:00	1205
02:00 - 03:00	773
03:00 - 04:00	281
04:00 - 05:00	223
05:00 - 06:00	343
06:00 - 07:00	728
07:00 - 08:00	1196
08:00 - 09:00	1339
09:00 - 10:00	1159
10:00 - 11:00	1347
11:00 - 12:00	1321
12:00 - 13:00	1408
13:00 - 14:00	1376
14:00 - 15:00	1632
15:00 - 16:00	1587
16:00 - 17:00	1562
17:00 - 18:00	1756
18:00 - 19:00	1555
19:00 - 20:00	1568
20:00 - 21:00	1308
21:00 - 22:00	1102
22:00 - 23:00	994
23:00 - 24:00	1067
TOTAL	27711

Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

Vehicle Crash Data

MassDOT Crash Rates (2008-2010)

Below AverageCrash Rate

	Route 1A / Bell Circle	Route 1A/ Boardman St	Route 1A/ Furlong Drive	Route 1A/ Jughandle	Route 1A/ Suffolk Downs Drive	Route 1A/ Waldemar Ave	Route 145/ Route 1A	Route 145/ N Shore Rd	Route 145/ Tomasso Dr	Bennington St/ Neptune Rd
Year										
2008	10	8	3	6	2	1	12	6	7	3
2009	8	2	2	2	0	0	10	7	10	3
2010	2	0	3	3	0	0	17	5	2	0
Total	20	10.00	8	11	2	1	39	18	19	6
Average	6.67	3.33	2.67	3.67	0.66	0.33	13.00	6.00	6.33	2.00
Collision Type										
Angle	3	0	4	3	0	1	13	8	13	2
Head-on	0	2	0	0	0	0	0	0	0	0
Rear-end	6	6	2	7	2	0	10	6	2	0
Rear-to-Rear	0	0	0	0	0	0	0	0	0	1
Sideswipe, opposite direction	0	0	0	0	0	0	0	0	0	0
Sideswipe, same direction	3	1	0	0	0	0	2	3	0	0
Single vehicle crash	1	0	0	0	0	0	7	1	3	0
Unknown	1	0	0	0	0	0	0	0	0	1
Not reported	6	1	2	1	0	0	7	0	1	2
Total	20	10	8	11	2	1	39	18	19	6
Crash Severity										
Fatal injury	0	0	0	0	0	0	0	0	0	0
Non-fatal injury	6	3	3	6	0	0	16	9	6	2
Property damage only (none injured)	10	6	3	2	2	1	15	9	13	3
Not Reported	4	0	1	2	0	0	7	0	0	1
Unknown	0	1	1	1	0	0	1	0	0	0
Total	20	10	8	11	2	1	39	18	19	6
Time of Day										
Weekday, 7:00 AM - 9:00 AM	2	1	1	1	0	0	6	5	3	0
Weekday, 4:00 PM - 6:00 PM	2	0	2	2	0	0	4	1	1	1
Saturday, 11:00 AM - 2:00 PM	0	0	0	1	0	0	0	0	0	0
Weekday, other time	9	5	5	6	1	1	12	6	11	3
Weekend, other time	7	4	0	1	1	0	17	6	4	2
Total	20	10	8	11	2	1	39	18	19	6
Pavement Conditions										
Dry	13	8	5	7	1	1	24	14	14	4
Wet	4	1	2	2	1	0	11	3	3	0
Snow	0	0	0	1	0	0	0	0	0	1
Ice	0	0	0	0	0	0	1	1	1	0
Sand, mud, dirt, oil, gravel	0	0	1	0	0	0	1	0	0	0
Water (standing, moving)	0	0	0	0	0	0	0	0	0	0
Slush	0	1	0	1	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0
Unknown	1	0	0	0	0	0	0	0	0	0
Not reported	2	0	0	0	0	0	2	0	1	1
Total	20	10	8	11	2	1	39	18	19	6
Non Motroist (Bike, Pedestrian)										
Total	1	0	0	0	0	0	1	0	1	0

Below Average Crash Rate

	Bennington St/ Saratoga St	Neptune Rd/ Route 1A	Ocean Rd/ State St	Revere St/ Route 60	Route 1A/ Route 16	Neptune Rd/ Bremen St	Neptune Rd/ Saratoga St	Route 1A SB/Curtis St	Bennington St/ Crescent Ave	North Shore Rd/ Wonderland MBTA	North Shore Rd/ Revere St	Squire Rd/ Charger St	Squire Rd/ Sigourney St
Year													
2008	14	1	3	7	9	1	0	1	0	3	9	4	5
2009	3	1	4	5	13	0	0	1	0	4	7	4	6
2010	4	0	5	6	11	0	0	0	0	3	4	0	1
Total	21	2	12	18	33	1	0	2	0	10	20	8	12
Average	7.00	0.66	4.00	6.00	11.00	0.66	0		0	3.33	6.67	2.66	4.00
Collision Type													
Angle	5	2	2	3	4	0	0	0	0	0	4	3	3
Head-on	1	0	0	1	0	0	0	0	0	1	1	0	1
Rear-end	5	0	4	11	7	1	0	2	0	7	9	4	5
Rear-to-Rear	0	0	0	0	1	0	0	0	0	0	0	0	0
Sideswipe, opposite direction	1	0	0	0	0	0	0	0	0	0	0	0	0
Sideswipe, same direction	2	0	2	1	8	0	0	0	0	0	3	0	1
Single vehicle crash	3	0	0	1	12	0	0	0	0	1	3	1	1
Unknown	0	0	1	0	0	0	0	0	0	0	0	0	0
Not reported	4	0	3	1	1	0	0	0	0	1	0	0	1
Total	21	2	12	18	33	1	0	2	0	10	20	8	12
Crash Severity													
Fatal injury	0	0	0	0	0	0	0	0	0	0	1	0	0
Non-fatal injury	7	0	4	7	13	1	0	1	0	6	6	6	6
Property damage only (none injured)	10	2	7	5	18	0	0	0	0	3	9	1	3
Not Reported	2	0	1	6	2	0	0	1	0	1	1	1	1
Unknown	2	0	0	0	0	0	0	0	0	0	3	0	2
Total	21	2	12	18	33	1	0	2	0	10	20	8	12
Time of Day													
Weekday, 7:00 AM - 9:00 AM	5	1	4	1	6	0	0	0	0	1	3	0	1
Weekday, 4:00 PM - 6:00 PM	1	0	1	0	3	0	0	0	0	1	3	1	1
Saturday, 11:00 AM - 2:00 PM	1	0	0	1	4	0	0	0	0	0	3	0	0
Weekday, other time	11	1	6	11	11	1	0	2	0	6	7	5	6
Weekend, other time	3	0	1	5	9	0	0	0	0	2	4	2	4
Total	21	2	12	18	33	1	0	2	0	10	20	8	12
Pavement Conditions													
Dry	12	1	9	11	29	0	0	0	0	8	15	5	9
Wet	5	1	0	5	3	0	0	2	0	1	4	3	3
Snow	1	0	0	1	0	1	0	0	0	0	0	0	0
Ice	1	0	0	0	0	0	0	0	0	0	0	0	0
Sand, mud, dirt, oil, gravel	0	0	0	0	0	0	0	0	0	0	0	0	0
Water (standing, moving)	0	0	0	0	0	0	0	0	0	0	0	0	0
Slush	0	0	0	0	0	0	0	0	0	0	1	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	1	0	0	0	0	0	0	0	0
Not reported	2	0	3	1	0	0	0	0	0	1	0	0	0
Total	21	2	12	18	33	1	0	2	0	10	20	8	12
Non Motroist (Bike, Pedestrian)													
Total	2	0	0	0	2	0	0	0	0	1	0	0	0

Above Average Crash Rate

	Rt 16& Rt 1A/ Bell Circle	Route 16/ Route 145	Route 16/ Garfield St	Route 60/ Bell Circle	Beach St/ Bell Circle	Bennington/ Winthrop Ave
Year						
2008	15	20	22	14	5	5
2009	14	21	19	14	4	10
2010	3	11	20	1	2	5
Total	32	52	61	29	11	20
Average	10.67	17.33	20.33	9.67	3.67	6.67
Collision Type						
Angle	8	16	19	6	3	7
Head-on	1	4	4	0	0	0
Rear-end	13	20	20	11	4	1
Rear-to-Rear	0	0	0	0	0	0
Sideswipe, opposite direction	1	0	1	0	0	0
Sideswipe, same direction	2	3	12	4	0	2
Single vehicle crash	2	5	3	1	0	7
Unknown	1	0	1	1	0	0
Not reported	4	4	1	6	4	3
Total	32	52	61	29	11	20
Crash Severity						
Fatal injury	0	1	0	0	0	1
Non-fatal injury	11	20	14	12	4	5
Property damage only (none injured)	12	27	44	14	5	9
Not Reported	9	4	1	3	2	5
Unknown	0	0	2	0	0	0
Total	32	52	61	29	11	20
Time of Day						
Weekday, 7:00 AM - 9:00 AM	4	5	13	3	1	3
Weekday, 4:00 PM - 6:00 PM	2	5	6	1	1	3
Saturday, 11:00 AM - 2:00 PM	2	3	1	2	0	0
Weekday, other time	15	19	29	16	6	11
Weekend, other time	9	20	12	7	3	3
Total	32	52	61	29	11	20
Pavement Conditions						
Dry	21	39	53	14	8	10
Wet	7	7	6	9	3	4
Snow	1	2	1	2	0	0
Ice	0	0	0	1	0	3
Sand, mud, dirt, oil, gravel	0	1	0	0	0	0
Water (standing, moving)	0	0	0	0	0	0
Slush	0	0	0	0	0	1
Other	0	0	0	0	0	0
Unknown	0	0	0	1	0	0
Not reported	3	3	1	2	0	2
Total	32	52	61	29	11	20
Non Motroist (Bike, Pedestrian)						
Total	0	2	1	1	0	3

Rotaries & Roundabouts

Bell Circle	Brown Circle	Butler Circle	Copeland Circle	Elliot circle
46	43	23	105	14
40	27	23	82	6
11	18	9	37	5
97	88	55	224	25
32.33	29.33	18.33	74.67	8.33
22	18	6	22	4
1	1	0	0	0
36	38	19	130	11
0	0	1	0	0
1	1	0	0	1
11	14	10	20	3
3	8	11	38	5
2	0	0	1	0
21	8	8	13	1
97	88	55	224	25
0	0	1	1	0
32	28	21	77	9
43	39	17	117	14
22	16	14	23	1
0	5	2	6	1
97	88	55	224	25
10	11	7	21	3
8	7	2	19	0
5	1	2	12	0
51	45	25	120	11
23	24	19	52	11
97	88	55	224	25
64	67	39	148	19
21	15	11	62	3
3	0	0	1	1
1	0	1	3	1
0	0	0	3	0
0	0	0	0	0
0	0	0	1	0
0	0	0	0	0
1	1	0	0	0
7	5	4	6	1
97	88	55	224	25
1	1	1	1	1

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

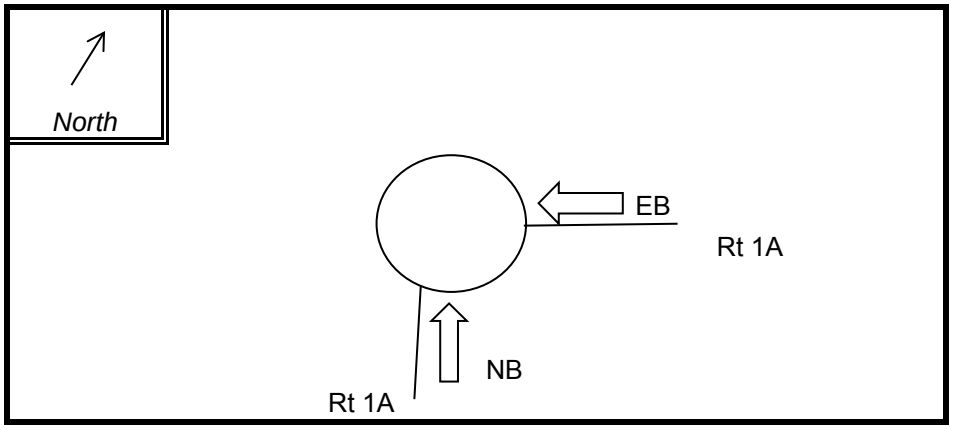
DISTRICT : 4 UNSIGNALIZED : ☐ SIGNALIZED : ☒

~ INTERSECTION DATA ~

MAJOR STREET : Bell Circle

MINOR STREET(S) : 1A

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	EB				
PEAK HOURLY VOLUMES (AM/PM) :	1,714	947				**2,661**

" K " FACTOR :	**0.090**	INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :			**29,567**
TOTAL # OF CRASHES :	20	# OF YEARS :	3	AVERAGE # OF CRASHES PER YEAR (**A**) :	**6.67**

CRASH RATE CALCULATION : **0.62** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

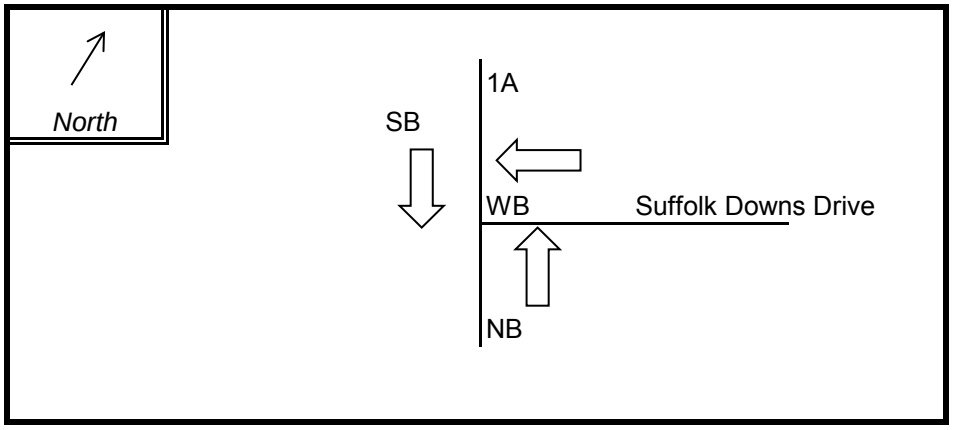
DISTRICT : 6 UNSIGNALIZED : ☒ SIGNALIZED : ☐

~ INTERSECTION DATA ~

MAJOR STREET : Route 1A

MINOR STREET(S) : Suffolk Downs Drive (Tomasello Dr)

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	WB			
PEAK HOURLY VOLUMES (AM/PM) :	2,165	1,720	32			**3,917**

" K " FACTOR :	**0.090**	INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :	**43,522**

TOTAL # OF CRASHES :	2	# OF YEARS :	3	AVERAGE # OF CRASHES PER YEAR (**A**) :	**0.67**

CRASH RATE CALCULATION : **0.04** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE : May xx, 2012

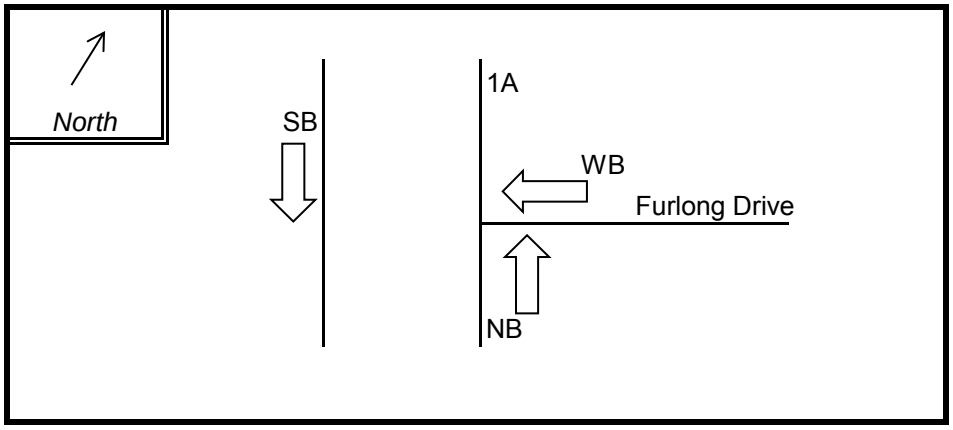
DISTRICT : 4 UNSIGNALIZED : ☒ SIGNALIZED : ☐

~ INTERSECTION DATA ~

MAJOR STREET : Route 1A

MINOR STREET(S) : Furlong Drive

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	WB			
PEAK HOURLY VOLUMES (AM/PM) :	2,131		108			**2,239**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **24,878**

TOTAL # OF CRASHES : 8 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **2.67**

CRASH RATE CALCULATION : **0.29** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

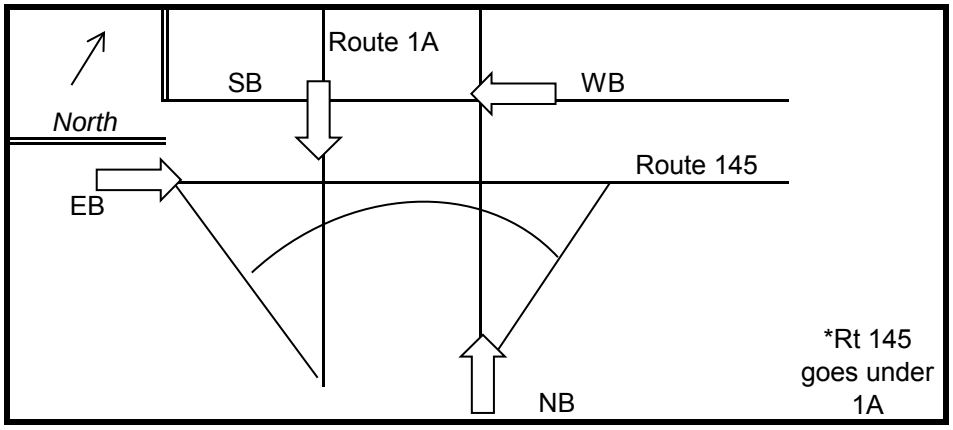
DISTRICT : 4 UNSIGNALIZED : ☐ SIGNALIZED : ☒

~ INTERSECTION DATA ~

MAJOR STREET : 1A

MINOR STREET(S) : Route 145

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	EB	SB	WB		
PEAK HOURLY VOLUMES (AM/PM) :	2,139	1,586		1,655		**5,380**

" K " FACTOR :	**0.090**	INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :	**59,778**

TOTAL # OF CRASHES :	39	# OF YEARS :	3	AVERAGE # OF CRASHES PER YEAR (**A**) :	**13.00**

CRASH RATE CALCULATION : **0.60** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

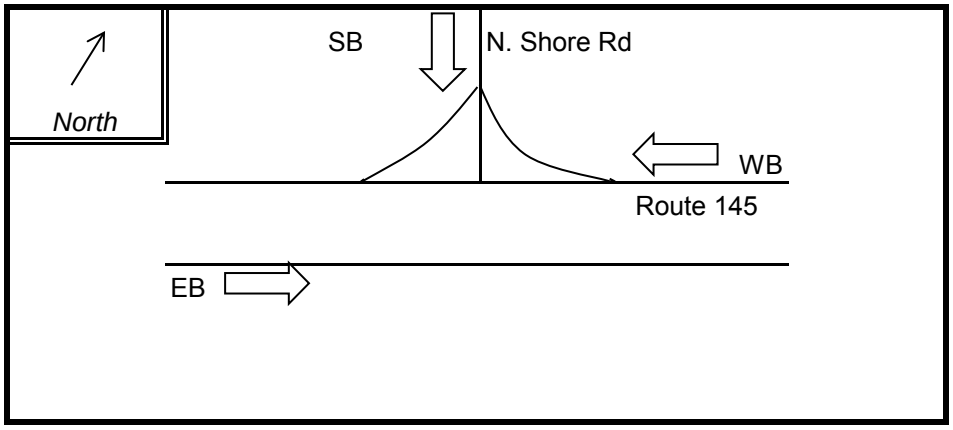
DISTRICT : 4 UNSIGNALIZED : ☐ SIGNALIZED : ☒

~ INTERSECTION DATA ~

MAJOR STREET : Route 145

MINOR STREET(S) : North Shore Road

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	SB	WB			
PEAK HOURLY VOLUMES (AM/PM) :	1,598	468	1,217			**3,283**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **36,478**

TOTAL # OF CRASHES : 18 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **6.00**

CRASH RATE CALCULATION : **0.45** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

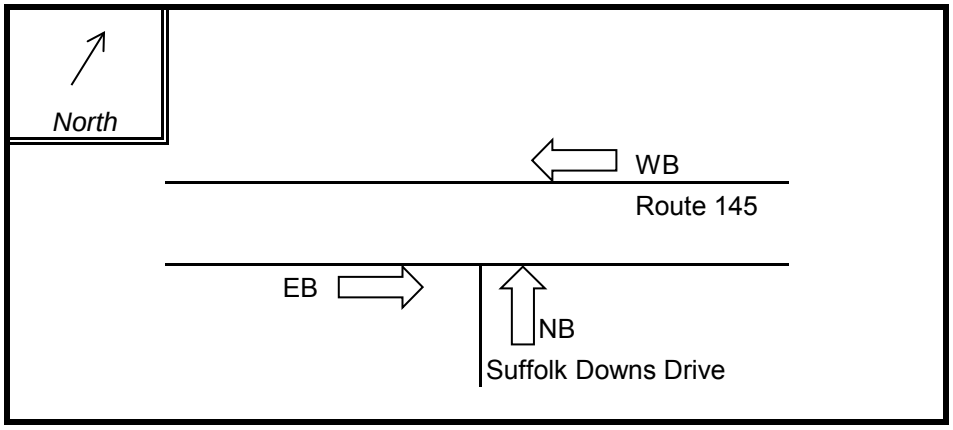
DISTRICT : 4 UNSIGNALIZED : SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET :

MINOR STREET(S) :

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	EB	WB			
PEAK HOURLY VOLUMES (AM/PM) :	692	1,339	1,085			**3,116**

" K " FACTOR :	**0.090**	INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :			**34,622**
TOTAL # OF CRASHES :	19	# OF YEARS :	3	AVERAGE # OF CRASHES PER YEAR (**A**) :	**6.33**

CRASH RATE CALCULATION : **0.50** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

DISTRICT : 4 UNSIGNALIZED : ☐ SIGNALIZED : ☒

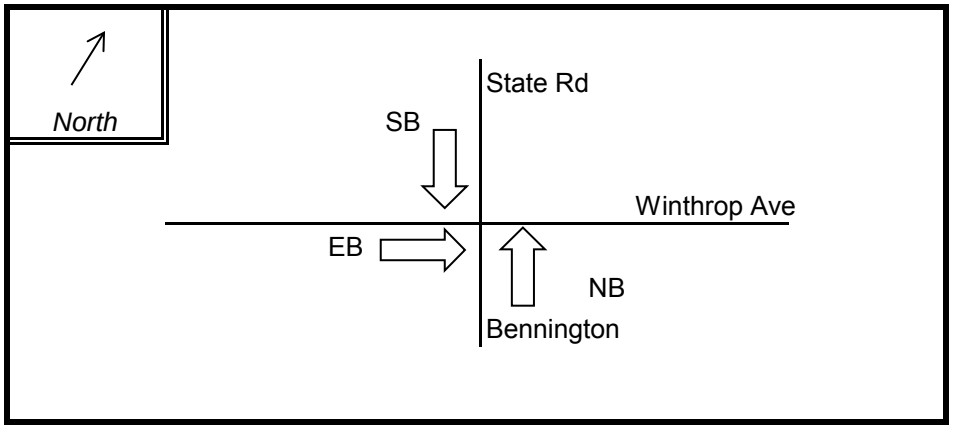
~ INTERSECTION DATA ~

MAJOR STREET : Winthrop

MINOR STREET(S) : Bennington

State Rd

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	EB			
PEAK HOURLY VOLUMES (AM/PM) :	892	355	566			1,813

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **20,144**

TOTAL # OF CRASHES : 20 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **6.67**

CRASH RATE CALCULATION : **0.91** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

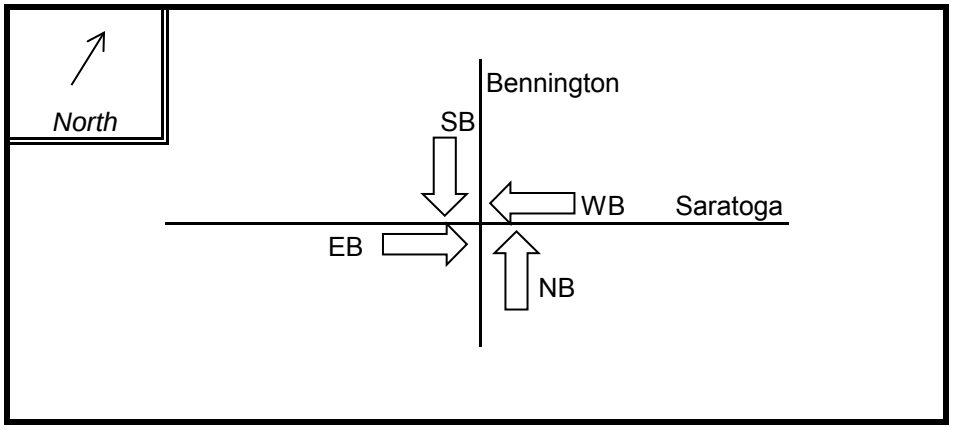
DISTRICT : 6 UNSIGNALIZED : SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET : Bennington

MINOR STREET(S) : Saratoga

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	EB	SB	WB		
PEAK HOURLY VOLUMES (AM/PM) :	851	392	429	639		**2,311**

" K " FACTOR :	**0.090**	INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :	**25,678**

TOTAL # OF CRASHES :	21	# OF YEARS :	3	AVERAGE # OF CRASHES PER YEAR (**A**) :	**7.00**

CRASH RATE CALCULATION : **0.75** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

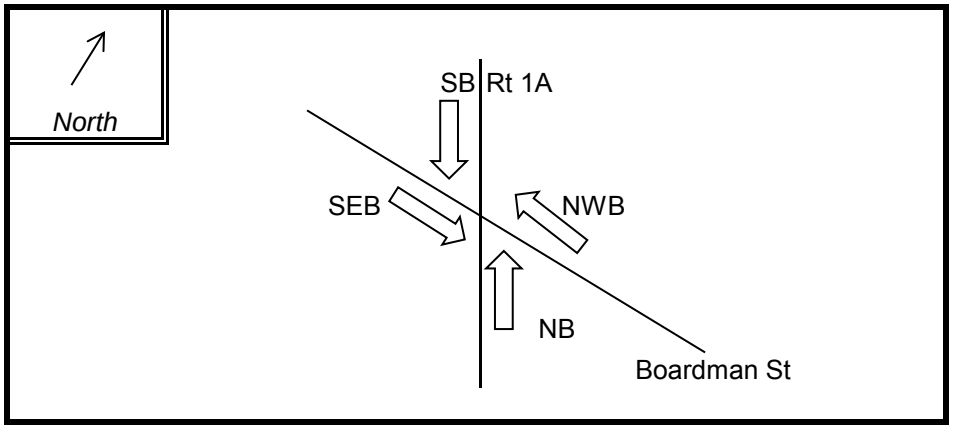
DISTRICT : 6 UNSIGNALIZED : ☐ SIGNALIZED : ☒

~ INTERSECTION DATA ~

MAJOR STREET : Rt 1 A

MINOR STREET(S) : Boardman St

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	NWB	SEB		
PEAK HOURLY VOLUMES (AM/PM) :	2,051	1,754	398	86		**4,289**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **47,656**

TOTAL # OF CRASHES : 10 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **3.33**

CRASH RATE CALCULATION : **0.19** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

DISTRICT : 4 UNSIGNALIZED : SIGNALIZED : X

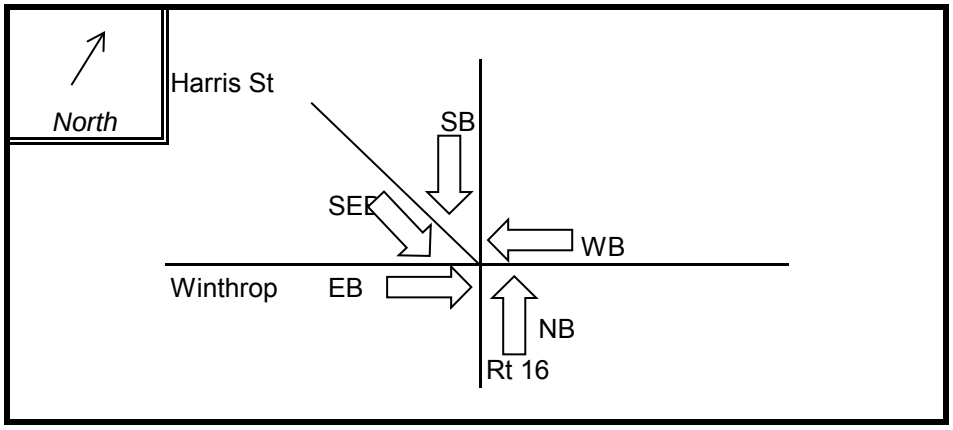
~ INTERSECTION DATA ~

MAJOR STREET : Route 16

MINOR STREET(S) : Winthrop

Harris

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	EB	WB	SEB	
PEAK HOURLY VOLUMES (AM/PM) :	1,818	527	234	1,390	139	**4,108**

" K " FACTOR :	**0.090**	INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :	**45,644**

TOTAL # OF CRASHES :	52	# OF YEARS :	3	AVERAGE # OF CRASHES PER YEAR (**A**) :	**17.33**

CRASH RATE CALCULATION : **1.04** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

DISTRICT : 4 UNSIGNALIZED : ☐ SIGNALIZED : ☒

~ INTERSECTION DATA ~

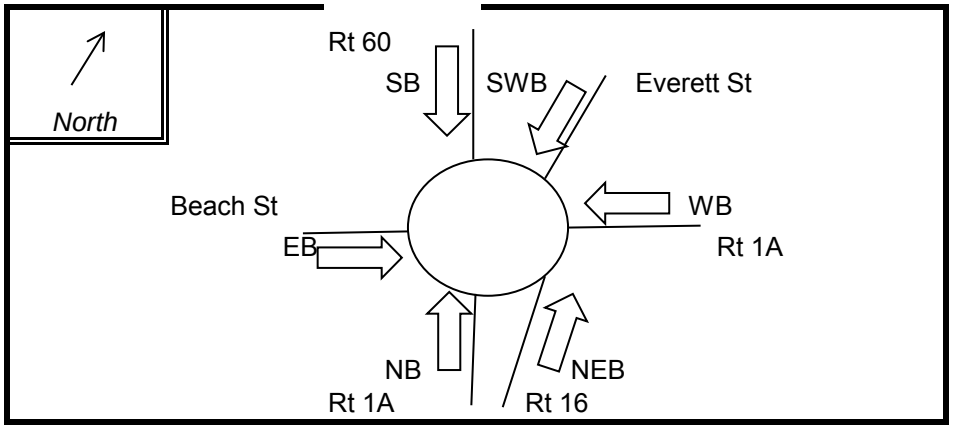
MAJOR STREET : 1A

MINOR STREET(S) : Beach St

Rt 16

Rt 60

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	NEB	SB	EB	WB&SWB	
PEAK HOURLY VOLUMES (AM/PM) :	1,714	661	1,014	313	1,068	**4,770**

" K " FACTOR :	**0.090**	INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :	**53,000**

TOTAL # OF CRASHES :	97	# OF YEARS :	3	AVERAGE # OF CRASHES PER YEAR (**A**) :	**32.33**

CRASH RATE CALCULATION : **1.67** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

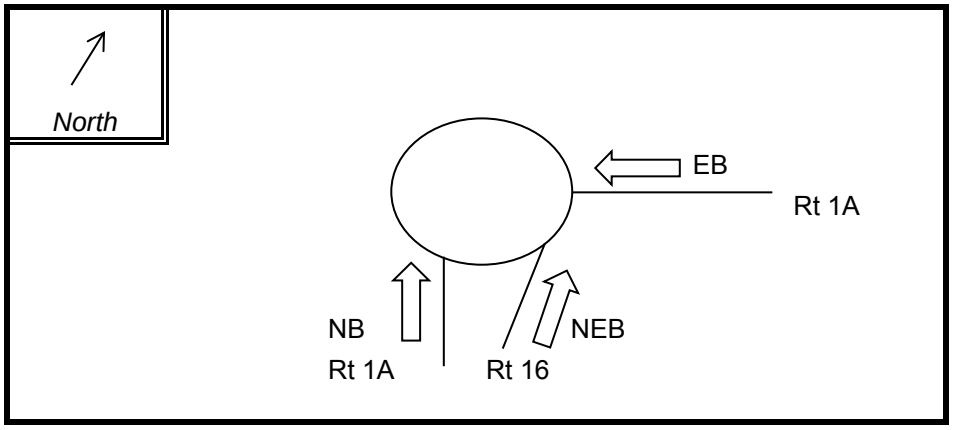
DISTRICT : 4 UNSIGNALIZED : ☐ SIGNALIZED : ☒

~ INTERSECTION DATA ~

MAJOR STREET :

MINOR STREET(S) :

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	NEB	EB			
PEAK HOURLY VOLUMES (AM/PM) :	1,714	661	947			**3,322**

" K " FACTOR :	**0.090**	INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :	**36,911**

TOTAL # OF CRASHES :	32	# OF YEARS :	3	AVERAGE # OF CRASHES PER YEAR (**A**) :	**10.67**

CRASH RATE CALCULATION : **0.79** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

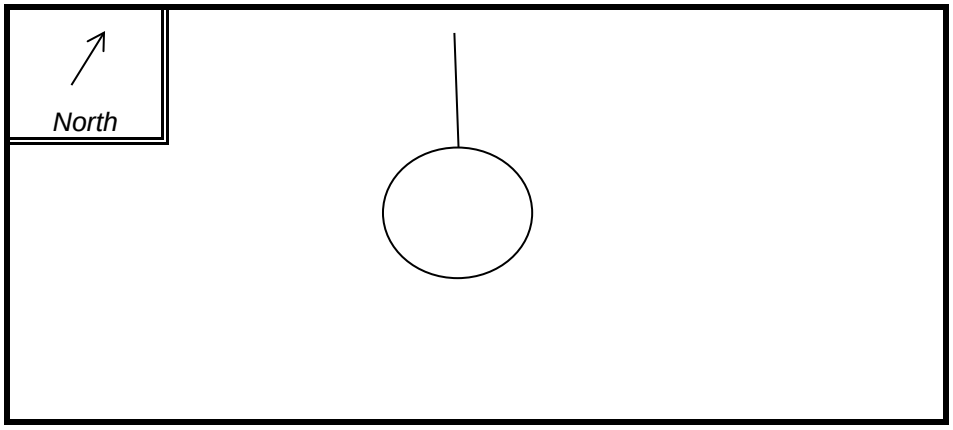
DISTRICT : 4 UNSIGNALIZED : ☐ SIGNALIZED : ☒

~ INTERSECTION DATA ~

MAJOR STREET : Bell Circle

MINOR STREET(S) : Rt 60

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	SB					
PEAK HOURLY VOLUMES (AM/PM) :	1,014					**1,014**

" K " FACTOR :	**0.090**	INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :			**11,267**
TOTAL # OF CRASHES :	29	# OF YEARS :	3	AVERAGE # OF CRASHES PER YEAR (**A**) :	**9.67**

CRASH RATE CALCULATION : **2.35** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

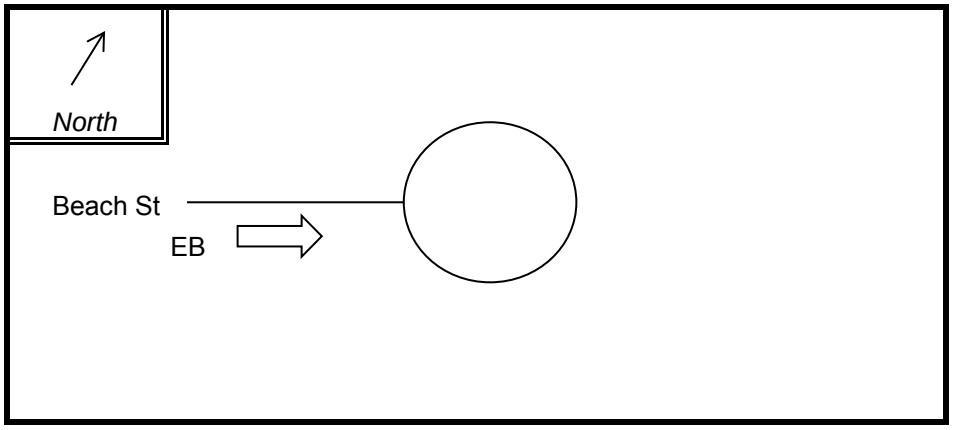
DISTRICT : 4 UNSIGNALIZED : ☐ SIGNALIZED : ☒

~ INTERSECTION DATA ~

MAJOR STREET : Bell Circle

MINOR STREET(S) : Beach St

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB					
PEAK HOURLY VOLUMES (AM/PM) :	313					**313**

" K " FACTOR :	**0.090**	INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :			**3,478**
TOTAL # OF CRASHES :	11	# OF YEARS :	3	AVERAGE # OF CRASHES PER YEAR (**A**) :	**3.67**

CRASH RATE CALCULATION : **2.89** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

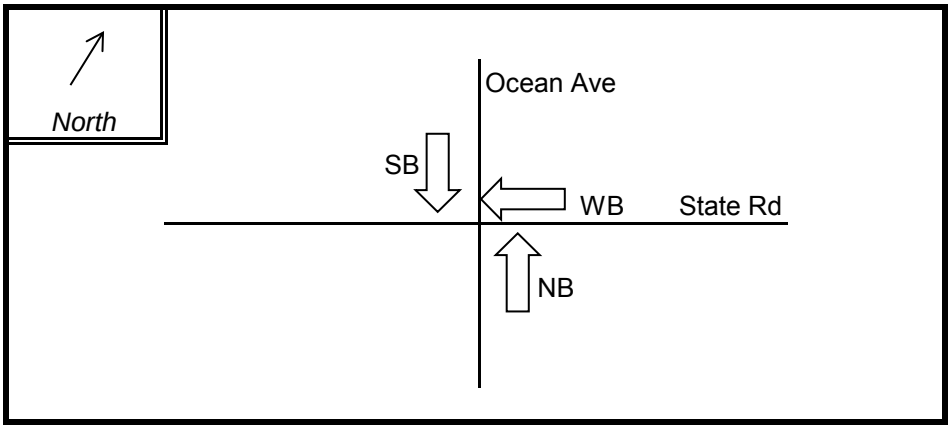
DISTRICT : 4 UNSIGNALIZED : SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET : Ocean Ave

MINOR STREET(S) : State Rd

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	WB			
PEAK HOURLY VOLUMES (AM/PM) :	1,223	767	298			**2,288**

" K " FACTOR :	**0.090**	INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :	**25,422**

TOTAL # OF CRASHES :	12	# OF YEARS :	3	AVERAGE # OF CRASHES PER YEAR (**A**) :	**4.00**

CRASH RATE CALCULATION : **0.43** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

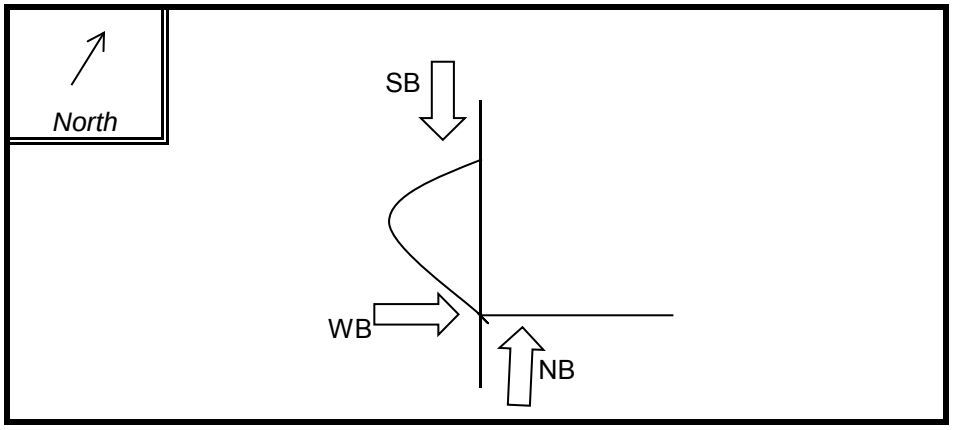
DISTRICT : 4 UNSIGNALIZED : SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET : 1A

MINOR STREET(S) : Jughandle

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	WB			
PEAK HOURLY VOLUMES (AM/PM) :	2,031	1,738	115			**3,884**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **43,156**

TOTAL # OF CRASHES : 11 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **3.67**

CRASH RATE CALCULATION : **0.23** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

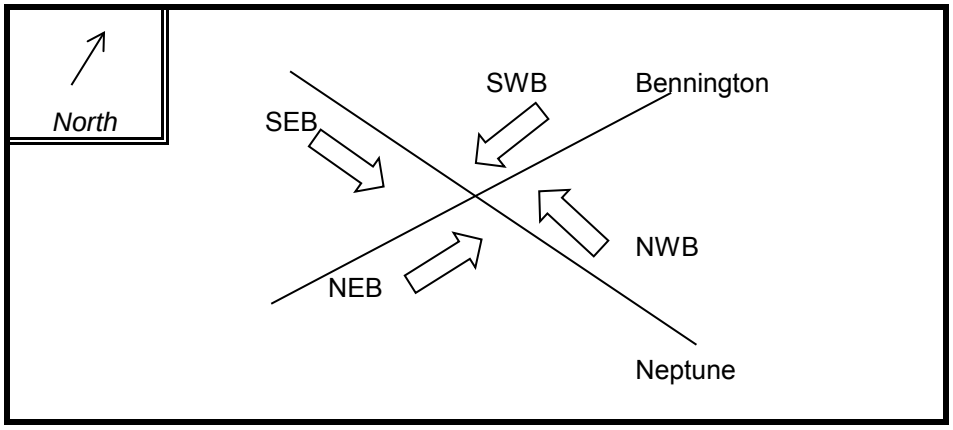
DISTRICT : 6 UNSIGNALIZED : SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET : Bennington

MINOR STREET(S) : Neptune

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NWB	NEB	SEB	SWB		
PEAK HOURLY VOLUMES (AM/PM) :	631	722	189	784		**2,326**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **25,844**

TOTAL # OF CRASHES : 6 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **2.00**

CRASH RATE CALCULATION : **0.21** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

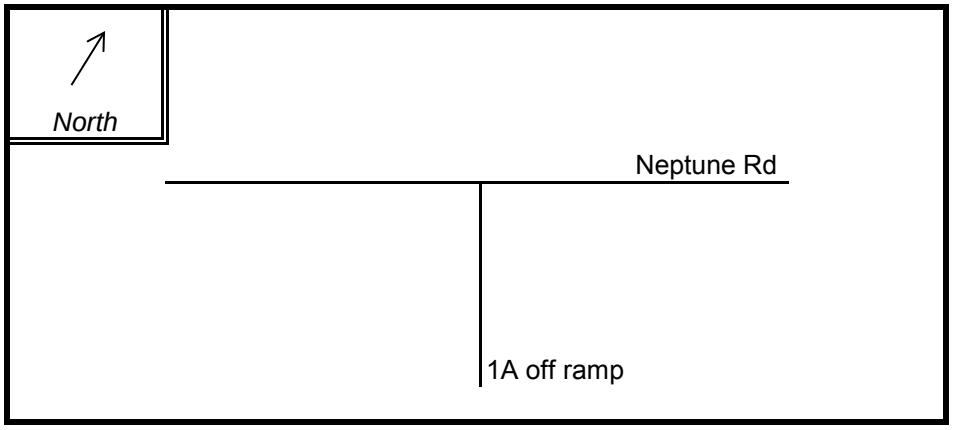
DISTRICT : 6 UNSIGNALIZED : SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET : Neptune Rd

MINOR STREET(S) : 1A off ramp

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	NB			
PEAK HOURLY VOLUMES (AM/PM) :	64	469	957			**1,490**

" K " FACTOR :	**0.090**	INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :			**16,556**
TOTAL # OF CRASHES :	2	# OF YEARS :	3	AVERAGE # OF CRASHES PER YEAR (**A**) :	**0.67**

CRASH RATE CALCULATION : **0.11** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

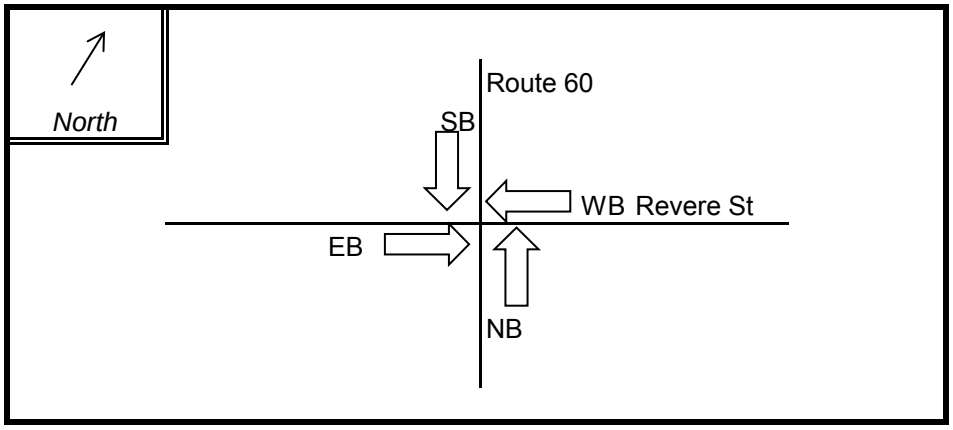
DISTRICT : 4 UNSIGNALIZED : SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET : Route 60

MINOR STREET(S) : Revere St

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	EB	SB	WB		
PEAK HOURLY VOLUMES (AM/PM) :	1,337	299	1,458	286		**3,380**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **37,556**

TOTAL # OF CRASHES : 18 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **6.00**

CRASH RATE CALCULATION : **0.44** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

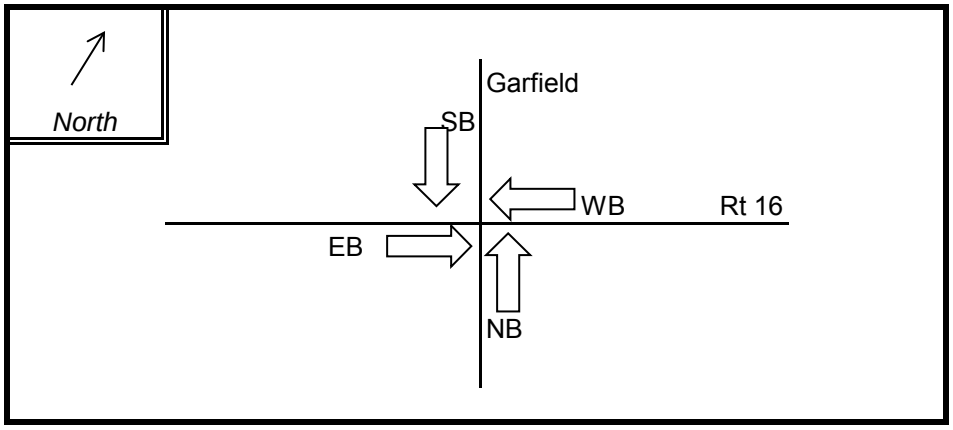
DISTRICT : 6 UNSIGNALIZED : SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET : Route 16

MINOR STREET(S) : Garfield

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	EB	SB	WB		
PEAK HOURLY VOLUMES (AM/PM) :	682	1,463	493	1,854		**4,492**

" K " FACTOR :	**0.090**	INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :	**49,911**

TOTAL # OF CRASHES :	61	# OF YEARS :	3	AVERAGE # OF CRASHES PER YEAR (**A**) :	**20.33**

CRASH RATE CALCULATION : **1.12** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

DISTRICT : 4 UNSIGNALIZED : ☒ SIGNALIZED : ☐

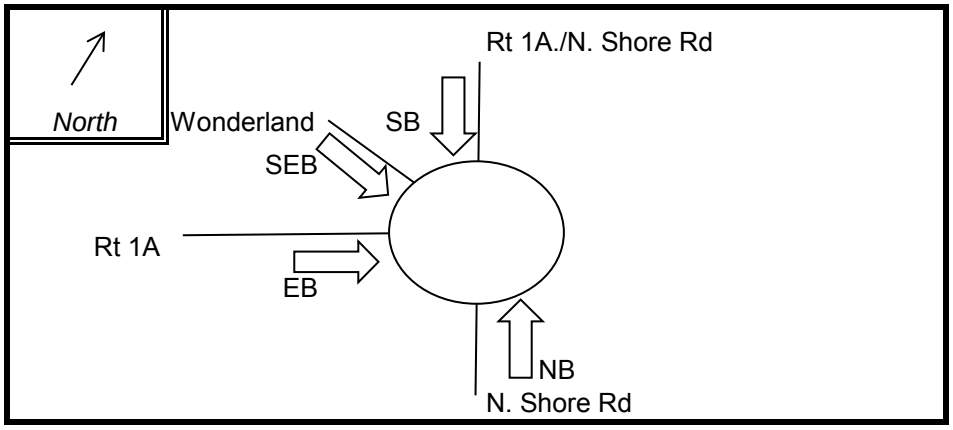
~ INTERSECTION DATA ~

MAJOR STREET : Rt 1 A

MINOR STREET(S) : N. Shore Rd

Wonderland Lot

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	SEB	EB		
PEAK HOURLY VOLUMES (AM/PM) :	417	1,039	12	1,053		**2,521**

" K " FACTOR :	**0.090**	INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :			**28,011**
TOTAL # OF CRASHES :	55	# OF YEARS :	3	AVERAGE # OF CRASHES PER YEAR (**A**) :	**18.33**

CRASH RATE CALCULATION : **1.79** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

DISTRICT : 4 UNSIGNALIZED : ☒ SIGNALIZED : ☐

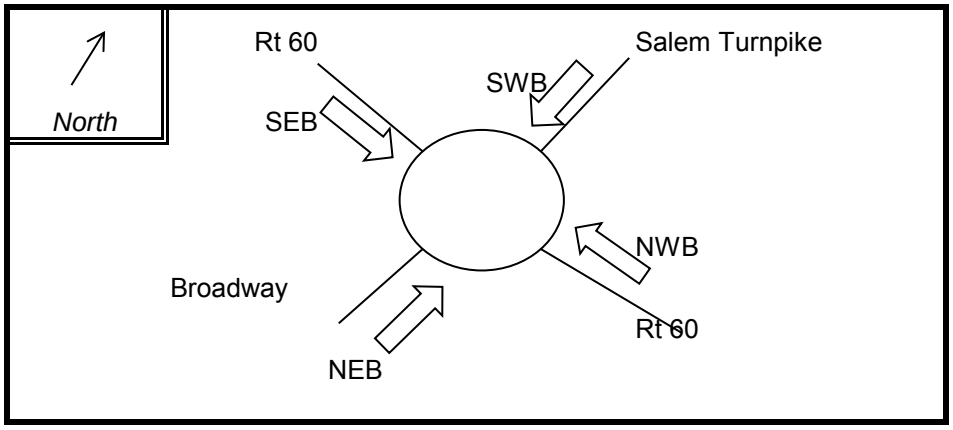
~ INTERSECTION DATA ~

MAJOR STREET : Rt 60

MINOR STREET(S) : Salem Turnpike

Broadway

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NEB	NWB	SEB	SWB		
PEAK HOURLY VOLUMES (AM/PM) :	553	1,694	1,590	999		**4,836**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **53,733**

TOTAL # OF CRASHES : 88 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **29.33**

CRASH RATE CALCULATION : **1.50** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

DISTRICT : 4 UNSIGNALIZED : [X] SIGNALIZED : [ ]

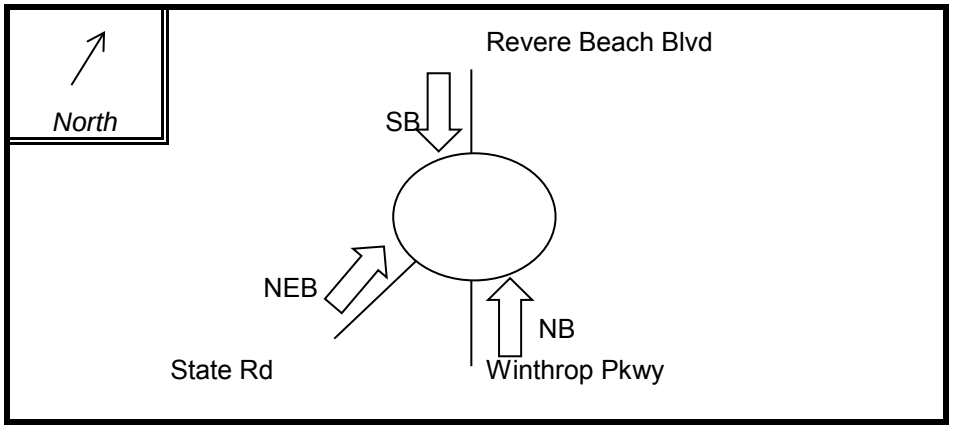
~ INTERSECTION DATA ~

MAJOR STREET : Revere Beach Blvd

MINOR STREET(S) : State Rd

Winthrop Pkwy

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	NEB	SB			
PEAK HOURLY VOLUMES (AM/PM) :	516	1,373				**1,889**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **20,989**

TOTAL # OF CRASHES : 25 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **8.33**

CRASH RATE CALCULATION : **1.09** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

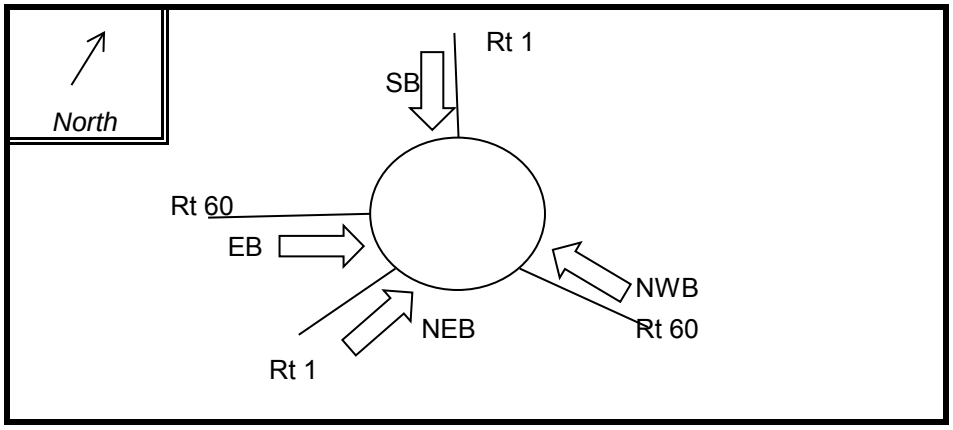
DISTRICT : 4 UNSIGNALIZED : ☒ SIGNALIZED : ☐

~ INTERSECTION DATA ~

MAJOR STREET : Rt 1

MINOR STREET(S) : Rt 60

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NEB	NWB	SB	EB		
PEAK HOURLY VOLUMES (AM/PM) :	441	2,114	864	818		**4,237**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **47,078**

TOTAL # OF CRASHES : 224 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **74.67**

CRASH RATE CALCULATION : **4.35** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

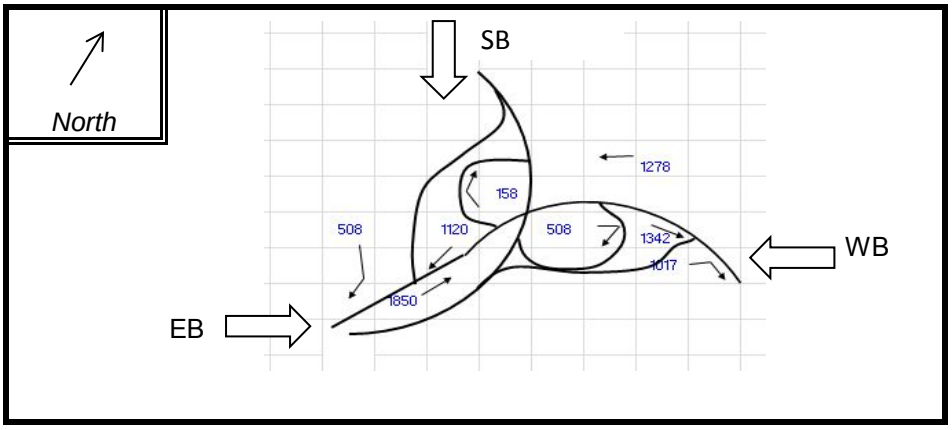
DISTRICT : 4/6 UNSIGNALIZED : ☐ SIGNALIZED : ☒

~ INTERSECTION DATA ~

MAJOR STREET : Route 1A

MINOR STREET(S) : Route 16

INTERSECTION DIAGRAM
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	SB			
PEAK HOURLY VOLUMES (AM/PM) :	1,850	1,275	620			**3,745**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **41,611**

TOTAL # OF CRASHES : 33 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **11.00**

CRASH RATE CALCULATION : **0.72** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE :

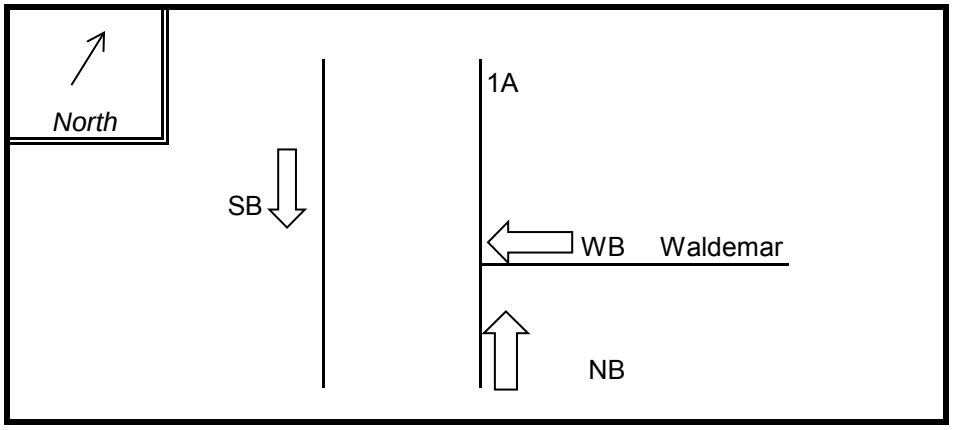
DISTRICT : 6 UNSIGNALIZED : [X] SIGNALIZED : [ ]

~ INTERSECTION DATA ~

MAJOR STREET : 1A

MINOR STREET(S) : Waldemar

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	WB			
PEAK HOURLY VOLUMES (AM/PM) :	2,196		149			**2,345**

" K " FACTOR :	**0.090**	INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :			**26,056**
TOTAL # OF CRASHES :	1	# OF YEARS :	3	AVERAGE # OF CRASHES PER YEAR (**A**) :	**0.33**

CRASH RATE CALCULATION : **0.04** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE : April 26, 2013

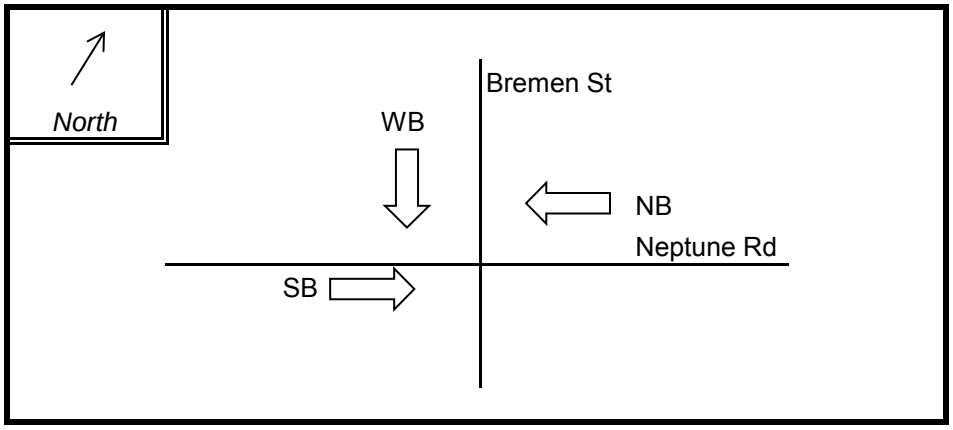
DISTRICT : 6 UNSIGNALIZED : ☒ SIGNALIZED : ☐

~ INTERSECTION DATA ~

MAJOR STREET : Neptune Rd

MINOR STREET(S) : Bremen St

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	SB	WB			
PEAK HOURLY VOLUMES (AM/PM) :	225	104	417			**746**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **8,289**

TOTAL # OF CRASHES : 1 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **0.33**

CRASH RATE CALCULATION : **0.11** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs, May 2013

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE : April 26, 2013

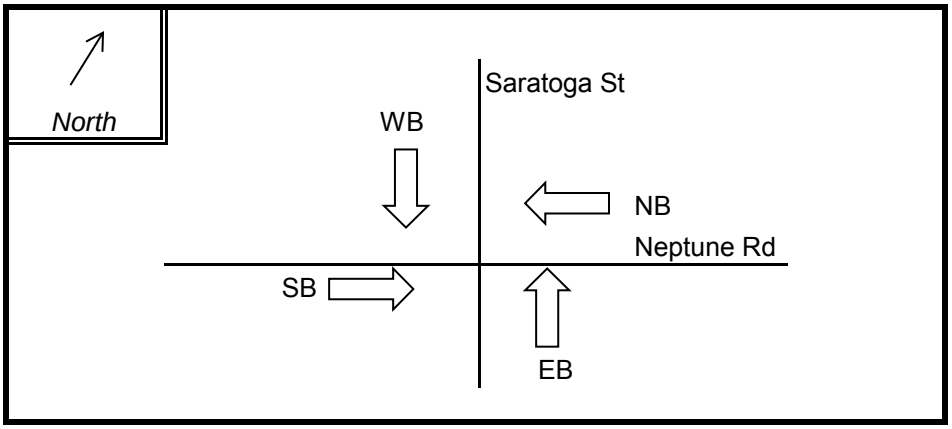
DISTRICT : 6 UNSIGNALIZED : ☒ SIGNALIZED : ☐

~ INTERSECTION DATA ~

MAJOR STREET : Neptune Rd

MINOR STREET(S) : Saratoga St

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	EB	WB		
PEAK HOURLY VOLUMES (AM/PM) :	268	442	287	396		**1,393**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **15,478**

TOTAL # OF CRASHES : 0 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **0.00**

CRASH RATE CALCULATION : **0.00** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs, May 2013

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston COUNT DATE : April 26, 2013

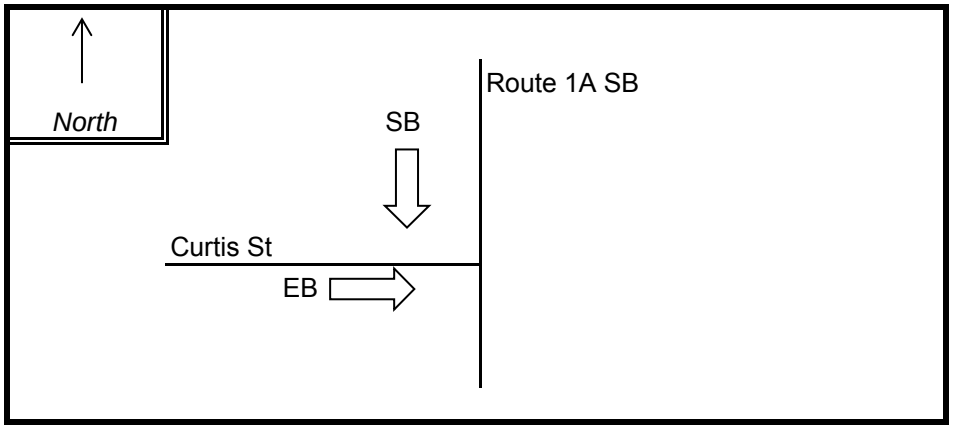
DISTRICT : 6 UNSIGNALIZED : ☒ SIGNALIZED : ☐

~ INTERSECTION DATA ~

MAJOR STREET : McClellan Hwy/Route 1A SB

MINOR STREET(S) : Curtis St

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	SB	EB				
PEAK HOURLY VOLUMES (AM/PM) :	1,832	410				**2,242**

" K " FACTOR :	**0.090**	INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :	**24,911**

TOTAL # OF CRASHES :	2	# OF YEARS :	3	AVERAGE # OF CRASHES PER YEAR (**A**) :	**0.67**

CRASH RATE CALCULATION : **0.07** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs, May 2013

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Revere COUNT DATE : April 26, 2013

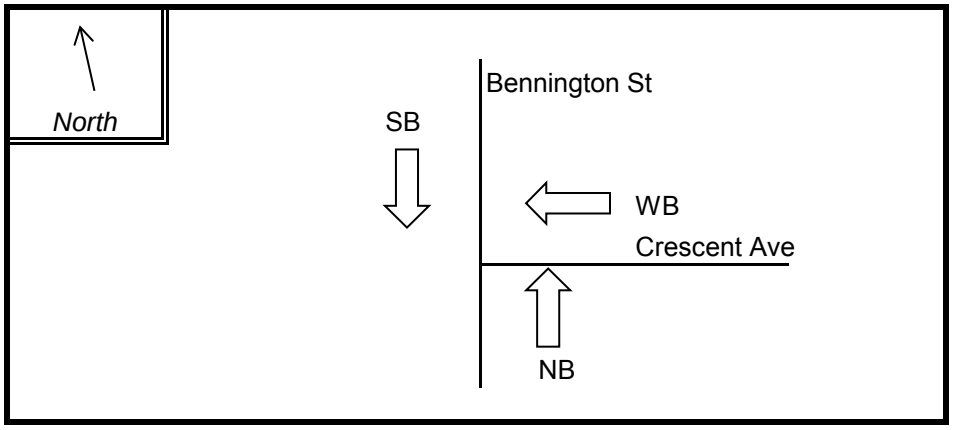
DISTRICT : 4 UNSIGNALIZED : ☒ SIGNALIZED : ☐

~ INTERSECTION DATA ~

MAJOR STREET : Bennington St

MINOR STREET(S) : Crescent Ave

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	WB			
PEAK HOURLY VOLUMES (AM/PM) :	739	410	216			**1,365**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **15,167**

TOTAL # OF CRASHES : 0 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **0.00**

CRASH RATE CALCULATION : **0.00** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs, May 2013

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Revere COUNT DATE : April 26, 2013

DISTRICT : 4 UNSIGNALIZED : ☐ SIGNALIZED : ☒

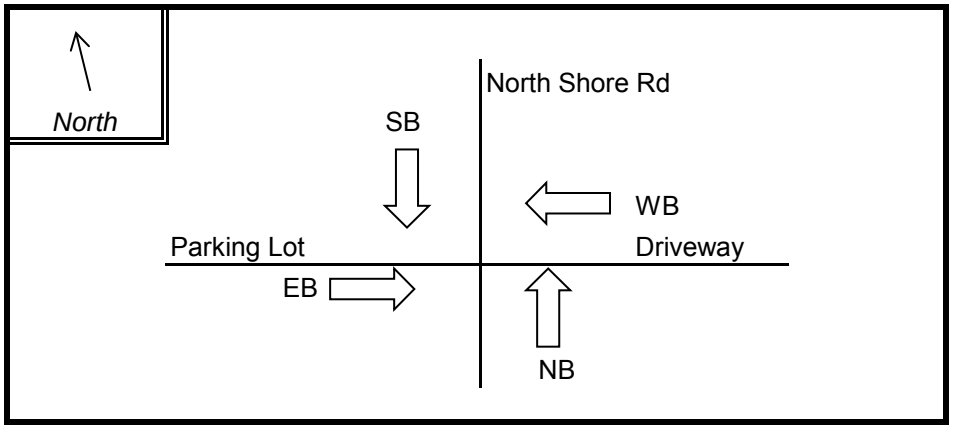
~ INTERSECTION DATA ~

MAJOR STREET : North Shore Rd/Route 1A

MINOR STREET(S) : Wonderland MBTA Station Parking Lot

Wonderland MBTA Station Driveway

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	EB	WB		
PEAK HOURLY VOLUMES (AM/PM) :	1,419	1,045	0	423		**2,887**

" K " FACTOR :	**0.090**	INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :	**32,078**

TOTAL # OF CRASHES :	10	# OF YEARS :	3	AVERAGE # OF CRASHES PER YEAR (**A**) :	**3.33**

CRASH RATE CALCULATION : **0.28** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs, May 2013

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Revere COUNT DATE : April 26, 2013

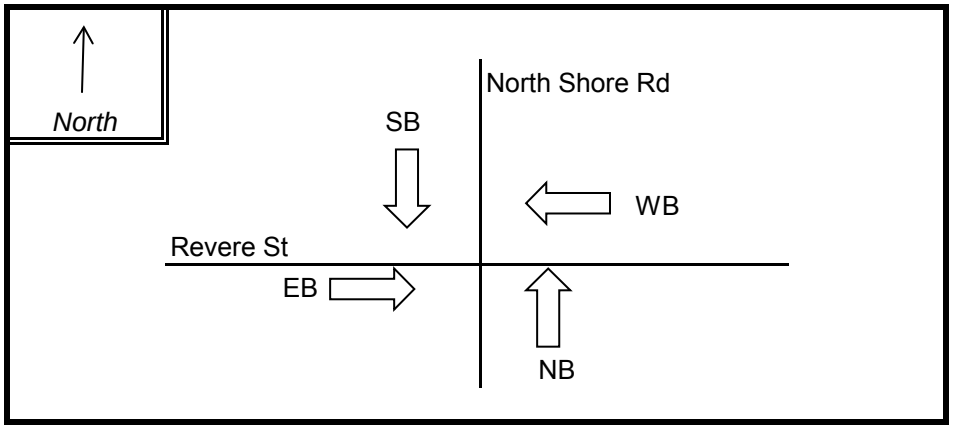
DISTRICT : 4 UNSIGNALIZED : ☐ SIGNALIZED : ☒

~ INTERSECTION DATA ~

MAJOR STREET : North Shore Rd/Route 1A

MINOR STREET(S) : Revere St

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	EB	WB		
PEAK HOURLY VOLUMES (AM/PM) :	1,809	1,148	448	286		**3,691**

" K " FACTOR :	**0.090**	INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :	**41,011**

TOTAL # OF CRASHES :	20	# OF YEARS :	3	AVERAGE # OF CRASHES PER YEAR (**A**) :	**6.67**

CRASH RATE CALCULATION : **0.45** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs, May 2013

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Revere COUNT DATE : April 26, 2013

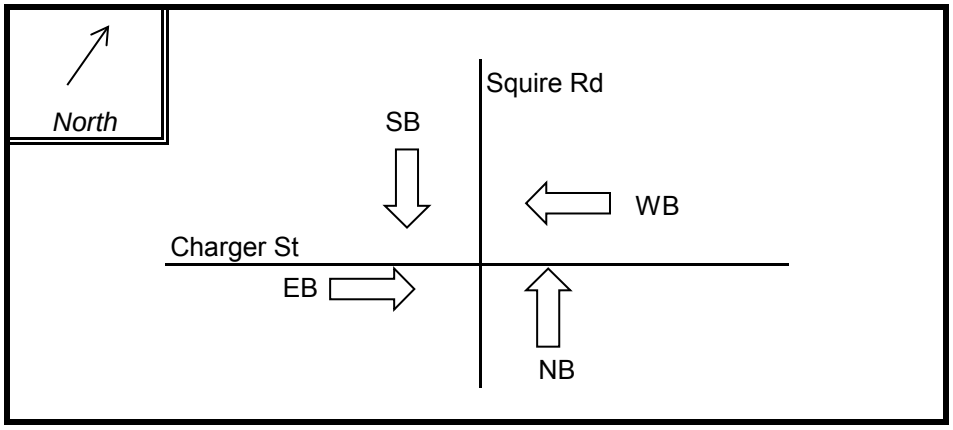
DISTRICT : 4 UNSIGNALIZED : ☐ SIGNALIZED : ☒

~ INTERSECTION DATA ~

MAJOR STREET : Squire Rd/Route 60

MINOR STREET(S) : Charger St

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	EB	WB		
PEAK HOURLY VOLUMES (AM/PM) :	1,417	1,653	151	343		**3,564**

" K " FACTOR :	**0.090**	INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :	**39,600**
TOTAL # OF CRASHES :	8	# OF YEARS : 3	AVERAGE # OF CRASHES PER YEAR (**A**) : **2.67**

CRASH RATE CALCULATION : **0.18** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs, May 2013

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Revere COUNT DATE : April 26, 2013

DISTRICT : 4 UNSIGNALIZED : ☐ SIGNALIZED : ☒

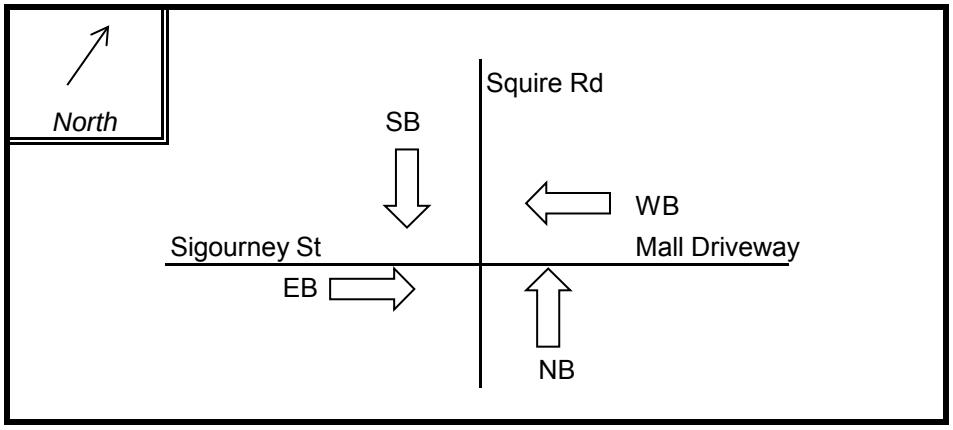
~ INTERSECTION DATA ~

MAJOR STREET : Squire Rd/Route 60

MINOR STREET(S) : Sigourney St

Mall Driveway

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	EB	WB		
PEAK HOURLY VOLUMES (AM/PM) :	1,411	1,685	160	351		**3,607**

" K " FACTOR :	**0.090**	INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :	**40,078**

TOTAL # OF CRASHES :	12	# OF YEARS :	3	AVERAGE # OF CRASHES PER YEAR (**A**) :	**4.00**

CRASH RATE CALCULATION : **0.27** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date: Suffolk Downs, May 2013

Route 1A at Bell Circle

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
1/9/2008	5:10 PM	Property damage only (none injured)	4	0	0	Not reported	Not reported	Daylight	Rain	V1:Westbound / V2:Westbound / V3:Westbound / V4:Westbound	V1: Not reported / V2: Not reported / V3: Not reported / V4: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead / V3:Travelling straight ahead / V4:Travelling straight ahead	V1: Passenger car / V2:Not reported / V3:Not reported / V4:Not reported	
3/28/2008	7:30 AM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Daylight	Rain	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
4/2/2008	1:15 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Unknown	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Parked / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
5/18/2008	5:30 PM	Not Reported	2	0	0	Not reported	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Not reported / V2:Not reported	
9/17/2008	12:30 PM	Property damage only (none injured)	2	0	0	Not reported	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Turning left / V2:Changing lanes	V1: Truck/trailer / V2:Passenger car	
10/19/2008	4:15 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Southbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Passenger car	
11/17/2008	3:00 AM	Property damage only (none injured)	2	0	0	Not reported	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Turning left / V2:Turning left	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
11/25/2008	5:30 PM	Non-fatal injury	2	1	0	Rear-end	Wet	Dark - roadway not lighted	Rain	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Not reported / V2:Not reported	
12/5/2008	6:12 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
12/13/2008	5:00 PM	Not Reported	2	0	0	Unknown	Dry	Dusk	Other	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
1/11/2009	11:30 PM	Non-fatal injury	1	1	0	Single vehicle crash	Wet	Dark - lighted roadway	Clear	V1:Northbound	V1: Collision with pedestrian	V1: Travelling straight ahead	V1: Tractor/semi-trailer	P2:Pedestrian

1/22/2009	9:00 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
2/12/2009	5:30 AM	Non-fatal injury	2	1	0	Not reported	Dry	Dark - lighted roadway	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Leaving traffic lane	V1: Passenger car / V2:Passenger car	
2/24/2009	11:30 AM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Turning left / V2:Turning left	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
5/30/2009	2:15 AM	Not Reported	2	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
6/29/2009	3:30 AM	Non-fatal injury	2	1	0	Sideswipe, same direction	Wet	Dark - lighted roadway	Rain	V1:Northbound / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Not reported / V2:Not reported	
8/24/2009	12:00 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
9/13/2009	11:00 AM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Clear	V1:Northbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
2/15/2010	6:00 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Southbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Tractor/semi-trailer	
10/9/2010	2:40 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Northbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	

Route 1A at Boardman St

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
1/27/2008	5:18 AM	Non-fatal injury	2	1	0	Rear-end	Slush	Dusk	Snow	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	

3/11/2008	3:45 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
4/7/2008	11:00 PM	Property damage only (none injured)	2	0	0	Not reported	Dry	Dark - lighted roadway	Clear	V1:Northbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Turning left	V1: Not reported / V2:Not reported	
7/20/2008	11:30 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Cloudy	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Turning left / V2:Not reported	V1: Passenger car / V2:Not reported	
8/10/2008	8:57 AM	Unknown	2	0	0	Head-on	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Passenger car	
9/12/2008	4:30 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Not reported	
10/19/2008	3:30 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
12/15/2008	1:20 AM	Property damage only (none injured)	2	0	0	Head-on	Wet	Dark - lighted roadway	Other	V1:Southbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Turning left	V1: Passenger car / V2:Unknown heavy truck, cannot classify	
2/6/2009	12:00 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Not reported	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
8/4/2009	7:37 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

Route 1A at Furlong Drive

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
1/3/2008	8:22 AM	Unknown	2	0	0	Not reported	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
1/21/2008	10:45 AM	Not Reported	2	0	0	Not reported	Dry	Dark - lighted roadway	Clear	V1:Northbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	

10/9/2008	7:49 PM	Non-fatal injury	2	1	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
4/30/2009	2:15 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Cloudy	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Other / V2:Other	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
5/22/2009	5:56 PM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Overturn/rollover	V1: Entering traffic lane / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
6/10/2010	9:20 PM	Non-fatal injury	2	2	0	Rear-end	Wet	Daylight	Rain	V1:Eastbound / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Changing lanes	V1: Not reported / V2:Passenger car	
10/5/2010	10:45 AM	Property damage only (none injured)	2	0	0	Angle	Wet	Daylight	Rain	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Turning right	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Tractor/semi-trailer	
12/23/2010	5:43 PM	Property damage only (none injured)	3	0	0	Rear-end	Sand, mud, dirt, oil, gravel	Dark - lighted roadway	Clear	V1:Southbound / V2:Southbound / V3:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic / V3:Not reported	V1: Passenger car / V2:Passenger car / V3:Not reported	

1A at Jughandle

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
2/28/2008	00:00 AM	Non-fatal injury	2	1	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Entering traffic lane / V2:Travelling straight ahead	V1: Truck/trailer / V2:Passenger car	
3/7/2008	10:45 AM	Non-fatal injury	2	4	0	Rear-end	Wet	Dark - lighted roadway	Rain	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Unknown	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
4/23/2008	12:00 PM	Unknown	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Unknown	V1: Passenger car / V2:Passenger car	
4/26/2008	5:00 AM	Non-fatal injury	2	3	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	

6/27/2008	11:30 AM	Not Reported	2	0	0	Not reported	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Not reported / V2:Not reported	
11/21/2008	3:45 PM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Cloudy	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Turning right / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
1/12/2009	9:05 AM	Property damage only (none injured)	3	0	0	Rear-end	Snow	Daylight	Clear	V1:Southbound / V2:Southbound / V3:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car / V3:Passenger car	
1/20/2009	5:21 PM	Non-fatal injury	2	1	0	Rear-end	Wet	Dawn	Snow	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Truck/trailer / V2:Passenger car	
1/2/2010	1:45 PM	Not Reported	2	0	0	Angle	Slush	Daylight	Snow/Blowing sand, snow	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
4/30/2010	4:30 PM	Non-fatal injury	2	2	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Not reported	
5/24/2010	10:39 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Dark - lighted roadway	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

1A at Tomasello Way

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
2/16/2008	10:00 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Parked / V2:Backing	V1: Passenger car / V2:Single-unit truck (2-axle, 6-tire)	
9/12/2008	11:15 AM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Dark - lighted roadway	Rain	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	

Route 1A at Waldemar Ave

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
4/25/2008	11:15 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Not reported / V2:Northbound	V1: Not reported / V2: Not reported	V1: Entering traffic lane / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	

Route 16 and Route 1A at Bell Circle

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
1/1/2008	5:20 AM	Property damage only (none injured)	2	0	0	Angle	Wet	Dark - lighted roadway	Clear	V1:Eastbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
2/6/2008	5:45 AM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Dawn	Rain	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Single-unit truck (2-axle, 6-tire)	
3/1/2008	12:30 PM	Property damage only (none injured)	2	0	0	Unknown	Dry	Daylight	Not Reported	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
3/6/2008	7:30 AM	Not Reported	2	0	0	Rear-end	Dry	Dark - lighted roadway	Cloudy	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
4/2/2008	6:35 AM	Not Reported	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Turning right / V2:Turning right	V1: Tractor/semi-trailer / V2:Passenger car	
4/4/2008	10:10 AM	Property damage only (none injured)	2	0	0	Head-on	Wet	Dark - roadway not lighted	Cloudy	V1:Westbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
4/27/2008	3:00 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear/Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
6/2/2008	7:30 AM	Not Reported	2	0	0	Rear-end	Not reported	Daylight	Not Reported	V1:Eastbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Truck/trailer / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
6/21/2008	11:30 AM	Not Reported	2	0	0	Not reported	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Turning left / V2:Turning left	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
6/22/2008	6:30 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
6/28/2008	1:30 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Entering traffic lane	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	

7/27/2008	1:24 AM	Non-fatal injury	2	3	0	Rear-end	Dry	Dark - lighted roadway	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
11/28/2008	1:20 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	Wet	Not reported	Rain	V1:Northbound	V1: Collision with median barrier	V1: Travelling straight ahead	V1: Passenger car	
12/12/2008	5:30 AM	Property damage only (none injured)	2	0	0	Sideswipe, opposite direction	Dry	Dark - lighted roadway	Not Reported	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Not reported / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
12/25/2008	2:00 PM	Not Reported	2	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Not reported / V2:Not reported	
1/10/2009	6:15 PM	Not Reported	2	0	0	Rear-end	Dry	Dark - unknown roadway lighting	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Turning right / V2:Turning right	V1: Passenger car / V2:Passenger car	
1/25/2009	11:30 AM	Non-fatal injury	2	3	0	Angle	Dry	Daylight	Clear	V1:Northbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
2/3/2009	11:18 AM	Non-fatal injury	2	1	0	Angle	Snow	Daylight	Cloudy/Snow	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Changing lanes / V2:Travelling straight ahead	V1: Passenger car / V2:Tractor/semi-trailer	
3/27/2009	3:00 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Turning right / V2:Turning right	V1: Passenger car / V2:Truck/trailer	
5/2/2009	10:30 PM	Non-fatal injury	2	2	0	Angle	Dry	Dark - lighted roadway	Clear/Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
8/17/2009	9:50 AM	Not Reported	2	0	0	Not reported	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Not reported	
8/20/2009	10:00 AM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning right / V2:Turning right	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/1/2009	4:30 PM	Not Reported	2	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Not reported	V1: Not reported / V2:Not reported	V1: Passenger car / V2:Single-unit truck (2-axle, 6-tire)	

9/21/2009	11:00 PM	Non-fatal injury	1	1	0	Single vehicle crash	Dry	Daylight	Clear/Clear	V1:Westbound	V1: Collision with cyclist (bicycle, tricycle, unicycle, pedal car)	V1: Slowing or stopped in traffic	V1: Passenger car	
9/30/2009	6:23 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Changing lanes / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
10/5/2009	1:15 PM	Non-fatal injury	2	1	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Changing lanes	V1: Passenger car / V2:Passenger car	
11/29/2009	3:48 AM	Non-fatal injury	2	4	0	Angle	Wet	Dark - lighted roadway	Rain	V1:Eastbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Passenger car	
12/7/2009	10:45 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
12/9/2009	8:15 AM	Non-fatal injury	2	1	0	Rear-end	Wet	Daylight	Snow	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
6/13/2010	3:12 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Cloudy/Unknown	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Truck/trailer	
10/28/2010	1:19 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning right / V2:Turning right	V1: Passenger car / V2:Tractor/semi-trailer	
12/31/2010	9:25 PM	Property damage only (none injured)	2	0	0	Angle	Wet	Dark - lighted roadway	Clear/Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Passenger car / V2:Not reported	

Route 16 at Route 145

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
1/12/2008	11:39 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Single-unit truck (2-axle, 6-tire) / V2:Passenger car	
1/13/2008	11:40 AM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Turning right	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
1/20/2008	2:30 AM	Non-fatal injury	1	5	0	Single vehicle crash	Sand, mud, dirt, oil, gravel	Dark - unknown roadway lighting	Clear	V1:Southbound	V1: Not reported	V1: Changing lanes	V1: Passenger car	
2/4/2008	8:10 PM	Non-fatal injury	2	1	0	Angle	Dry	Dark - lighted roadway	Cloudy	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning right	V1: Passenger car / V2:Single-unit truck (2-axle, 6-tire)	
2/7/2008	6:00 AM	Non-fatal injury	2	2	0	Angle	Wet	Dark - lighted roadway	Cloudy	V1:Eastbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
2/23/2008	1:00 PM	Property damage only (none injured)	2	0	0	Angle	Snow	Daylight	Cloudy	V1:Eastbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Other	V1: Passenger car / V2:Passenger car	
3/2/2008	7:02 PM	Non-fatal injury	2	2	0	Rear-end	Dry	Dark - lighted roadway	Snow	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
5/12/2008	9:55 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Cloudy	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Backing	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Single-unit truck (2-axle, 6-tire)	
5/24/2008	6:30 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Dawn	Clear	V1:Westbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Turning left	V1: Passenger car / V2:Passenger car	

7/2/2008	4:02 PM	Non-fatal injury	2	1	0	Rear-end	Wet	Daylight	Cloudy	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	P1:Other non-motorist (wheelchair, etc.)
7/19/2008	10:39 PM	Non-fatal injury	2	2	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Eastbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
7/30/2008	9:05 PM	Property damage only (none injured)	1	0	0	Head-on	Dry	Dark - lighted roadway	Not Reported	V1:Eastbound	V1: Collision with pedestrian	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	P1:Other non-motorist (wheelchair, etc.)
8/31/2008	8:30 AM	Property damage only (none injured)	2	0	0	Not reported	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Backing	V1: Passenger car / V2:Passenger car	
10/26/2008	3:10 AM	Non-fatal injury	2	1	0	Angle	Wet	Dark - lighted roadway	Rain	V1:Eastbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
10/26/2008	6:38 AM	Non-fatal injury	2	2	0	Head-on	Wet	Dawn	Rain	V1:Westbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
11/1/2008	3:34 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Dry	Dark - lighted roadway	Cloudy	V1:Eastbound	V1: Collision with curb	V1: Travelling straight ahead	V1: Passenger car	
11/6/2008	11:50 AM	Non-fatal injury	2	1	0	Sideswipe, same direction	Wet	Daylight	Rain	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Changing lanes / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
11/16/2008	4:00 PM	Non-fatal injury	1	1	0	Single vehicle crash	Dry	Daylight	Clear	V1:Eastbound	V1: Collision with curb	V1: Travelling straight ahead	V1: Motorcycle	

11/21/2008	7:34 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Dark - lighted roadway	Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
11/30/2008	3:30 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Cloudy	V1:Northbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Changing lanes	V1: Not reported / V2:Not reported	
1/3/2009	11:27 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Dark - lighted roadway	Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Changing lanes	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
1/28/2009	10:50 AM	Non-fatal injury	2	1	0	Rear-end	Snow	Daylight	Not Reported	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
2/1/2009	12:38 PM	Property damage only (none injured)	4	0	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported / V3:Not reported / V4:Not reported	V1: Not reported / V2: Not reported / V3: Not reported / V4: Not reported	V1: Not reported / V2:Not reported / V3:Not reported / V4:Not reported	V1: Not reported / V2:Not reported / V3:Not reported / V4:Not reported	
2/16/2009	3:15 PM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Not reported	
3/14/2009	1:30 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Not Reported	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
4/11/2009	3:00 PM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Daylight	Not Reported	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
4/20/2009	4:27 PM	Non-fatal injury	3	1	0	Rear-end	Dry	Daylight	Cloudy	V1:Not reported / V2:Not reported / V3:Not reported	V1: Not reported / V2: Not reported / V3: Not reported	V1: Not reported / V2:Not reported / V3:Not reported	V1: Passenger car / V2:Passenger car / V3:Passenger car	
5/3/2009	4:28 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Dark - lighted roadway	Clear	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Changing lanes	V1: Passenger car / V2:Passenger car	

6/19/2009	7:00 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
6/24/2009	4:36 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Northbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
6/25/2009	10:59 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Dark - lighted roadway	Clear	V1:Not reported / V2:Eastbound	V1: Not reported / V2: Collision with motor vehicle in traffic	V1: Not reported / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
6/26/2009	3:25 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Cloudy	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Turning left	V1: Passenger car / V2:Passenger car	
6/29/2009	10:00 AM	Property damage only (none injured)	2	0	0	Rear-end	Not reported	Not reported	Not Reported	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Other / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
7/7/2009	6:15 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Not reported / V2:Passenger car	
7/18/2009	9:40 AM	Not Reported	2	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
7/23/2009	2:50 AM	Property damage only (none injured)	2	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Westbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
9/11/2009	7:35 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Cloudy	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
10/3/2009	2:34 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Dry	Dark - lighted roadway	Clear	V1:Eastbound	V1: Collision with curb	V1: Not reported	V1: Passenger car	
10/5/2009	5:40 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Not Reported	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

10/9/2009	10:45 PM	Non-fatal injury	2	2	0	Angle	Dry	Dark - lighted roadway	Not Reported	V1:Eastbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
12/18/2009	11:05 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Westbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Entering traffic lane / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
1/21/2010	1:10 PM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Cloudy	V1:Eastbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
5/20/2010	10:20 AM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Cloudy	V1:Northbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
6/5/2010	9:15 AM	Non-fatal injury	2	1	0	Not reported	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Changing lanes	V1: Not reported / V2:Not reported	
7/6/2010	1:00 AM	Not Reported	2	0	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Northbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
7/9/2010	3:48 PM	Not Reported	2	0	0	Angle	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Passenger car	
7/14/2010	5:28 PM	Property damage only (none injured)	2	0	0	Head-on	Dry	Daylight	Not Reported	V1:Westbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
8/20/2010	8:38 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Not Reported	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Changing lanes	V1: Passenger car / V2:Passenger car	

8/28/2010	1:25 AM	Fatal injury	2	0	2	Angle	Dry	Dark - lighted roadway	Clear	V1:Eastbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning right / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
10/27/2010	7:15 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Wet	Daylight	Cloudy	V1:Westbound	V1: Collision with light pole or other post/support	V1: Changing lanes	V1: Passenger car	
12/11/2010	5:20 PM	Non-fatal injury	2	2	0	Head-on	Dry	Dark - lighted roadway	Clear	V1:Eastbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
11/18/2010	10:58 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

Route 16 at Webster Ave and Garfield Ave

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
1/8/2008	1:24 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Not Reported	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
1/14/2008	5:30 PM	Property damage only (none injured)	2	0	0	Angle	Wet	Dark - lighted roadway	Clear	V1:Not reported / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Turning left	V1: Passenger car / V2:Passenger car	
1/16/2008	3:49 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Passenger car	
1/21/2008	1:20 AM	Unknown	2	0	0	Rear-end	Not reported	Daylight	Clear	V1:Southbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Turning right	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Truck/trailer	

1/21/2008	2:26 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Dark - lighted roadway	Not Reported	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
2/28/2008	11:25 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
3/10/2008	3:40 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
4/16/2008	7:25 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
5/21/2008	6:25 PM	Non-fatal injury	2	1	0	Angle	Wet	Daylight	Rain	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning right / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
6/5/2008	8:45 AM	Property damage only (none injured)	2	0	0	Angle	Wet	Daylight	Cloudy/Rain	V1:Northbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Turning left	V1: Passenger car / V2:Passenger car	
6/10/2008	7:45 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Westbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Making U-turn / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
7/10/2008	2:01 PM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Clear	V1:Northbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
8/19/2008	11:45 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Cloudy/Rain	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Changing lanes	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

8/23/2008	7:12 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Entering traffic lane	V1: Passenger car / V2:Unknown vehicle configuration	
12/14/2008	1:30 AM	Non-fatal injury	2	2	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Passenger car	
11/5/2008	6:07 PM	Property damage only (none injured)	4	0	0	Rear-end	Dry	Dark - roadway not lighted	Clear	V1:Eastbound / V2:Eastbound / V3:Eastbound / V4:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic / V4: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3:Slowing or stopped in traffic / V4:Not reported	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car / V3:Passenger car / V4:Not reported	
11/20/2008	8:51 AM	Property damage only (none injured)	2	0	0	Sideswipe, opposite direction	Dry	Daylight	Clear/Unknown	V1:Westbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning right	V1: Passenger car / V2:Passenger car	
11/21/2008	5:18 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Westbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
11/23/2008	3:30 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Eastbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
11/26/2008	6:00 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Dark - lighted roadway	Clear	V1:Westbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
12/2/2008	7:30 AM	Property damage only (none injured)	2	0	0	Head-on	Dry	Daylight	Clear	V1:Northbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Turning left / V2:Turning left	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
12/6/2008	5:25 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Northbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

1/26/2009	3:00 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Dark - lighted roadway	Not Reported	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Entering traffic lane / V2:Entering traffic lane	V1: Passenger car / V2:Passenger car	
1/5/2009	1:11 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Not Reported	V1:Southbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Tractor/semi-trailer	
1/14/2009	1:15 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Turning left / V2:Travelling straight ahead	V1: Single-unit truck (2-axle, 6-tire) / V2:Passenger car	
8/1/2009	1:17 AM	Non-fatal injury	2	3	0	Angle	Dry	Dark - lighted roadway	Cloudy	V1:Eastbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
8/1/2009	7:07 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Not Reported	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with light pole or other post/support	V1: Turning right / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
8/1/2009	10:25 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
2/4/2009	1:25 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
2/16/2009	4:15 AM	Property damage only (none injured)	2	0	0	Not reported	Dry	Dusk	Clear	V1:Southbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
4/11/2009	10:37 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	Wet	Dark - lighted roadway	Not Reported	V1:Westbound	V1: Collision with fence	V1: Entering traffic lane	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
5/29/2009	4:59 PM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Daylight	Clear/Cloudy	V1:Westbound / V2:Westbound / V3:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic / V3:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V3:Passenger car	

7/1/2009	5:19 PM	Property damage only (none injured)	2	0	0	Single vehicle crash	Wet	Daylight	Rain	V1:Northbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Entering traffic lane	V1: Passenger car / V2:Passenger car	
7/14/2009	7:31 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
8/27/2009	8:25 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Eastbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Other	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
9/3/2009	9:30 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
10/8/2009	2:00 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Cloudy	V1:Southbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
11/18/2009	11:25 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Cloudy	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Entering traffic lane / V2:Entering traffic lane	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Tractor/doubles	
11/19/2009	3:34 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Not Reported	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Changing lanes	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
11/21/2009	11:35 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Dark - lighted roadway	Not Reported	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Changing lanes / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/31/2009	1:10 PM	Property damage only (none injured)	2	0	0	Angle	Snow	Daylight	Snow	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Changing lanes	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

1/13/2010	2:25 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Not Reported	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
1/20/2010	8:32 AM	Not Reported	2	0	0	Unknown	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Other non-collision / V2: Collision with median barrier	V1: Entering traffic lane / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
2/2/2010	7:56 AM	Property damage only (none injured)	4	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound / V3:Northbound / V4:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic / V4: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3:Slowing or stopped in traffic / V4:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car / V3:Passenger car / V4:Passenger car	
2/4/2010	10:45 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
3/2/2010	2:37 PM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Not Reported	V1:Southbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
3/5/2010	8:55 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Dark - lighted roadway	Not Reported	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Making U-turn	V1: Passenger car / V2:Single-unit truck (2-axle, 6-tire)	
4/20/2010	11:10 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Collision with curb / V2: Collision with motor vehicle in traffic	V1: Changing lanes / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
4/29/2010	2:13 PM	Non-fatal injury	1	1	0	Single vehicle crash	Dry	Daylight	Clear	V1:Northbound	V1: Collision with fence	V1: Travelling straight ahead	V1: Passenger car	
6/17/2010	11:55 PM	Non-fatal injury	2	2	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Northbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	

5/26/2010	8:30 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
5/26/2010	10:32 PM	Property damage only (none injured)	2	0	0	Head-on	Dry	Dark - lighted roadway	Cloudy	V1:Eastbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Making U-turn	V1: Passenger car / V2:Passenger car	
6/12/2010	12:51 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Wet	Daylight	Rain/Cloudy	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Unknown heavy truck, cannot classify	
8/7/2010	9:12 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	P5:Pedestrian
9/11/2010	1:15 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Dark - lighted roadway	Not Reported	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
9/24/2010	7:36 AM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Daylight	Not Reported	V1:Northbound / V2:Northbound / V3:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic / V3:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car / V3:Passenger car	
9/26/2010	3:24 PM	Non-fatal injury	2	1	0	Head-on	Dry	Daylight	Cloudy	V1:Westbound / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Motorcycle / V2:Not reported	
10/29/2010	11:32 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Northbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
11/3/2010	9:00 AM	Unknown	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	

12/2/2010	1:42 PM	Property damage only (none injured)	2	0	0	Head-on	Dry	Daylight	Clear	V1:Eastbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/24/2010	10:27 AM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound / V3:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead / V3:Travelling straight ahead	V1: Passenger car / V2:Passenger car / V3:Passenger car	

Route 60 at Bell Circle

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
11/11/2008	4:30 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Dark - lighted roadway	Clear	V1:Southbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Turning left	V1: Not reported / V2:Not reported	
1/9/2008	5:10 PM	Property damage only (none injured)	4	0	0	Not reported	Not reported	Daylight	Rain	V1:Westbound / V2:Westbound / V3:Westbound / V4:Westbound	V1: Not reported / V2: Not reported / V3: Not reported / V4: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead / V3:Travelling straight ahead / V4:Travelling straight ahead	V1: Passenger car / V2:Not reported / V3:Not reported / V4:Not reported	
2/7/2008	3:30 PM	Non-fatal injury	2	1	0	Not reported	Wet	Daylight	Cloudy/Snow	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Passenger car / V2:Not reported	
4/2/2008	1:15 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Unknown	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Parked / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
4/12/2008	3:00 AM	Property damage only (none injured)	2	0	0	Not reported	Wet	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
4/18/2008	5:10 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Not reported	
5/1/2008	5:05 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Single-unit truck (2-axle, 6-tire)	
9/6/2008	3:30 AM	Non-fatal injury	3	2	0	Angle	Wet	Daylight	Rain	V1:Not reported / V2:Not reported / V3:Not reported	V1: Not reported / V2: Not reported / V3: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead / V3:Not reported	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Not reported / V3:Not reported	

10/19/2008	4:15 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Southbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Passenger car	
12/1/2008	8:30 PM	Non-fatal injury	2	2	0	Rear-end	Wet	Dark - lighted roadway	Rain	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
12/7/2008	1:20 AM	Non-fatal injury	2	2	0	Rear-end	Snow	Daylight	Snow	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/10/2008	5:00 AM	Non-fatal injury	2	1	0	Not reported	Wet	Dusk	Rain	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Not reported / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/13/2008	5:00 PM	Not Reported	2	0	0	Unknown	Dry	Dusk	Other	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/27/2008	1:00 PM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Daylight	Rain	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
1/2/2009	9:35 PM	Non-fatal injury	2	2	0	Angle	Ice	Dark - lighted roadway	Sleet, hail (freezing rain or drizzle)	V1:Southbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
1/11/2009	11:30 PM	Non-fatal injury	1	1	0	Single vehicle crash	Wet	Dark - lighted roadway	Clear	V1:Northbound	V1: Collision with pedestrian	V1: Travelling straight ahead	V1: Tractor/semi-trailer	P2:Pedestrian
1/22/2009	9:00 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
4/21/2009	1:09 PM	Property damage only (none injured)	2	0	0	Angle	Wet	Daylight	Cloudy/Rain	V1:Westbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Other / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
5/30/2009	2:15 AM	Not Reported	2	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
6/29/2009	3:30 AM	Non-fatal injury	2	1	0	Sideswipe, same direction	Wet	Dark - lighted roadway	Rain	V1:Northbound / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Not reported / V2:Not reported	
7/16/2009	5:15 AM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Eastbound / V3:Eastbound	V1: Not reported / V2: Not reported / V3: Not reported	V1: Not reported / V2:Travelling straight ahead / V3:Making U-turn	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car / V3:Passenger car	

7/20/2009	00:00 AM	Property damage only (none injured)	2	0	0	Not reported	Snow	Dark - roadway not lighted	Snow	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Other / V2:Turning left	V1: Not reported / V2:Passenger car	
8/18/2009	8:15 PM	Non-fatal injury	3	1	0	Rear-end	Dry	Dusk	Clear	V1:Northbound / V2:Not reported / V3:Northbound	V1: Not reported / V2: Not reported / V3: Not reported	V1: Slowing or stopped in traffic / V2:Not reported / V3:Not reported	V1: Not reported / V2:Not reported / V3:Not reported	
8/27/2009	7:00 AM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Daylight	Cloudy	V1:Northbound / V2:Northbound / V3:Northbound	V1: Not reported / V2: Not reported / V3: Not reported	V1: Slowing or stopped in traffic / V2:Turning right / V3:Turning right	V1: Passenger car / V2:Passenger car / V3:Passenger car	
8/27/2009	3:00 PM	Non-fatal injury	2	5	0	Angle	Dry	Daylight	Clear/Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/15/2009	7:30 PM	Not Reported	2	0	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Turning right	V1: Not reported / V2:Not reported	
10/31/2009	12:00 PM	Non-fatal injury	2	2	0	Rear-end	Dry	Daylight	Clear/Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/30/2009	9:45 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Cloudy	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Not reported	V1: Entering traffic lane / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/24/2010	11:00 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Not reported	V1: Slowing or stopped in traffic / V2:Not reported	V1: Tractor/semi-trailer / V2:Passenger car	

Route 145 at Route 1A

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
1/3/2008	8:22 AM	Unknown	2	0	0	Not reported	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

1/17/2008	8:37 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Tractor/semi-trailer / V2:Tractor/semi-trailer	
1/21/2008	10:45 AM	Not Reported	2	0	0	Not reported	Dry	Dark - lighted roadway	Clear	V1:Northbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
2/10/2008	7:05 AM	Non-fatal injury	2	1	0	Rear-end	Ice	Dark - lighted roadway	Snow	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
5/2/2008	7:11 PM	Not Reported	2	0	0	Angle	Wet	Daylight	Rain	V1:Northbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Passenger car / V2:Passenger car	
5/12/2008	9:40 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
8/23/2008	4:05 AM	Non-fatal injury	2	3	0	Not reported	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
9/2/2008	3:00 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Entering traffic lane	V1: Tractor/semi-trailer / V2:Not reported	
9/14/2008	12:02 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	Wet	Daylight	Cloudy	V1:Westbound	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/14/2008	12:30 PM	Non-fatal injury	1	1	0	Single vehicle crash	Wet	Daylight	Rain	V1:Northbound	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Passenger car	
10/10/2008	4:30 PM	Non-fatal injury	2	1	0	Not reported	Dry	Daylight	Clear	V1:Southbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Not reported / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
11/29/2008	11:50 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Dark - roadway not lighted	Clear	V1:Northbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Not reported / V2:Not reported	
1/20/2009	2:05 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Not Reported	V1:Northbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Single-unit truck (2-axle, 6-tire)	
1/29/2009	6:00 PM	Non-fatal injury	1	1	0	Not reported	Dry	Dark - lighted roadway	Clear	V1:Not reported	V1: Not reported	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	P2:Pedestrian

2/16/2009	9:55 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Not Reported	V1:Southbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
3/15/2009	4:12 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
4/30/2009	2:15 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Cloudy	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Other / V2:Other	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
5/22/2009	5:56 PM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Overturn/rollover	V1: Entering traffic lane / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
6/14/2009	2:15 PM	Property damage only (none injured)	2	0	0	Angle	Wet	Daylight	Not Reported	V1:Northbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Passenger car	
8/15/2009	10:30 AM	Not Reported	2	0	0	Rear-end	Dry	Dark - lighted roadway	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Not reported	
10/9/2009	11:00 PM	Non-fatal injury	1	1	0	Single vehicle crash	Wet	Dark - lighted roadway	Rain	V1:Southbound	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Bus (seats for 7-15 people, including driver)	
12/7/2009	9:12 AM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Clear	V1:Southbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
3/12/2010	11:01 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Cloudy	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

3/14/2010	7:40 PM	Not Reported	7	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Not reported / V2:Not reported / V3:Not reported / V4:Not reported / V5:Not reported / V6:Not reported / V7:Not reported	V1: Collision with ditch / V2: Collision with ditch / V3: Collision with ditch / V4: Collision with ditch / V5: Collision with ditch / V6: Not reported / V7: Collision with ditch	V1: Travelling straight ahead / V2:Travelling straight ahead / V3:Travelling straight ahead / V4:Travelling straight ahead / V5:Travelling straight ahead / V6:Not reported / V7:Travelling straight ahead	V1: Passenger car / V2:Passenger car / V3:Passenger car / V4:Passenger car / V5:Passenger car / V6:Not reported / V7:Not reported	
3/15/2010	6:55 PM	Not Reported	4	0	0	Rear-end	Wet	Dark - lighted roadway	Rain	V1:Southbound / V2:Not reported / V3:Not reported / V4:Not reported	V1: Collision with fence / V2: Not reported / V3: Not reported / V4: Not reported	V1: Travelling straight ahead / V2:Not reported / V3:Parked / V4:Parked	V1: Passenger car / V2:Not reported / V3:Not reported / V4:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
3/20/2010	10:30 PM	Property damage only (none injured)	2	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
4/3/2010	8:50 AM	Property damage only (none injured)	3	0	0	Angle	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound / V3:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Not reported	V1: Turning right / V2:Travelling straight ahead / V3:Not reported	V1: Passenger car / V2:Passenger car / V3:Not reported	
4/10/2010	4:32 PM	Not Reported	1	0	0	Single vehicle crash	Dry	Daylight	Not Reported	V1:Southbound	V1: Collision with light pole or other post/support	V1: Turning right	V1: Passenger car	
6/6/2010	10:50 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Not Reported	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
7/2/2010	10:00 PM	Not Reported	2	0	0	Angle	Dry	Dark - lighted roadway	Not Reported	V1:Southbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
7/17/2010	5:38 PM	Non-fatal injury	2	1	0	Single vehicle crash	Sand, mud, dirt, oil, gravel	Daylight	Clear	V1:Southbound / V2:Not reported	V1: Reported but invalid / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Motorcycle / V2:Passenger car	

7/25/2010	00:00 AM	Non-fatal injury	2	2	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Eastbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Passenger car	
8/25/2010	12:30 PM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Daylight	Cloudy/Rain	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/6/2010	1:19 AM	Non-fatal injury	2	4	0	Rear-end	Dry	Dark - roadway not lighted	Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
10/5/2010	10:45 AM	Property damage only (none injured)	2	0	0	Angle	Wet	Daylight	Rain	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Turning right	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Tractor/semi-trailer	
11/2/2010	8:25 AM	Non-fatal injury	2	2	0	Angle	Dry	Daylight	Cloudy	V1:Southbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
12/12/2010	11:50 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Wet	Daylight	Cloudy/Rain	V1:Not reported	V1: Not reported	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/12/2010	9:43 PM	Non-fatal injury	1	1	0	Single vehicle crash	Wet	Dark - lighted roadway	Cloudy/Rain	V1:Westbound	V1: Collision with overhead sign support	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/29/2010	11:35 AM	Property damage only (none injured)	2	0	0	Angle	Wet	Daylight	Cloudy	V1:Northbound / V2:Eastbound	V1: Collision with guardrail / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

Route 145 at North Shore Road

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
2/16/2008	4:00 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	

4/3/2008	7:45 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Entering traffic lane / V2:Entering traffic lane	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
8/3/2008	11:40 PM	Non-fatal injury	2	3	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Northbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
8/10/2008	6:25 PM	Non-fatal injury	2	1	0	Angle	Wet	Daylight	Rain	V1:Southbound / V2:Westbound	V1: Collision with other movable object / V2: Collision with motor vehicle in traffic	V1: Not reported / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
11/14/2008	1:15 PM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Daylight	Rain	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
11/15/2008	6:30 PM	Property damage only (none injured)	2	0	0	Angle	Wet	Dark - roadway not lighted	Rain	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Passenger car	
2/3/2009	7:20 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Cloudy	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Changing lanes / V2:Travelling straight ahead	V1: Passenger car / V2:Bus (seats for 7-15 people, including driver)	
2/20/2009	3:35 AM	Property damage only (none injured)	2	0	0	Rear-end	Ice	Dark - lighted roadway	Snow	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
4/2/2009	4:16 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Cloudy/Cloudy	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
5/8/2009	6:55 AM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Clear	V1:Westbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	

7/13/2009	12:27 PM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Clear	V1:Southbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
7/14/2009	7:00 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/14/2009	00:00 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Dark - lighted roadway	Not Reported	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
1/11/2010	8:15 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Westbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
2/23/2010	9:25 AM	Non-fatal injury	2	1	0	Sideswipe, same direction	Dry	Daylight	Not Reported	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning right	V1: Passenger car / V2:Single-unit truck (2-axle, 6-tire)	
6/20/2010	9:45 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Westbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
10/18/2010	10:30 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Dry	Daylight	Clear	V1:Westbound	V1: Collision with light pole or other post/support	V1: Making U-turn	V1: Tractor/semi-trailer	
11/14/2010	1:15 AM	Non-fatal injury	2	1	0	Angle	Dry	Dark - lighted roadway	Not Reported	V1:Southbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

Route 145 at Tomasello Drive

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
3/8/2008	6:00 AM	Property damage only (none injured)	2	0	0	Angle	Wet	Dark - roadway not lighted	Rain	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Turning left / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

4/5/2008	7:00 PM	Non-fatal injury	3	3	0	Not reported	Not reported	Not reported	Not Reported	V1:Eastbound / V2:Northbound / V3:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left / V3:Turning left	V1: Passenger car / V2:Passenger car / V3:Passenger car	
5/16/2008	10:35 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Southbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
6/3/2008	12:15 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Northbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
7/24/2008	1:42 PM	Non-fatal injury	1	1	0	Single vehicle crash	Wet	Daylight	Rain	V1:Westbound	V1: Collision with motor vehicle in traffic	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/22/2008	10:25 PM	Non-fatal injury	2	2	0	Rear-end	Dry	Dark - lighted roadway	Clear	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
12/29/2008	12:11 PM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Clear	V1:Eastbound / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Passenger car / V2:Not reported	
2/20/2009	8:30 AM	Property damage only (none injured)	2	0	0	Angle	Ice	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
4/28/2009	12:37 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	Dry	Daylight	Not Reported	V1:Northbound	V1: Collision with other movable object	V1: Turning right	V1: Passenger car	
5/26/2009	7:18 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Eastbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	

6/11/2009	1:54 PM	Non-fatal injury	3	4	0	Angle	Dry	Daylight	Cloudy	V1:Eastbound / V2:Northbound / V3:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead / V3:Travelling straight ahead	V1: Passenger car / V2:Passenger car / V3:Passenger car	
7/22/2009	9:15 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Cloudy	V1:Northbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
8/3/2009	5:38 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
10/2/2009	9:59 AM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Clear	V1:Northbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
10/2/2009	9:41 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	Dry	Dark - lighted roadway	Cloudy	V1:Northbound	V1: Collision with cyclist (bicycle, tricycle, unicycle, pedal car)	V1: Turning right	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	P1:Pedalcyclist (bicycle, tricycle, unicycle, pedal car)
10/24/2009	7:15 AM	Property damage only (none injured)	2	0	0	Angle	Wet	Daylight	Cloudy	V1:Eastbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
11/15/2009	1:02 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Eastbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
7/26/2010	12:35 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Eastbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

12/24/2010	11:00 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Eastbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	

Beach Street at Bell Circle

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
3/28/2008	7:30 AM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Daylight	Rain	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
5/18/2008	5:30 PM	Not Reported	2	0	0	Not reported	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Not reported / V2:Not reported	
9/17/2008	12:30 PM	Property damage only (none injured)	2	0	0	Not reported	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Turning left / V2:Changing lanes	V1: Truck/trailer / V2:Passenger car	
11/17/2008	3:00 AM	Property damage only (none injured)	2	0	0	Not reported	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Turning left / V2:Turning left	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
11/25/2008	5:30 PM	Non-fatal injury	2	1	0	Rear-end	Wet	Dark - roadway not lighted	Rain	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Not reported / V2:Not reported	
2/12/2009	5:30 AM	Non-fatal injury	2	1	0	Not reported	Dry	Dark - lighted roadway	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Leaving traffic lane	V1: Passenger car / V2:Passenger car	
2/24/2009	11:30 AM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Turning left / V2:Turning left	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
8/24/2009	12:00 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
9/13/2009	11:00 AM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Clear	V1:Northbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

4/16/2010	1:59 PM	Property damage only (none injured)	2	0	0	Angle	Wet	Daylight	Rain	V1:Westbound / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Parked	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
10/9/2010	2:40 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Northbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	

Bell Circle

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
11/11/2008	4:30 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Dark - lighted roadway	Clear	V1:Southbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Turning left	V1: Not reported / V2:Not reported	
1/1/2008	5:20 AM	Property damage only (none injured)	2	0	0	Angle	Wet	Dark - lighted roadway	Clear	V1:Eastbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
1/9/2008	5:10 PM	Property damage only (none injured)	4	0	0	Not reported	Not reported	Daylight	Rain	V1:Westbound / V2:Westbound / V3:Westbound / V4:Westbound	V1: Not reported / V2: Not reported / V3: Not reported / V4: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead / V3:Travelling straight ahead / V4:Travelling straight ahead	V1: Passenger car / V2:Not reported / V3:Not reported / V4:Not reported	
1/28/2008	7:30 PM	Not Reported	2	0	0	Not reported	Dry	Dark - lighted roadway	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Changing lanes	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
2/6/2008	5:45 AM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Dawn	Rain	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Single-unit truck (2-axle, 6-tire)	
2/7/2008	3:30 PM	Non-fatal injury	2	1	0	Not reported	Wet	Daylight	Cloudy/Snow	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Passenger car / V2:Not reported	
3/1/2008	12:30 PM	Property damage only (none injured)	2	0	0	Unknown	Dry	Daylight	Not Reported	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
3/6/2008	7:30 AM	Not Reported	2	0	0	Rear-end	Dry	Dark - lighted roadway	Cloudy	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
3/14/2008	4:30 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Unknown	V1: Passenger car / V2:Not reported	

3/28/2008	7:30 AM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Daylight	Rain	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
4/2/2008	1:15 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Unknown	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Parked / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
4/2/2008	6:35 AM	Not Reported	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Turning right / V2:Turning right	V1: Tractor/semi-trailer / V2:Passenger car	
4/4/2008	10:10 AM	Property damage only (none injured)	2	0	0	Head-on	Wet	Dark - roadway not lighted	Cloudy	V1:Westbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
4/12/2008	3:00 AM	Property damage only (none injured)	2	0	0	Not reported	Wet	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
4/12/2008	4:00 AM	Non-fatal injury	2	1	0	Rear-end	Wet	Dark - lighted roadway	Rain	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
4/18/2008	5:10 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Not reported	
4/24/2008	8:20 AM	Property damage only (none injured)	2	0	0	Not reported	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Turning right	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
4/27/2008	3:00 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear/Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
5/1/2008	5:05 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Single-unit truck (2-axle, 6-tire)	
5/18/2008	5:30 PM	Not Reported	2	0	0	Not reported	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Not reported / V2:Not reported	
6/2/2008	7:30 AM	Not Reported	2	0	0	Rear-end	Not reported	Daylight	Not Reported	V1:Eastbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Truck/trailer / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
6/21/2008	11:30 AM	Not Reported	2	0	0	Not reported	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Turning left / V2:Turning left	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
6/22/2008	6:30 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

6/28/2008	1:30 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Entering traffic lane	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
7/27/2008	1:24 AM	Non-fatal injury	2	3	0	Rear-end	Dry	Dark - lighted roadway	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
7/30/2008	6:00 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Turning left / V2:Turning left	V1: Passenger car / V2:Passenger car	
8/1/2008	1:35 PM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
8/2/2008	4:30 AM	Not Reported	1	0	0	Angle	Not reported	Daylight	Rain	V1:Northbound	V1: Not reported	V1: Travelling straight ahead	V1: Passenger car	
8/14/2008	3:00 AM	Not Reported	3	0	0	Not reported	Not reported	Daylight	Clear	V1:Not reported / V2:Not reported / V3:Not reported	V1: Not reported / V2: Not reported / V3: Not reported	V1: Not reported / V2:Not reported / V3:Not reported	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Not reported / V3:Not reported	
8/24/2008	5:00 AM	Not Reported	2	0	0	Not reported	Dry	Daylight	Clear	V1:Southbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Turning left / V2:Not reported	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/6/2008	3:30 AM	Non-fatal injury	3	2	0	Angle	Wet	Daylight	Rain	V1:Not reported / V2:Not reported / V3:Not reported	V1: Not reported / V2: Not reported / V3: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead / V3:Not reported	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Not reported / V3:Not reported	
9/10/2008	3:30 PM	Property damage only (none injured)	2	0	0	Not reported	Dry	Daylight	Clear	V1:Northbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Other / V2:Not reported	V1: Not reported / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/13/2008	00:00 AM	Property damage only (none injured)	3	0	0	Not reported	Dry	Daylight	Clear	V1:Northbound / V2:Westbound / V3:Not reported	V1: Not reported / V2: Not reported / V3: Not reported	V1: Travelling straight ahead / V2:Other / V3:Not reported	V1: Not reported / V2:Not reported / V3:Not reported	
9/17/2008	12:30 PM	Property damage only (none injured)	2	0	0	Not reported	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Turning left / V2:Changing lanes	V1: Truck/trailer / V2:Passenger car	
10/19/2008	4:15 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Southbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Passenger car	
11/17/2008	3:00 AM	Property damage only (none injured)	2	0	0	Not reported	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Turning left / V2:Turning left	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	

11/25/2008	5:30 PM	Non-fatal injury	2	1	0	Rear-end	Wet	Dark - roadway not lighted	Rain	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Not reported / V2:Not reported	
11/28/2008	1:20 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	Wet	Not reported	Rain	V1:Northbound	V1: Collision with median barrier	V1: Travelling straight ahead	V1: Passenger car	
12/1/2008	8:30 PM	Non-fatal injury	2	2	0	Rear-end	Wet	Dark - lighted roadway	Rain	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
12/2/2008	4:20 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
12/7/2008	1:20 AM	Non-fatal injury	2	2	0	Rear-end	Snow	Daylight	Snow	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/10/2008	5:00 AM	Non-fatal injury	2	1	0	Not reported	Wet	Dusk	Rain	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Not reported / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/12/2008	5:30 AM	Property damage only (none injured)	2	0	0	Sideswipe, opposite direction	Dry	Dark - lighted roadway	Not Reported	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Not reported / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
12/13/2008	5:00 PM	Not Reported	2	0	0	Unknown	Dry	Dusk	Other	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/25/2008	2:00 PM	Not Reported	2	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Not reported / V2:Not reported	
12/27/2008	1:00 PM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Daylight	Rain	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
1/2/2009	6:45 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Dawn	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Backing	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
1/2/2009	9:35 PM	Non-fatal injury	2	2	0	Angle	Ice	Dark - lighted roadway	Sleet, hail (freezing rain or drizzle)	V1:Southbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
1/10/2009	6:15 PM	Not Reported	2	0	0	Rear-end	Dry	Dark - unknown roadway lighting	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Turning right / V2:Turning right	V1: Passenger car / V2:Passenger car	
1/11/2009	11:30 PM	Non-fatal injury	1	1	0	Single vehicle crash	Wet	Dark - lighted roadway	Clear	V1:Northbound	V1: Collision with pedestrian	V1: Travelling straight ahead	V1: Tractor/semi-trailer	P2:Pedestrian

1/22/2009	9:00 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
1/25/2009	11:30 AM	Non-fatal injury	2	3	0	Angle	Dry	Daylight	Clear	V1:Northbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
2/3/2009	11:18 AM	Non-fatal injury	2	1	0	Angle	Snow	Daylight	Cloudy/Snow	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Changing lanes / V2:Travelling straight ahead	V1: Passenger car / V2:Tractor/semi-trailer	
2/12/2009	5:30 AM	Non-fatal injury	2	1	0	Not reported	Dry	Dark - lighted roadway	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Leaving traffic lane	V1: Passenger car / V2:Passenger car	
2/13/2009	10:30 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Southbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Tractor/semi-trailer / V2:Passenger car	
2/20/2009	6:30 PM	Not Reported	2	0	0	Sideswipe, same direction	Dry	Dark - lighted roadway	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Changing lanes	V1: Passenger car / V2:Single-unit truck (3-or-more axles)	
2/24/2009	11:30 AM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Turning left / V2:Turning left	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
3/10/2009	12:43 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Tractor/semi-trailer	
3/27/2009	3:00 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Turning right / V2:Turning right	V1: Passenger car / V2:Truck/trailer	
4/21/2009	1:09 PM	Property damage only (none injured)	2	0	0	Angle	Wet	Daylight	Cloudy/Rain	V1:Westbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Other / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
5/2/2009	10:30 PM	Non-fatal injury	2	2	0	Angle	Dry	Dark - lighted roadway	Clear/Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
5/8/2009	6:00 PM	Non-fatal injury	2	1	0	Sideswipe, same direction	Dry	Daylight	Clear/Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Turning right	V1: Tractor/doubles / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

5/30/2009	2:15 AM	Not Reported	2	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
6/23/2009	11:41 AM	Non-fatal injury	3	5	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Westbound / V3:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead / V3:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V3:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
6/29/2009	3:30 AM	Non-fatal injury	2	1	0	Sideswipe, same direction	Wet	Dark - lighted roadway	Rain	V1:Northbound / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Not reported / V2:Not reported	
7/16/2009	5:15 AM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Eastbound / V3:Eastbound	V1: Not reported / V2: Not reported / V3: Not reported	V1: Not reported / V2:Travelling straight ahead / V3:Making U-turn	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car / V3:Passenger car	
7/20/2009	00:00 AM	Property damage only (none injured)	2	0	0	Not reported	Snow	Dark - roadway not lighted	Snow	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Other / V2:Turning left	V1: Not reported / V2:Passenger car	
8/17/2009	9:50 AM	Not Reported	2	0	0	Not reported	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Not reported	
8/18/2009	8:15 PM	Non-fatal injury	3	1	0	Rear-end	Dry	Dusk	Clear	V1:Northbound / V2:Not reported / V3:Northbound	V1: Not reported / V2: Not reported / V3: Not reported	V1: Slowing or stopped in traffic / V2:Not reported / V3:Not reported	V1: Not reported / V2:Not reported / V3:Not reported	
8/20/2009	10:00 AM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning right / V2:Turning right	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
8/24/2009	12:00 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	

8/27/2009	7:00 AM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Daylight	Cloudy	V1:Northbound / V2:Northbound / V3:Northbound	V1: Not reported / V2: Not reported / V3: Not reported	V1: Slowing or stopped in traffic / V2:Turning right / V3:Turning right	V1: Passenger car / V2:Passenger car / V3:Passenger car	
8/27/2009	3:00 PM	Non-fatal injury	2	5	0	Angle	Dry	Daylight	Clear/Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/1/2009	4:30 PM	Not Reported	2	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Not reported	V1: Not reported / V2:Not reported	V1: Passenger car / V2:Single-unit truck (2-axle, 6-tire)	
9/13/2009	11:00 AM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Clear	V1:Northbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/15/2009	7:30 PM	Not Reported	2	0	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Turning right	V1: Not reported / V2:Not reported	
9/16/2009	4:30 AM	Not Reported	2	0	0	Not reported	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
9/21/2009	11:00 PM	Non-fatal injury	1	1	0	Single vehicle crash	Dry	Daylight	Clear/Clear	V1:Westbound	V1: Collision with cyclist (bicycle, tricycle, unicycle, pedal car)	V1: Slowing or stopped in traffic	V1: Passenger car	
9/30/2009	6:23 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Changing lanes / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
10/5/2009	1:15 PM	Non-fatal injury	2	1	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Changing lanes	V1: Passenger car / V2:Passenger car	
10/26/2009	8:30 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Dark - lighted roadway	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	

10/31/2009	12:00 PM	Non-fatal injury	2	2	0	Rear-end	Dry	Daylight	Clear/Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
11/29/2009	3:48 AM	Non-fatal injury	2	4	0	Angle	Wet	Dark - lighted roadway	Rain	V1:Eastbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Passenger car	
12/7/2009	10:45 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
12/9/2009	8:15 AM	Non-fatal injury	2	1	0	Rear-end	Wet	Daylight	Snow	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
12/30/2009	9:45 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Cloudy	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Not reported	V1: Entering traffic lane / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
1/21/2010	3:30 PM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
2/15/2010	6:00 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Southbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Tractor/semi-trailer	
3/5/2010	6:45 AM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Dawn	Rain/Snow	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
4/16/2010	1:59 PM	Property damage only (none injured)	2	0	0	Angle	Wet	Daylight	Rain	V1:Westbound / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Parked	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

6/13/2010	3:12 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Cloudy/Unknown	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Truck/trailer	
8/21/2010	12:25 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Passenger car	
10/9/2010	2:40 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Northbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
10/28/2010	1:19 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning right / V2:Turning right	V1: Passenger car / V2:Tractor/semi-trailer	
11/18/2010	9:45 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Turning left	V1: Not reported / V2:Not reported	
12/24/2010	11:00 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Not reported	V1: Slowing or stopped in traffic / V2:Not reported	V1: Tractor/semi-trailer / V2:Passenger car	
12/31/2010	9:25 PM	Property damage only (none injured)	2	0	0	Angle	Wet	Dark - lighted roadway	Clear/Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Passenger car / V2:Not reported	

Bennington Street at Neptune Street

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
1/6/2008	00:00 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
1/20/2008	2:45 PM	Non-fatal injury	2	2	0	Angle	Dry	Daylight	Clear	V1:Northbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Not reported / V2:Not reported	
2/22/2008	2:00 AM	Not Reported	2	0	0	Not reported	Snow	Daylight	Snow	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Unknown heavy truck, cannot classify	

4/28/2009	5:00 PM	Property damage only (none injured)	2	0	0	Rear-to-rear	Dry	Daylight	Clear	V1:Westbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Backing / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
8/7/2009	2:45 PM	Property damage only (none injured)	2	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Truck/trailer	
8/11/2009	12:15 PM	Non-fatal injury	2	1	0	Unknown	Dry	Daylight	Clear	V1:Northbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Not reported	V1: Not reported / V2:Not reported	

Bennington Street at Saratoga St

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
1/7/2008	7:13 AM	Non-fatal injury	1	1	0	Single vehicle crash	Wet	Dark - lighted roadway	Clear	V1:Northbound	V1: Not reported	V1: Travelling straight ahead	V1: Passenger car	P2:Pedestrian
2/20/2008	7:35 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
3/3/2008	11:30 AM	Not Reported	2	0	0	Angle	Dry	Daylight	Cloudy	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
5/19/2008	11:46 AM	Non-fatal injury	2	2	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Southbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Turning left	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
5/21/2008	3:30 PM	Property damage only (none injured)	4	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Not reported / V3:Northbound / V4:Not reported	V1: Not reported / V2: Not reported / V3: Not reported / V4: Not reported	V1: Slowing or stopped in traffic / V2:Entering traffic lane / V3:Travelling straight ahead / V4:Slowing or stopped in traffic	V1: Not reported / V2:Not reported / V3:Passenger car / V4:Not reported	
5/24/2008	2:00 AM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound / V3:Northbound	V1: Not reported / V2: Not reported / V3: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic / V3:Travelling straight ahead	V1: Passenger car / V2:Passenger car / V3:Passenger car	
6/10/2008	8:30 AM	Non-fatal injury	2	3	0	Sideswipe, opposite direction	Wet	Dusk	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

9/16/2008	12:00 PM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Daylight	Rain	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
9/17/2008	4:30 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/30/2008	8:00 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Eastbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
10/25/2008	12:00 PM	Unknown	2	0	0	Not reported	Wet	Dark - lighted roadway	Rain	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
12/17/2008	5:00 AM	Property damage only (none injured)	2	0	0	Not reported	Not reported	Dusk	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/18/2008	4:32 AM	Not Reported	2	0	0	Not reported	Ice	Dark - lighted roadway	Not Reported	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Turning right / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
12/23/2008	10:20 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Not reported	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Parked	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
1/6/2009	1:30 PM	Unknown	2	0	0	Sideswipe, same direction	Wet	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Entering traffic lane	V1: Not reported / V2:Not reported	
1/27/2009	8:55 AM	Property damage only (none injured)	2	0	0	Not reported	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
3/5/2009	5:00 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Northbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Entering traffic lane	V1: Not reported / V2:Not reported	
1/9/2010	6:00 PM	Non-fatal injury	1	1	0	Single vehicle crash	Snow	Dark - lighted roadway	Clear/Clear	V1:Southbound	V1: Collision with pedestrian	V1: Backing	V1: Not reported	
1/11/2010	6:20 AM	Non-fatal injury	1	1	0	Single vehicle crash	Dry	Dark - lighted roadway	Clear	V1:Northbound	V1: Collision with pedestrian	V1: Turning right	V1: Not reported	P2:Pedestrian
11/3/2010	11:20 PM	Non-fatal injury	3	1	0	Head-on	Dry	Dark - lighted roadway	Clear/Clear	V1:Westbound / V2:Eastbound / V3:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Not reported	V1: Travelling straight ahead / V2:Turning left / V3:Not reported	V1: Passenger car / V2:Passenger car / V3:Not reported	
11/13/2010	00:00 AM	Non-fatal injury	2	1	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Northbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

Bennington Street at Winthrop Ave

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
2/1/2008	5:00 PM	Non-fatal injury	1	1	0	Single vehicle crash	Wet	Dark - lighted roadway	Rain	V1:Southbound	V1: Collision with pedestrian	V1: Travelling straight ahead	V1: Passenger car	P2:Pedestrian
5/2/2008	6:57 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Wet	Daylight	Rain	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with parked motor vehicle	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
9/23/2008	7:40 AM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Clear	V1:Southbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Turning left	V1: Not reported / V2:Not reported	
9/27/2008	8:00 PM	Non-fatal injury	2	2	0	Angle	Wet	Dark - lighted roadway	Rain	V1:Southbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/3/2008	10:00 AM	Not Reported	1	0	0	Not reported	Dry	Daylight	Clear	V1:Not reported	V1: Collision with cyclist (bicycle, tricycle, unicycle, pedal car)	V1: Turning left	V1: Not reported	
1/21/2009	2:15 PM	Not Reported	2	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Passenger car / V2:Not reported	
3/10/2009	8:30 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Southbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Other / V2:Entering traffic lane	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
4/3/2009	8:50 AM	Not Reported	2	0	0	Angle	Wet	Daylight	Cloudy/Rain	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
7/29/2009	9:10 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Dark - lighted roadway	Clear	V1:Westbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Turning left	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
11/14/2009	7:40 PM	Fatal injury	1	0	1	Single vehicle crash	Dry	Dark - lighted roadway	Rain	V1:Northbound	V1: Collision with pedestrian	V1: Travelling straight ahead	V1: Passenger car	P2:Pedestrian
12/14/2009	5:25 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Ice	Dawn	Cloudy	V1:Northbound	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/14/2009	6:43 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Ice	Dawn	Cloudy	V1:Northbound	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

12/14/2009	6:44 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Ice	Dawn	Cloudy	V1:Northbound	V1: Collision with curb	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/15/2009	7:20 PM	Non-fatal injury	1	1	0	Single vehicle crash	Dry	Dark - lighted roadway	Clear	V1:Eastbound	V1: Collision with pedestrian	V1: Travelling straight ahead	V1: Passenger car	P2:Pedestrian
12/27/2009	10:00 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Eastbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
4/19/2010	6:45 PM	Not Reported	2	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
5/19/2010	3:35 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Northbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/8/2010	10:11 AM	Non-fatal injury	2	2	0	Angle	Dry	Daylight	Clear	V1:Eastbound / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Making U-turn	V1: Passenger car / V2:Passenger car	
11/19/2010	2:50 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Overtaking/passing	V1: Not reported / V2:Not reported	
12/27/2010	9:45 PM	Not Reported	1	0	0	Single vehicle crash	Slush	Dark - lighted roadway	Blowing sand, snow/Blowing sand, snow	V1:Not reported	V1: Collision with light pole or other post/support	V1: Travelling straight ahead	V1: Unknown heavy truck, cannot classify	

Brown Circle

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
1/5/2008	5:40 AM	Non-fatal injury	2	1	0	Single vehicle crash	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Other / V2:Other	V1: Passenger car / V2:Passenger car	
1/5/2008	6:00 AM	Non-fatal injury	2	2	0	Single vehicle crash	Dry	Dark - lighted roadway	Clear	V1:Westbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Entering traffic lane	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	

1/9/2008	7:50 AM	Non-fatal injury	2	1	0	Rear-end	Wet	Dawn	Cloudy	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
1/15/2008	9:00 AM	Property damage only (none injured)	2	0	0	Rear-end	Unknown	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
1/19/2008	3:00 PM	Not Reported	2	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Eastbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Unknown / V2:Not reported	V1: Not reported / V2:Not reported	
1/30/2008	7:30 AM	Property damage only (none injured)	2	0	0	Not reported	Wet	Daylight	Rain	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Turning right / V2:Turning right	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Not reported	
2/15/2008	7:00 PM	Non-fatal injury	3	1	0	Rear-end	Dry	Dark - lighted roadway	Clear	V1:Northbound / V2:Northbound / V3:Not reported	V1: Not reported / V2: Not reported / V3: Not reported	V1: Slowing or stopped in traffic / V2:Unknown / V3:Not reported	V1: Passenger car / V2:Not reported / V3:Not reported	
3/6/2008	5:00 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Northbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Other / V2:Not reported	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
3/15/2008	7:50 PM	Unknown	2	0	0	Angle	Dry	Dark - unknown roadway lighting	Clear	V1:Southbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Turning right / V2:Overtaking/passing	V1: Not reported / V2:Passenger car	
3/16/2008	00:00 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Dark - lighted roadway	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
3/16/2008	11:15 AM	Non-fatal injury	2	3	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Not reported	
3/27/2008	7:40 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Turning right	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
3/27/2008	10:20 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Dark - lighted roadway	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Turning right	V1: Passenger car / V2:Passenger car	
3/29/2008	6:50 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Leaving traffic lane / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
4/2/2008	6:45 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Dawn	Clear	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
4/6/2008	5:30 AM	Non-fatal injury	2	1	0	Rear-end	Wet	Dusk	Rain	V1:Northbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Turning right / V2:Entering traffic lane	V1: Passenger car / V2:Passenger car	

4/14/2008	6:25 AM	Non-fatal injury	2	1	0	Angle	Dry	Dusk	Clear	V1:Southbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Other / V2:Entering traffic lane	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
4/27/2008	12:31 PM	Unknown	1	0	0	Head-on	Dry	Daylight	Clear	V1:Southbound	V1: Collision with pedestrian	V1: Slowing or stopped in traffic	V1: Passenger car	
5/28/2008	1:00 AM	Non-fatal injury	2	2	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
5/31/2008	5:45 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Dusk	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Other / V2:Not reported	V1: Passenger car / V2:Passenger car	
5/31/2008	3:30 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
6/8/2008	1:15 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Entering traffic lane / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
6/10/2008	5:30 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Northbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Unknown / V2:Unknown	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
6/10/2008	3:00 PM	Non-fatal injury	2	1	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Other / V2:Not reported	V1: Not reported / V2:Not reported	
6/21/2008	11:30 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Dark - roadway not lighted	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
6/30/2008	4:30 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Other	V1: Not reported / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
7/10/2008	4:00 AM	Property damage only (none injured)	2	0	0	Not reported	Not reported	Dark - lighted roadway	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Passenger car / V2:Passenger car	
7/22/2008	1:30 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
8/3/2008	10:30 AM	Not Reported	2	0	0	Angle	Dry	Daylight	Clear	V1:Southbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Passenger car / V2:Not reported	
8/10/2008	7:00 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Cloudy	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Turning right / V2:Unknown	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/3/2008	2:00 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Changing lanes	V1: Not reported / V2:Unknown heavy truck, cannot classify	

9/11/2008	7:15 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Dark - roadway not lighted	Clear	V1:Eastbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Passenger car	
9/16/2008	8:00 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
9/20/2008	11:20 AM	Property damage only (none injured)	2	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Westbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Turning right	V1: Passenger car / V2:Passenger car	
9/22/2008	6:00 AM	Not Reported	2	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Passenger car / V2:Passenger car	
9/26/2008	11:00 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Wet	Daylight	Rain	V1:Southbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Entering traffic lane / V2:Overtaking/passing	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
11/1/2008	4:30 PM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Turning right / V2:Not reported	V1: Not reported / V2:Passenger car	
11/2/2008	7:20 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Dawn	Cloudy	V1:Southbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Entering traffic lane / V2:Entering traffic lane	V1: Not reported / V2:Not reported	
11/14/2008	6:33 PM	Non-fatal injury	2	1	0	Rear-end	Wet	Dark - lighted roadway	Rain	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
12/5/2008	2:32 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
12/13/2008	7:15 PM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Dark - lighted roadway	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/22/2008	7:55 AM	Not Reported	1	0	0	Single vehicle crash	Wet	Daylight	Clear	V1:Not reported	V1: Collision with pedestrian	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	P2:Pedestrian
12/30/2008	2:45 PM	Not Reported	2	0	0	Rear-end	Dry	Dark - lighted roadway	Clear	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

2/9/2009	00:00 AM	Property damage only (none injured)	2	0	0	Single vehicle crash	Dry	Dark - lighted roadway	Clear/Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
2/11/2009	9:00 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Northbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Other / V2:Leaving traffic lane	V1: Passenger car / V2:Passenger car	
4/16/2009	2:30 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Changing lanes	V1: Truck/trailer / V2:Passenger car	
4/20/2009	5:00 AM	Non-fatal injury	1	1	0	Single vehicle crash	Dry	Dawn	Clear	V1:Westbound	V1: Not reported	V1: Travelling straight ahead	V1: Truck/trailer	
4/20/2009	5:38 AM	Non-fatal injury	2	1	0	Single vehicle crash	Dry	Dawn	Clear	V1:Not reported / V2:Westbound	V1: Not reported / V2: Reported but invalid	V1: Not reported / V2:Entering traffic lane	V1: Tractor/semi-trailer / V2:Not reported	
4/21/2009	10:20 AM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Daylight	Cloudy/Rain	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
4/29/2009	3:23 PM	Non-fatal injury	2	2	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Tractor/semi-trailer	
5/15/2009	2:11 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Passenger car / V2:Passenger car	
6/18/2009	6:00 PM	Not Reported	1	0	0	Single vehicle crash	Wet	Dusk	Rain	V1:Westbound	V1: Not reported	V1: Unknown	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
6/26/2009	10:30 AM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Not reported	V1: Not reported / V2:Not reported	

7/5/2009	7:30 PM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound / V3:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead / V3:Travelling straight ahead	V1: Passenger car / V2:Passenger car / V3:Passenger car	
7/8/2009	9:30 PM	Non-fatal injury	1	1	0	Single vehicle crash	Dry	Dark - lighted roadway	Clear	V1:Eastbound	V1: Collision with curb	V1: Turning right	V1: Motorcycle	
7/28/2009	9:00 PM	Not Reported	2	0	0	Rear-end	Dry	Dark - lighted roadway	Clear	V1:Westbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Other / V2:Entering traffic lane	V1: Truck/trailer / V2:Not reported	
7/29/2009	5:00 PM	Unknown	2	0	0	Rear-end	Dry	Daylight	Clear/Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
7/31/2009	2:00 PM	Not Reported	2	0	0	Not reported	Wet	Daylight	Cloudy/Rain	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Entering traffic lane / V2:Entering traffic lane	V1: Not reported / V2:Not reported	
8/13/2009	6:40 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Not reported	V1: Passenger car / V2:Not reported	
8/14/2009	8:45 PM	Not Reported	2	0	0	Sideswipe, same direction	Dry	Dark - lighted roadway	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Turning right / V2:Entering traffic lane	V1: Not reported / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
8/15/2009	10:45 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Entering traffic lane / V2:Not reported	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
8/31/2009	3:00 AM	Not Reported	2	0	0	Angle	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/5/2009	10:55 PM	Unknown	2	0	0	Sideswipe, same direction	Dry	Dark - lighted roadway	Clear/Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Not reported	V1: Other / V2:Not reported	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
9/14/2009	6:45 AM	Not Reported	2	0	0	Angle	Dry	Daylight	Clear	V1:Southbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Other / V2:Entering traffic lane	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	

9/26/2009	5:00 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear/Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
10/1/2009	6:45 AM	Non-fatal injury	2	2	0	Rear-end	Dry	Dawn	Clear/Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
10/5/2009	5:15 PM	Unknown	2	0	0	Rear-end	Dry	Daylight	Clear/Clear	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
10/13/2009	8:00 AM	Not Reported	2	0	0	Angle	Wet	Daylight	Rain	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Tractor/semi-trailer	
11/5/2009	3:33 PM	Non-fatal injury	3	1	0	Rear-end	Wet	Daylight	Rain	V1:Not reported / V2:Not reported / V3:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with parked motor vehicle / V3: Collision with parked motor vehicle	V1: Travelling straight ahead / V2:Parked / V3:Parked	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car / V3:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
11/15/2009	2:22 PM	Non-fatal injury	2	2	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
2/12/2010	10:30 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning right	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
2/22/2010	3:30 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Changing lanes	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

2/27/2010	10:55 AM	Non-fatal injury	2	1	0	Rear-end	Wet	Daylight	Cloudy/Snow	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
4/16/2010	12:10 PM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Daylight	Cloudy/Rain	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning right / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
5/20/2010	10:00 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
5/24/2010	2:58 PM	Property damage only (none injured)	3	0	0	Angle	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound / V3:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Entering traffic lane / V3:Travelling straight ahead	V1: Passenger car / V2:Passenger car / V3:Single-unit truck (3-or-more axles)	
6/22/2010	6:55 AM	Non-fatal injury	3	1	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Northbound / V2:Northbound / V3:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead / V3:Changing lanes	V1: Passenger car / V2:Passenger car / V3:Passenger car	
7/2/2010	4:20 PM	Non-fatal injury	2	2	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
8/3/2010	7:00 PM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Clear	V1:Southbound / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Changing lanes / V2:Other	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
8/17/2010	1:00 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Not reported / V2:Not reported	
8/20/2010	12:00 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

10/6/2010	8:00 PM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Dark - lighted roadway	Rain	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
10/25/2010	3:20 PM	Property damage only (none injured)	2	0	0	Sideswipe, opposite direction	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
10/29/2010	6:50 PM	Non-fatal injury	5	9	0	Not reported	Dry	Dark - lighted roadway	Not Reported	V1:Not reported / V2:Not reported / V3:Not reported / V4:Not reported / V5:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic / V4: Collision with motor vehicle in traffic / V5: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic / V3:Slowing or stopped in traffic / V4:Slowing or stopped in traffic / V5:Not reported	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car / V3:Passenger car / V4:Passenger car / V5:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
11/5/2010	9:30 PM	Property damage only (none injured)	3	0	0	Sideswipe, same direction	Dry	Dark - lighted roadway	Clear	V1:Not reported / V2:Not reported / V3:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Entering traffic lane / V2:Entering traffic lane / V3:Entering traffic lane	V1: Passenger car / V2:Passenger car / V3:Passenger car	
11/30/2010	7:30 AM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/1/2010	00:00 AM	Not Reported	2	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Southbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Passenger car / V2:Passenger car	
12/17/2010	7:00 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear/Clear	V1:Southbound / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Overtaking/passing	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

Butler Circle

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
6/12/2008	11:15 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Overtaking/passing	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

11/13/2008	3:25 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	Wet	Daylight	Rain	V1:Northbound	V1: Collision with curb	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
1/10/2008	2:00 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Not reported	
2/10/2008	7:10 PM	Property damage only (none injured)	3	0	0	Not reported	Ice	Dark - lighted roadway	Sleet, hail (freezing rain or drizzle)	V1:Not reported / V2:Not reported / V3:Not reported	V1: Not reported / V2: Not reported / V3: Not reported	V1: Travelling straight ahead / V2:Parked / V3:Parked	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car / V3:Passenger car	
3/2/2008	3:25 AM	Non-fatal injury	2	1	0	Not reported	Dry	Not reported	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Passenger car / V2:Passenger car	
3/5/2008	3:30 PM	Not Reported	2	0	0	Not reported	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Other	
3/12/2008	7:50 AM	Property damage only (none injured)	2	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Entering traffic lane	V1: Passenger car / V2:Passenger car	
4/15/2008	9:40 AM	Not Reported	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Entering traffic lane	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
4/25/2008	4:45 AM	Property damage only (none injured)	2	0	0	Single vehicle crash	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
5/6/2008	4:30 AM	Non-fatal injury	3	1	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Not reported / V3:Not reported	V1: Not reported / V2: Not reported / V3: Not reported	V1: Slowing or stopped in traffic / V2:Not reported / V3:Not reported	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V3:Not reported	
5/18/2008	8:30 AM	Non-fatal injury	3	2	0	Sideswipe, same direction	Dry	Dark - lighted roadway	Clear	V1:Southbound / V2:Southbound / V3:Southbound	V1: Not reported / V2: Not reported / V3: Not reported	V1: Travelling straight ahead / V2:Changing lanes / V3:Not reported	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car / V3:Not reported	
6/7/2008	2:15 AM	Non-fatal injury	1	1	0	Single vehicle crash	Dry	Dark - roadway not lighted	Clear	V1:Northbound	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Passenger car	
6/12/2008	6:30 AM	Non-fatal injury	2	3	0	Angle	Not reported	Dusk	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
6/18/2008	5:25 AM	Non-fatal injury	1	1	0	Single vehicle crash	Dry	Daylight	Clear/Clear	V1:Not reported	V1: Unknown non-collision	V1: Travelling straight ahead	V1: Not reported	
7/3/2008	11:40 AM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Passenger car	

7/15/2008	8:51 AM	Not Reported	2	0	0	Not reported	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Not reported / V2:Passenger car	
7/25/2008	5:30 AM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Not reported	V1: Passenger car / V2:Not reported	
8/7/2008	6:15 AM	Non-fatal injury	3	1	0	Rear-to-rear	Dry	Daylight	Clear	V1:Northbound / V2:Northbound / V3:Northbound	V1: Not reported / V2: Not reported / V3: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car / V3:Passenger car	
8/30/2008	11:45 AM	Property damage only (none injured)	2	0	0	Rear-end	Not reported	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
10/23/2008	2:32 AM	Property damage only (none injured)	2	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Not reported / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Other	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
11/1/2008	8:40 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
11/14/2008	5:50 PM	Non-fatal injury	2	1	0	Rear-end	Wet	Dark - lighted roadway	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Single-unit truck (2-axle, 6-tire)	
11/30/2008	4:40 PM	Non-fatal injury	2	1	0	Rear-end	Wet	Dark - lighted roadway	Rain	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
1/25/2009	1:16 AM	Non-fatal injury	2	4	0	Sideswipe, same direction	Dry	Dark - lighted roadway	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Not reported	
1/30/2009	3:45 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Westbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Not reported	V1: Not reported / V2:Not reported	
2/14/2009	1:45 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Dark - lighted roadway	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
2/15/2009	2:52 AM	Non-fatal injury	1	1	0	Single vehicle crash	Dry	Dark - lighted roadway	Clear/Clear	V1:Not reported	V1: Collision with guardrail	V1: Slowing or stopped in traffic	V1: Passenger car	
3/15/2009	3:11 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Not reported / V2:Not reported	

3/16/2009	1:00 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	Dry	Daylight	Cloudy	V1:Eastbound	V1: Not reported	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
4/25/2009	11:30 AM	Unknown	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Turning left	V1: Passenger car / V2:Passenger car	
5/2/2009	7:30 PM	Unknown	1	0	0	Single vehicle crash	Wet	Daylight	Rain/Rain	V1:Not reported	V1: Not reported	V1: Travelling straight ahead	V1: Passenger car	
5/8/2009	11:28 PM	Non-fatal injury	2	1	0	Rear-end	Wet	Daylight	Rain	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
5/24/2009	11:15 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Entering traffic lane	V1: Passenger car / V2:Passenger car	
5/27/2009	12:30 PM	Not Reported	2	0	0	Not reported	Wet	Daylight	Rain	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Passenger car / V2:Not reported	
7/19/2009	3:30 PM	Not Reported	2	0	0	Not reported	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
7/19/2009	8:15 PM	Non-fatal injury	3	1	0	Sideswipe, same direction	Dry	Daylight	Clear/Clear	V1:Southbound / V2:Southbound / V3:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead / V3:Not reported	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car / V3:Passenger car	
7/20/2009	11:55 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Westbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Entering traffic lane	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
7/31/2009	3:30 PM	Not Reported	2	0	0	Angle	Dry	Daylight	Cloudy	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Changing lanes / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	

8/21/2009	9:40 AM	Non-fatal injury	3	1	0	Rear-end	Dry	Daylight	Cloudy	V1:Not reported / V2:Not reported / V3:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic / V3:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car / V3:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
8/23/2009	7:00 PM	Non-fatal injury	2	2	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Not reported / V2:Not reported	
9/12/2009	11:56 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Wet	Dark - lighted roadway	Cloudy	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Entering traffic lane	V1: Passenger car / V2:Not reported	
9/13/2009	00:00 AM	Not Reported	1	0	0	Single vehicle crash	Wet	Dark - lighted roadway	Rain	V1:Southbound	V1: Collision with motor vehicle in traffic	V1: Turning left	V1: Not reported	
9/15/2009	11:00 AM	Not Reported	2	0	0	Angle	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Turning right	V1: Not reported / V2:Not reported	
9/16/2009	7:30 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/17/2009	8:30 PM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Cloudy	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
10/11/2009	7:25 AM	Not Reported	1	0	0	Single vehicle crash	Dry	Daylight	Clear	V1:Not reported	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Passenger car	
2/4/2010	4:40 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning right / V2:Overtaking/passing	V1: Not reported / V2:Not reported	
3/14/2010	1:43 PM	Non-fatal injury	2	1	0	Rear-end	Wet	Daylight	Rain	V1:Eastbound / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
3/16/2010	1:30 PM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Cloudy	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	

4/12/2010	11:00 PM	Non-fatal injury	2	2	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Southbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Entering traffic lane / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
8/2/2010	7:40 AM	Non-fatal injury	3	2	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported / V3:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V3:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/27/2010	4:20 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Wet	Dark - lighted roadway	Rain/Fog, smog, smoke	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Entering traffic lane / V2:Entering traffic lane	V1: Single-unit truck (2-axle, 6-tire) / V2:Passenger car	
10/11/2010	7:00 AM	Fatal injury	1	0	1	Single vehicle crash	Dry	Daylight	Clear	V1:Northbound	V1: Collision with pedestrian	V1: Travelling straight ahead	V1: Passenger car	P2:Pedestrian
11/10/2010	2:30 AM	Non-fatal injury	1	3	0	Single vehicle crash	Wet	Dark - lighted roadway	Rain	V1:Not reported	V1: Collision with utility pole	V1: Travelling straight ahead	V1: Not reported	
12/8/2010	10:00 AM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	

Copeland Circle

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
1/1/2008	4:00 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Wet	Dark - lighted roadway	Clear	V1:Southbound	V1: Not reported	V1: Slowing or stopped in traffic	V1: Passenger car	
1/1/2008	5:45 AM	Property damage only (none injured)	2	0	0	Angle	Wet	Dark - roadway not lighted	Sleet, hail (freezing rain or drizzle)	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
1/2/2008	3:50 PM	Non-fatal injury	2	1	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Passenger car / V2:Not reported	

1/4/2008	3:18 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Cloudy	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
1/12/2008	2:05 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Cloudy	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
1/15/2008	12:15 PM	Property damage only (none injured)	1	0	0	Not reported	Dry	Daylight	Clear	V1:Northbound	V1: Collision with motor vehicle in traffic	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
1/19/2008	1:30 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
1/21/2008	12:15 PM	Property damage only (none injured)	2	0	0	Unknown	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Parked / V2:Not reported	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
1/30/2008	3:30 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Cloudy	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Changing lanes	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
2/5/2008	10:29 AM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Daylight	Rain	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
2/12/2008	4:25 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
2/13/2008	2:16 PM	Property damage only (none injured)	3	0	0	Not reported	Wet	Daylight	Rain	V1:Southbound / V2:Southbound / V3:Northbound	V1: Collision with other movable object / V2: Collision with other movable object / V3: Cargo/equipment loss or shift	V1: Changing lanes / V2:Entering traffic lane / V3:Travelling straight ahead	V1: Passenger car / V2:Single-unit truck (2-axle, 6-tire) / V3:Truck/trailer	
2/20/2008	3:28 PM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound / V3:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic / V3:Slowing or stopped in traffic	V1: Single-unit truck (3-or-more axles) / V2:Single-unit truck (2-axle, 6-tire) / V3:Passenger car	

2/29/2008	3:00 AM	Property damage only (none injured)	1	0	0	Not reported	Not reported	Daylight	Clear	V1:Not reported	V1: Not reported	V1: Parked	V1: Passenger car	P3:Pedestrian
2/29/2008	4:40 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
3/4/2008	7:01 PM	Property damage only (none injured)	2	0	0	Angle	Wet	Dark - lighted roadway	Cloudy/Rain	V1:Northbound / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Bus (seats for more than 15 people, including driver) / V2:Not reported	
3/6/2008	6:05 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Dusk	Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
3/8/2008	5:00 PM	Non-fatal injury	1	1	0	Single vehicle crash	Wet	Dark - lighted roadway	Rain	V1:Not reported	V1: Not reported	V1: Travelling straight ahead	V1: Passenger car	
3/11/2008	6:15 AM	Non-fatal injury	2	1	0	Not reported	Dry	Daylight	Clear	V1:Not reported / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Passenger car / V2:Passenger car	
3/14/2008	11:55 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Cloudy	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Single-unit truck (2-axle, 6-tire)	
3/16/2008	4:30 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
3/18/2008	10:10 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Collision with other movable object / V2: Collision with other movable object	V1: Entering traffic lane / V2:Changing lanes	V1: Tractor/semi-trailer / V2:Passenger car	
3/24/2008	2:00 PM	Not Reported	2	0	0	Not reported	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Not reported / V2:Not reported	
3/26/2008	8:25 AM	Property damage only (none injured)	3	0	0	Rear-end	Wet	Daylight	Cloudy/Rain	V1:Southbound / V2:Southbound / V3:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car / V3:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
3/26/2008	7:34 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	Dry	Dark - lighted roadway	Clear	V1:Westbound	V1: Reported but invalid	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

3/29/2008	12:20 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
4/1/2008	4:50 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Sand, mud, dirt, oil, gravel	Daylight	Clear	V1:Northbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Entering traffic lane	V1: Truck/trailer / V2:Passenger car	
4/4/2008	8:00 AM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Dark - roadway not lighted	Rain	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
4/5/2008	2:00 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Cloudy	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
4/5/2008	9:41 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Cloudy	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
4/5/2008	1:00 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	Dry	Daylight	Cloudy	V1:Southbound	V1: Collision with median barrier	V1: Travelling straight ahead	V1: Passenger car	
4/10/2008	8:20 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Single-unit truck (2-axle, 6-tire)	
4/10/2008	10:45 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Single-unit truck (3-or-more axles) / V2:Passenger car	
4/15/2008	2:50 PM	Non-fatal injury	2	3	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
4/19/2008	3:00 PM	Non-fatal injury	1	1	0	Single vehicle crash	Dry	Daylight	Clear	V1:Northbound	V1: Not reported	V1: Travelling straight ahead	V1: Motorcycle	
4/26/2008	4:30 AM	Non-fatal injury	2	2	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Other	
4/29/2008	2:17 PM	Non-fatal injury	1	1	0	Single vehicle crash	Wet	Daylight	Rain	V1:Southbound	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Passenger car	
5/2/2008	6:00 AM	Non-fatal injury	2	1	0	Not reported	Wet	Daylight	Rain	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

5/6/2008	11:21 PM	Non-fatal injury	2	2	0	Not reported	Dry	Dark - lighted roadway	Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Not reported / V2:Not reported	V1: Motorcycle / V2:Motorcycle	
5/7/2008	12:00 PM	Unknown	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
5/9/2008	3:30 AM	Property damage only (none injured)	3	0	0	Rear-end	Wet	Daylight	Rain	V1:Northbound / V2:Northbound / V3:Northbound	V1: Not reported / V2: Not reported / V3: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car / V3:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
5/12/2008	5:15 AM	Property damage only (none injured)	3	0	0	Rear-end	Wet	Not reported	Cloudy	V1:Northbound / V2:Northbound / V3:Not reported	V1: Not reported / V2: Not reported / V3: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3:Not reported	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V3:Not reported	
5/15/2008	6:35 AM	Unknown	2	0	0	Not reported	Not reported	Dusk	Not Reported	V1:Northbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Entering traffic lane	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
5/16/2008	10:45 PM	Property damage only (none injured)	6	0	0	Rear-end	Wet	Dark - roadway not lighted	Rain	V1:Northbound / V2:Northbound / V3:Northbound / V4:Northbound / V5:Northbound / V6:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic / V4: Collision with motor vehicle in traffic / V5: Collision with motor vehicle in traffic / V6: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead / V3:Travelling straight ahead / V4:Travelling straight ahead / V5:Travelling straight ahead / V6:Turning right	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V3:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V4:Passenger car / V5:Light truck(van, mini-van, panel, pickup, sport	
5/21/2008	4:00 PM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound / V3:Northbound	V1: Not reported / V2: Not reported / V3: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic / V3:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V3:Passenger car	
5/23/2008	2:30 PM	Property damage only (none injured)	4	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound / V3:Northbound / V4:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic / V4: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic / V3:Slowing or stopped in traffic / V4:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car / V3:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V4:Passenger car	

5/30/2008	4:30 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
6/4/2008	9:00 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Wet	Daylight	Cloudy	V1:Westbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Other / V2:Other	V1: Passenger car / V2:Not reported	
6/6/2008	10:49 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Dark - lighted roadway	Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
6/8/2008	1:50 AM	Fatal injury	1	1	1	Single vehicle crash	Dry	Dark - lighted roadway	Clear	V1:Westbound	V1: Overturn/rollover	V1: Travelling straight ahead	V1: Passenger car	
6/8/2008	4:30 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
6/22/2008	2:45 AM	Non-fatal injury	4	1	0	Rear-end	Dry	Daylight	Cloudy	V1:Northbound / V2:Northbound / V3:Northbound / V4:Northbound	V1: Not reported / V2: Not reported / V3: Not reported / V4: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3:Slowing or stopped in traffic / V4:Travelling straight ahead	V1: Passenger car / V2:Passenger car / V3:Passenger car / V4:Passenger car	
6/26/2008	11:12 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Collision with other movable object / V2: Collision with other movable object	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Tractor/semi-trailer	
7/5/2008	12:47 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
7/6/2008	00:00 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Dark - lighted roadway	Cloudy/Fog, smog, smoke	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Passenger car / V2:Passenger car	
7/9/2008	7:10 PM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Daylight	Rain	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	

7/9/2008	7:45 PM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Daylight	Rain	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
7/13/2008	11:15 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Not reported	
7/16/2008	3:00 AM	Non-fatal injury	2	1	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Westbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Motorcycle / V2:Not reported	
7/16/2008	4:00 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
7/19/2008	4:30 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
7/22/2008	10:02 PM	Non-fatal injury	2	1	0	Rear-end	Wet	Dark - lighted roadway	Cloudy	V1:Southbound / V2:Southbound	V1: Collision with other movable object / V2: Collision with motor vehicle in traffic	V1: Entering traffic lane / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
7/24/2008	6:40 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Wet	Daylight	Rain	V1:Northbound	V1: Not reported	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
7/29/2008	6:25 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Collision with other movable object / V2: Collision with overhead sign support	V1: Changing lanes / V2:Travelling straight ahead	V1: Passenger car / V2:Single-unit truck (2-axle, 6-tire)	
7/30/2008	2:45 AM	Property damage only (none injured)	2	0	0	Rear-end	Slush	Daylight	Clear	V1:Northbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
8/1/2008	9:55 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Unknown	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Truck/trailer	
8/6/2008	1:30 PM	Non-fatal injury	1	1	0	Single vehicle crash	Wet	Daylight	Cloudy	V1:Northbound	V1: Collision with median barrier	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
8/9/2008	7:45 AM	Non-fatal injury	2	1	0	Rear-end	Not reported	Daylight	Clear	V1:Northbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
8/10/2008	11:45 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Not reported / V2:Turning left	V1: Passenger car / V2:Passenger car	
8/16/2008	4:49 PM	Non-fatal injury	1	1	0	Single vehicle crash	Dry	Daylight	Clear	V1:Northbound	V1: Collision with median barrier	V1: Travelling straight ahead	V1: Passenger car	

8/17/2008	1:30 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
8/29/2008	10:45 PM	Unknown	2	0	0	Rear-end	Dry	Dark - lighted roadway	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Other / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
9/2/2008	5:55 AM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/9/2008	1:49 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	Dry	Daylight	Rain	V1:Northbound	V1: Collision with median barrier	V1: Not reported	V1: Passenger car	
9/14/2008	3:50 AM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Cloudy	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/14/2008	7:43 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Wet	Daylight	Rain	V1:Eastbound	V1: Collision with curb	V1: Travelling straight ahead	V1: Passenger car	
9/22/2008	8:37 AM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Cloudy	V1:Northbound / V2:Northbound	V1: Overturn/rollover / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Changing lanes	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
9/22/2008	8:45 AM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/24/2008	4:30 AM	Property damage only (none injured)	2	0	0	Not reported	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Not reported	
9/24/2008	3:52 PM	Non-fatal injury	1	1	0	Single vehicle crash	Dry	Daylight	Clear	V1:Northbound	V1: Not reported	V1: Travelling straight ahead	V1: Motorcycle	
9/28/2008	7:56 AM	Not Reported	1	0	0	Single vehicle crash	Wet	Daylight	Cloudy/Rain	V1:Northbound	V1: Collision with median barrier	V1: Travelling straight ahead	V1: Passenger car	
9/28/2008	4:40 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	Wet	Daylight	Rain	V1:Northbound	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Passenger car	
9/29/2008	6:50 AM	Non-fatal injury	1	1	0	Single vehicle crash	Wet	Dawn	Cloudy/Rain	V1:Northbound	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Passenger car	
10/1/2008	12:45 PM	Not Reported	2	0	0	Angle	Sand, mud, dirt, oil, gravel	Daylight	Rain	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	

10/4/2008	2:15 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Unknown heavy truck, cannot classify	
10/13/2008	6:56 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Dusk	Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
10/19/2008	11:34 AM	Property damage only (none injured)	2	0	0	Not reported	Dry	Daylight	Clear	V1:Southbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Unknown	V1: Passenger car / V2:Passenger car	
10/22/2008	8:13 AM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Daylight	Rain	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Single-unit truck (3-or-more axles) / V2:Tractor/semi-trailer	
10/22/2008	10:38 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Wet	Daylight	Cloudy	V1:Northbound	V1: Collision with median barrier	V1: Travelling straight ahead	V1: Passenger car	
10/28/2008	2:08 PM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound / V3:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Entering traffic lane / V2:Entering traffic lane / V3:Entering traffic lane	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V3:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
10/31/2008	3:50 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
11/21/2008	3:10 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
11/24/2008	9:40 PM	Not Reported	2	0	0	Rear-end	Dry	Dark - unknown roadway lighting	Clear/Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	

11/29/2008	1:30 AM	Non-fatal injury	2	3	0	Rear-end	Wet	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
11/30/2008	7:00 PM	Not Reported	2	0	0	Rear-end	Wet	Dark - unknown roadway lighting	Rain/Rain	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
12/2/2008	6:30 AM	Not Reported	2	0	0	Sideswipe, same direction	Dry	Dark - unknown roadway lighting	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Not reported / V2:Overtaking/passing	V1: Passenger car / V2:Not reported	
12/4/2008	4:59 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Dark - lighted roadway	Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
12/7/2008	12:40 PM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Daylight	Rain	V1:Northbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Leaving traffic lane / V2:Leaving traffic lane	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
12/8/2008	6:23 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Dawn	Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Entering traffic lane / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
12/18/2008	11:30 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/20/2008	5:00 PM	Property damage only (none injured)	2	0	0	Rear-end	Snow	Dusk	Snow	V1:Eastbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Not reported	V1: Not reported / V2:Not reported	
12/24/2008	12:20 PM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Daylight	Cloudy	V1:Southbound / V2:Southbound / V3:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic / V3:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V3:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/24/2008	2:00 PM	Non-fatal injury	2	3	0	Rear-end	Wet	Daylight	Rain	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	

12/28/2008	2:00 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Entering traffic lane / V2:Entering traffic lane	V1: Passenger car / V2:Passenger car	
12/29/2008	3:21 PM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound / V3:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Entering traffic lane / V2:Slowing or stopped in traffic / V3:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car / V3:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
1/2/2009	6:43 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Wet	Dawn	Clear	V1:Southbound	V1: Collision with median barrier	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
3/1/2009	8:58 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Dry	Daylight	Not Reported	V1:Northbound	V1: Collision with motor vehicle in traffic	V1: Travelling straight ahead	V1: Passenger car	
1/3/2009	2:30 PM	Non-fatal injury	2	1	0	Rear-end	Sand, mud, dirt, oil, gravel	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
1/14/2009	1:27 PM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
1/15/2009	9:00 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Not Reported	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
1/25/2009	5:00 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Dusk	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
1/29/2009	12:50 PM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
1/29/2009	10:40 PM	Not Reported	1	0	0	Single vehicle crash	Ice	Dark - lighted roadway	Clear	V1:Not reported	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Passenger car	

1/30/2009	7:50 AM	Non-fatal injury	1	1	0	Single vehicle crash	Wet	Daylight	Cloudy	V1:Northbound	V1: Reported but invalid	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
2/6/2009	4:25 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Dusk	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
2/7/2009	12:07 PM	Non-fatal injury	2	2	0	Rear-end	Wet	Daylight	Clear/Other	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Truck/trailer / V2:Passenger car	
2/11/2009	8:20 AM	Non-fatal injury	1	1	0	Single vehicle crash	Dry	Daylight	Not Reported	V1:Southbound	V1: Collision with motor vehicle in traffic	V1: Travelling straight ahead	V1: Passenger car	
2/11/2009	8:20 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
2/11/2009	8:30 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Southbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Entering traffic lane	V1: Passenger car / V2:Passenger car	
2/19/2009	7:38 PM	Non-fatal injury	2	1	0	Rear-end	Wet	Dark - roadway not lighted	Rain/Snow	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Single-unit truck (2-axle, 6-tire) / V2:Passenger car	
2/20/2009	10:35 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Dark - roadway not lighted	Not Reported	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
3/3/2009	8:40 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Ice	Dark - lighted roadway	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with guardrail	V1: Other / V2:Other	V1: Passenger car / V2:Passenger car	
3/15/2009	1:00 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Passenger car / V2:Passenger car	
3/24/2009	3:10 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Cloudy	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

3/25/2009	11:45 AM	Not Reported	1	0	0	Single vehicle crash	Dry	Daylight	Clear	V1:Not reported	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Passenger car	
3/25/2009	1:41 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Not Reported	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
3/30/2009	5:30 PM	Not Reported	2	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Not reported / V2:Not reported	
4/6/2009	4:45 PM	Non-fatal injury	1	1	0	Single vehicle crash	Wet	Daylight	Cloudy/Rain	V1:Southbound	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
4/8/2009	3:43 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear/Cloudy	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
4/9/2009	5:17 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Not Reported	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Not reported / V2:Not reported	
4/11/2009	00:00 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Wet	Dark - lighted roadway	Rain	V1:Northbound	V1: Collision with highway traffic sign post	V1: Travelling straight ahead	V1: Passenger car	
4/14/2009	9:25 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Dark - lighted roadway	Not Reported	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
4/16/2009	1:15 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Turning right	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
4/20/2009	5:09 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Not Reported	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Changing lanes	V1: Passenger car / V2:Passenger car	
4/27/2009	7:30 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

5/2/2009	2:25 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Cloudy	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
5/3/2009	2:35 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Not Reported	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
5/9/2009	11:00 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Dry	Daylight	Clear	V1:Northbound	V1: Collision with median barrier	V1: Travelling straight ahead	V1: Passenger car	
5/15/2009	12:37 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Not Reported	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
5/17/2009	1:20 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Wet	Dark - lighted roadway	Cloudy/Rain	V1:Northbound	V1: Collision with median barrier	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
5/17/2009	10:00 AM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Cloudy	V1:Westbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Changing lanes / V2:Not reported	V1: Passenger car / V2:Single-unit truck (2-axle, 6-tire)	
5/17/2009	11:30 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Not Reported	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Entering traffic lane / V2:Entering traffic lane	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
5/17/2009	12:50 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
5/22/2009	2:03 PM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Clear	V1:Eastbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Entering traffic lane / V2:Leaving traffic lane	V1: Passenger car / V2:Tractor/semi-trailer	
5/22/2009	8:05 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Dark - lighted roadway	Not Reported	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Entering traffic lane	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

5/27/2009	10:45 PM	Non-fatal injury	2	1	0	Rear-end	Wet	Dark - lighted roadway	Rain	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
5/28/2009	11:04 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Cloudy	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
6/9/2009	11:30 AM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound / V3:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead / V3:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car / V3:Passenger car	
6/9/2009	8:13 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	Wet	Dark - lighted roadway	Rain	V1:Northbound	V1: Collision with median barrier	V1: Travelling straight ahead	V1: Passenger car	
6/9/2009	9:00 PM	Non-fatal injury	1	1	0	Angle	Wet	Dark - lighted roadway	Cloudy	V1:Not reported	V1: Not reported	V1: Travelling straight ahead	V1: Passenger car	
6/14/2009	10:20 AM	Non-fatal injury	1	2	0	Single vehicle crash	Wet	Daylight	Cloudy/Rain	V1:Northbound	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Passenger car	
6/15/2009	6:30 PM	Not Reported	2	0	0	Sideswipe, same direction	Dry	Daylight	Cloudy	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Passenger car / V2:Passenger car	
6/29/2009	8:03 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Wet	Daylight	Rain	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Bus (seats for more than 15 people, including driver)	
7/3/2009	10:05 PM	Non-fatal injury	1	1	0	Single vehicle crash	Wet	Dark - roadway not lighted	Cloudy/Rain	V1:Northbound	V1: Reported but invalid	V1: Travelling straight ahead	V1: Passenger car	
7/8/2009	10:36 AM	Non-fatal injury	3	1	0	Angle	Dry	Daylight	Cloudy	V1:Westbound / V2:Not reported / V3:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with guardrail / V3: Collision with motor vehicle in traffic	V1: Turning right / V2:Travelling straight ahead / V3:Parked	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car / V3:Truck/trailer	

7/8/2009	7:54 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Not Reported	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
7/13/2009	2:00 PM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Not Reported	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
7/15/2009	4:30 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Bus (seats for more than 15 people, including driver)	
7/18/2009	1:00 PM	Not Reported	3	0	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported / V3:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3:Travelling straight ahead	V1: Passenger car / V2:Passenger car / V3:Passenger car	
7/31/2009	10:26 PM	Property damage only (none injured)	1	0	0	Sideswipe, same direction	Wet	Dark - lighted roadway	Cloudy/Rain	V1:Southbound	V1: Collision with median barrier	V1: Travelling straight ahead	V1: Passenger car	
8/3/2009	7:50 AM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Turning right / V2:Not reported	V1: Not reported / V2:Not reported	
8/6/2009	9:00 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Turning right / V2:Entering traffic lane	V1: Not reported / V2:Not reported	
8/6/2009	11:08 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Truck/trailer	
8/14/2009	7:00 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	

8/14/2009	2:15 PM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Daylight	Not Reported	V1:Northbound / V2:Northbound / V3:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3:Not reported	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V3:Passenger car	
8/17/2009	10:30 AM	Unknown	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Not reported / V2:Unknown	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/3/2009	9:35 AM	Non-fatal injury	2	1	0	Sideswipe, same direction	Dry	Dusk	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Changing lanes	V1: Passenger car / V2:Unknown heavy truck, cannot classify	
9/11/2009	00:00 AM	Not Reported	2	0	0	Sideswipe, same direction	Dry	Dark - lighted roadway	Clear	V1:Westbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
9/13/2009	7:15 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Westbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning right / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
9/19/2009	11:02 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Dark - lighted roadway	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
9/27/2009	10:10 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Wet	Daylight	Rain	V1:Northbound	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Passenger car	
10/3/2009	4:46 PM	Non-fatal injury	2	2	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Changing lanes	V1: Not reported / V2:Not reported	
10/7/2009	8:30 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Wet	Daylight	Cloudy/Rain	V1:Northbound	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Passenger car	
10/10/2009	8:56 AM	Non-fatal injury	2	1	0	Sideswipe, same direction	Wet	Daylight	Cloudy	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Motorcycle / V2:Passenger car	
10/12/2009	7:20 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Dark - roadway not lighted	Not Reported	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	

10/18/2009	6:50 PM	Not Reported	2	0	0	Rear-end	Dry	Dark - unknown roadway lighting	Clear/Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
10/19/2009	3:43 PM	Non-fatal injury	2	3	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
10/22/2009	12:20 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
10/24/2009	3:43 PM	Non-fatal injury	2	3	0	Rear-end	Wet	Daylight	Cloudy	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
10/28/2009	10:35 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	Wet	Dark - lighted roadway	Not Reported	V1:Northbound	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Passenger car	
10/29/2009	6:00 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Dark - lighted roadway	Clear/Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
11/10/2009	6:00 PM	Non-fatal injury	3	1	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Not reported / V2:Not reported / V3:Westbound	V1: Not reported / V2: Not reported / V3: Not reported	V1: Turning right / V2:Turning left / V3:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car / V3:Passenger car	
11/14/2009	11:10 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Wet	Daylight	Cloudy/Rain	V1:Westbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with guardrail	V1: Turning right / V2:Turning left	V1: Not reported / V2:Not reported	
11/27/2009	3:56 AM	Not Reported	1	0	0	Single vehicle crash	Wet	Dark - lighted roadway	Not Reported	V1:Southbound	V1: Collision with curb	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/9/2009	4:15 PM	Non-fatal injury	2	1	0	Angle	Wet	Dark - lighted roadway	Not Reported	V1:Northbound / V2:Northbound	V1: Collision with median barrier / V2: Collision with median barrier	V1: Travelling straight ahead / V2:Changing lanes	V1: Passenger car / V2:Passenger car	

12/29/2009	12:00 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/31/2009	12:45 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	Ice	Dark - roadway not lighted	Other	V1:Northbound	V1: Not reported	V1: Travelling straight ahead	V1: Passenger car	
1/10/2010	8:00 PM	Not Reported	2	0	0	Angle	Dry	Dark - roadway not lighted	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Entering traffic lane / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
1/5/2010	12:37 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
1/25/2010	12:30 PM	Non-fatal injury	2	1	0	Rear-end	Wet	Daylight	Cloudy/Rain	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Entering traffic lane / V2:Travelling straight ahead	V1: Passenger car / V2:Truck/trailer	
2/3/2010	9:30 AM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
3/5/2010	11:45 AM	Not Reported	2	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Westbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Not reported / V2:Not reported	
3/5/2010	2:08 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
3/13/2010	1:00 PM	Non-fatal injury	3	1	0	Rear-end	Wet	Daylight	Rain	V1:Northbound / V2:Northbound / V3:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3:Travelling straight ahead	V1: Passenger car / V2:Passenger car / V3:Passenger car	

3/19/2010	3:44 PM	Non-fatal injury	4	1	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound / V3:Northbound / V4:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic / V4: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead / V3:Travelling straight ahead / V4:Travelling straight ahead	V1: Passenger car / V2:Passenger car / V3:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V4:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
3/23/2010	5:40 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Wet	Dark - roadway not lighted	Cloudy/Rain	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Changing lanes	V1: Passenger car / V2:Tractor/semi-trailer	
3/23/2010	9:09 PM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Dark - lighted roadway	Not Reported	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
3/29/2010	9:30 AM	Property damage only (none injured)	1	0	0	Angle	Wet	Daylight	Cloudy/Rain	V1:Eastbound	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
4/2/2010	12:15 PM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound / V3:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3:Travelling straight ahead	V1: Passenger car / V2:Passenger car / V3:Passenger car	
4/2/2010	5:20 PM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
4/3/2010	2:05 AM	Not Reported	1	0	0	Single vehicle crash	Dry	Dark - lighted roadway	Cloudy	V1:Southbound	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Passenger car	
4/9/2010	2:49 PM	Not Reported	2	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Not reported / V2:Not reported	
4/24/2010	7:00 PM	Non-fatal injury	2	2	0	Rear-end	Dry	Daylight	Not Reported	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Entering traffic lane / V2:Entering traffic lane	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

5/13/2010	2:43 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
5/16/2010	8:11 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Dusk	Not Reported	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Changing lanes / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
5/17/2010	2:50 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
5/27/2010	4:05 PM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Daylight	Not Reported	V1:Northbound / V2:Northbound / V3:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Entering traffic lane / V2:Slowing or stopped in traffic / V3:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V3:Passenger car	
5/30/2010	7:00 AM	Unknown	2	0	0	Rear-end	Dry	Daylight	Clear/Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
5/30/2010	7:00 PM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Clear	V1:Westbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
6/10/2010	1:24 PM	Non-fatal injury	3	1	0	Rear-end	Dry	Daylight	Cloudy	V1:Northbound / V2:Northbound / V3:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead / V3:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car / V3:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

6/27/2010	8:57 PM	Unknown	2	0	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Westbound / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with cyclist (bicycle, tricycle, unicycle, pedal car)	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
7/19/2010	6:00 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	Dry	Daylight	Clear	V1:Southbound	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Passenger car	
7/29/2010	10:25 AM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Daylight	Cloudy	V1:Northbound / V2:Northbound / V3:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead / V3:Travelling straight ahead	V1: Passenger car / V2:Passenger car / V3:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
10/26/2010	10:15 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
10/26/2010	12:02 PM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound / V3:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3:Travelling straight ahead	V1: Passenger car / V2:Passenger car / V3:Passenger car	
9/3/2010	5:15 PM	Non-fatal injury	2	1	0	Angle	Wet	Daylight	Rain	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
9/9/2010	12:45 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Cloudy	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Entering traffic lane / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/29/2010	7:15 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Dark - lighted roadway	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Unknown heavy truck, cannot classify / V2:Passenger car	

10/22/2010	1:29 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
11/16/2010	12:51 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Cloudy	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
11/21/2010	1:50 PM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound / V3:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3:Travelling straight ahead	V1: Passenger car / V2:Passenger car / V3:Passenger car	
12/13/2010	2:20 PM	Non-fatal injury	1	1	0	Single vehicle crash	Wet	Daylight	Rain	V1:Not reported	V1: Collision with light pole or other post/support	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/23/2010	3:35 PM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Daylight	Cloudy	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
12/28/2010	11:15 AM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Daylight	Cloudy	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	

Elliot Circle

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
11/13/2008	2:58 PM	Non-fatal injury	2	1	0	Rear-end	Wet	Daylight	Rain	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with other movable object	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
1/3/2008	6:15 AM	Unknown	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

1/27/2008	9:20 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	Wet	Dark - lighted roadway	Snow	V1:Westbound	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Passenger car	
2/25/2008	2:32 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
3/9/2008	12:38 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Changing lanes / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
3/24/2008	11:45 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Eastbound / V2:Northbound	V1: Collision with other movable object / V2: Collision with other movable object	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
4/13/2008	3:26 AM	Non-fatal injury	1	2	0	Single vehicle crash	Dry	Dark - lighted roadway	Clear	V1:Southbound	V1: Collision with light pole or other post/support	V1: Travelling straight ahead	V1: Passenger car	
7/18/2008	12:00 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Eastbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
7/29/2008	11:30 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
8/16/2008	5:00 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
9/30/2008	7:45 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Dark - lighted roadway	Clear	V1:Southbound / V2:Southbound	V1: Collision with parked motor vehicle / V2: Collision with parked motor vehicle	V1: Travelling straight ahead / V2:Parked	V1: Passenger car / V2:Passenger car	
10/12/2008	4:05 PM	Property damage only (none injured)	3	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Eastbound / V2:Not reported / V3:Not reported	V1: Collision with parked motor vehicle / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Parked / V3:Parked	V1: Passenger car / V2:Other / V3:Other	

11/8/2008	10:30 AM	Not Reported	2	0	0	Not reported	Dry	Daylight	Cloudy	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Parked / V2:Backing	V1: Not reported / V2:Passenger car	
11/18/2008	10:44 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Dark - lighted roadway	Clear	V1:Northbound / V2:Not reported	V1: Collision with parked motor vehicle / V2: Collision with parked motor vehicle	V1: Travelling straight ahead / V2:Parked	V1: Passenger car / V2:Passenger car	
1/18/2009	4:08 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Snow	Dark - lighted roadway	Snow	V1:Southbound	V1: Collision with utility pole	V1: Turning left	V1: Passenger car	
1/20/2009	9:30 AM	Property damage only (none injured)	2	0	0	Rear-end	Ice	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Not reported / V2:Not reported	
3/21/2009	2:26 AM	Non-fatal injury	1	3	0	Rear-end	Dry	Dark - lighted roadway	Cloudy	V1:Northbound	V1: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic	V1: Passenger car	
6/9/2009	2:05 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Not Reported	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
7/23/2009	9:05 AM	Non-fatal injury	1	1	0	Single vehicle crash	Dry	Daylight	Cloudy	V1:Eastbound	V1: Collision with motor vehicle in traffic	V1: Travelling straight ahead	V1: Passenger car	P2:Pedestrian
8/19/2009	3:34 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Not Reported	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Entering traffic lane / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
1/15/2010	12:45 PM	Property damage only (none injured)	4	0	0	Sideswipe, opposite direction	Dry	Daylight	Not Reported	V1:Southbound / V2:Not reported / V3:Not reported / V4:Not reported	V1: Collision with motor vehicle in traffic / V2: Not reported / V3: Not reported / V4: Not reported	V1: Travelling straight ahead / V2:Parked / V3:Parked / V4:Parked	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V3:Passenger car / V4:Passenger car	
1/17/2010	5:02 PM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Dark - lighted roadway	Not Reported	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
1/27/2010	8:20 AM	Non-fatal injury	1	1	0	Single vehicle crash	Dry	Daylight	Clear	V1:Northbound	V1: Collision with light pole or other post/support	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

5/15/2010	4:30 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Not Reported	V1:Northbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
6/5/2010	8:00 AM	Property damage only (none injured)	2	0	0	Angle	Not reported	Daylight	Cloudy/Rain	V1:Not reported / V2:Not reported	V1: Not reported / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	

Neptune Rd at Route 1A

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
3/17/2008	9:45 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Turning left / V2:Turning left	V1: Single-unit truck (3-or-more axles) / V2:Passenger car	
1/28/2009	6:30 AM	Property damage only (none injured)	2	0	0	Angle	Wet	Dark - lighted roadway	Rain	V1:Northbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	

Ocean Rd at State Rd

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
4/7/2008	00:00 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Dark - lighted roadway	Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
7/10/2008	8:38 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Dark - lighted roadway	Clear	V1:Eastbound / V2:Not reported	V1: Collision with parked motor vehicle / V2: Collision with other movable object	V1: Entering traffic lane / V2:Parked	V1: Passenger car / V2:Passenger car	
9/1/2008	7:30 PM	Not Reported	3	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Northbound / V2:Not reported / V3:Not reported	V1: Not reported / V2: Not reported / V3: Not reported	V1: Not reported / V2:Not reported / V3:Parked	V1: Passenger car / V2:Passenger car / V3:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
8/13/2009	8:00 AM	Non-fatal injury	2	1	0	Not reported	Not reported	Not reported	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
8/18/2009	1:30 PM	Property damage only (none injured)	2	0	0	Unknown	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Making U-turn	V1: Not reported / V2:Not reported	

8/25/2009	4:30 PM	Property damage only (none injured)	3	0	0	Sideswipe, same direction	Dry	Daylight	Not Reported	V1:Southbound / V2:Eastbound / V3:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Entering traffic lane / V3:Entering traffic lane	V1: Passenger car / V2:Passenger car / V3:Passenger car	
9/10/2009	7:40 AM	Non-fatal injury	2	2	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Other	V1: Passenger car / V2:Passenger car	
2/23/2010	12:15 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
4/3/2010	7:50 AM	Non-fatal injury	2	1	0	Not reported	Not reported	Not reported	Not Reported	V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Not reported / V2:Not reported	
6/3/2010	8:30 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Cloudy	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Changing lanes / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/8/2010	2:45 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
10/4/2010	9:15 AM	Non-fatal injury	2	2	0	Angle	Dry	Daylight	Not Reported	V1:Westbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	

Revere St at Route 60

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
2/2/2008	10:16 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Dark - lighted roadway	Clear	V1:Westbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
2/14/2008	2:45 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Cloudy	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Turning right / V2:Turning right	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

3/17/2008	8:30 PM	Not Reported	2	0	0	Sideswipe, same direction	Dry	Dark - lighted roadway	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Parked	V1: Not reported / V2:Not reported	
5/9/2008	9:00 PM	Non-fatal injury	2	1	0	Angle	Dry	Dark - lighted roadway	Clear	V1:Eastbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Turning left / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
5/19/2008	4:50 AM	Non-fatal injury	3	1	0	Rear-end	Dry	Daylight	Cloudy	V1:Westbound / V2:Westbound / V3:Westbound	V1: Not reported / V2: Not reported / V3: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V3:Passenger car	
7/27/2008	1:10 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/17/2008	7:35 AM	Non-fatal injury	2	1	0	Angle	Wet	Daylight	Rain	V1:Eastbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Not reported / V2:Not reported	
1/12/2009	10:30 AM	Not Reported	2	0	0	Rear-end	Wet	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
2/3/2009	1:50 PM	Property damage only (none injured)	2	0	0	Head-on	Snow	Dark - lighted roadway	Snow	V1:Northbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning left	V1: Not reported / V2:Not reported	
7/1/2009	11:45 AM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Cloudy	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
7/2/2009	1:00 PM	Not Reported	2	0	0	Rear-end	Wet	Daylight	Cloudy/Rain	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
8/15/2009	2:30 PM	Not Reported	2	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Making U-turn / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
2/7/2010	1:15 AM	Non-fatal injury	3	3	0	Rear-end	Dry	Dark - lighted roadway	Clear	V1:Northbound / V2:Northbound / V3:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic / V3:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car / V3:Passenger car	

5/16/2010	7:00 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Dry	Daylight	Clear	V1:Southbound	V1: Collision with utility pole	V1: Travelling straight ahead	V1: Passenger car	
8/7/2010	9:00 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Dark - lighted roadway	Clear	V1:Southbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
8/26/2010	10:09 PM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
10/6/2010	1:25 PM	Non-fatal injury	2	1	0	Rear-end	Wet	Daylight	Rain	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
10/5/2010	00:00 AM	Property damage only (none injured)	2	0	0	Angle	Wet	Dark - lighted roadway	Rain	V1:Northbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Turning left / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	

Route 1 at Route 16

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
6/20/2008	11:30 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Northbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Passenger car / V2:Passenger car	
2/4/2008	3:09 PM	Non-fatal injury	2	2	0	Angle	Dry	Daylight	Cloudy	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning right	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
7/16/2008	5:07 PM	Non-fatal injury	2	1	0	Single vehicle crash	Dry	Daylight	Clear/Cloudy	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with parked motor vehicle	V1: Parked / V2:Travelling straight ahead	V1: Passenger car / V2:Motorcycle	
8/9/2008	8:35 PM	Non-fatal injury	1	1	0	Single vehicle crash	Dry	Dark - lighted roadway	Clear	V1:Southbound	V1: Collision with median barrier	V1: Travelling straight ahead	V1: Motorcycle	
8/16/2008	1:50 PM	Non-fatal injury	1	1	0	Single vehicle crash	Dry	Daylight	Cloudy	V1:Eastbound	V1: Other non-collision	V1: Travelling straight ahead	V1: Motorcycle	

9/21/2008	1:24 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Motorcycle	
10/10/2008	3:35 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Collision with guardrail / V2: Collision with motor vehicle in traffic	V1: Changing lanes / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
10/15/2008	10:50 AM	Property damage only (none injured)	2	0	0	Not reported	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Passenger car / V2:Passenger car	
11/21/2008	7:40 AM	Property damage only (none injured)	3	0	0	Rear-to-rear	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound / V3:Eastbound	V1: Not reported / V2: Not reported / V3: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3:Unknown	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V3:Passenger car	
1/9/2009	3:49 PM	Not Reported	2	0	0	Sideswipe, same direction	Dry	Daylight	Not Reported	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Changing lanes / V2:Changing lanes	V1: Passenger car / V2:Passenger car	
2/22/2009	3:25 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Dry	Dark - lighted roadway	Not Reported	V1:Northbound	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Passenger car	
2/26/2009	8:30 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Dry	Daylight	Clear	V1:Northbound	V1: Reported but invalid	V1: Turning right	V1: Tractor/semi-trailer	
4/2/2009	10:05 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	Dry	Daylight	Not Reported	V1:Southbound	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
4/3/2009	8:40 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	Wet	Dark - lighted roadway	Rain	V1:Northbound	V1: Other	V1: Travelling straight ahead	V1: Passenger car	
5/9/2009	12:27 PM	Non-fatal injury	1	1	0	Angle	Dry	Daylight	Cloudy	V1:Westbound	V1: Collision with pedestrian	V1: Travelling straight ahead	V1: Passenger car	P4:Pedalcyclist (bicycle, tricycle, unicycle, pedal car)
5/29/2009	4:59 PM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Daylight	Clear/Cloudy	V1:Westbound / V2:Westbound / V3:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic / V3:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V3:Passenger car	

8/31/2009	2:00 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	Dry	Daylight	Clear	V1:Southbound	V1: Collision with guardrail	V1: Travelling straight ahead	V1: Passenger car	
9/10/2009	9:30 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Changing lanes	V1: Passenger car / V2:Passenger car	
9/14/2009	7:50 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Changing lanes / V2:Changing lanes	V1: Passenger car / V2:Passenger car	
10/24/2009	12:45 PM	Non-fatal injury	1	1	0	Single vehicle crash	Wet	Daylight	Cloudy/Rain	V1:Southbound	V1: Reported but invalid	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
10/24/2009	3:37 PM	Non-fatal injury	1	1	0	Single vehicle crash	Wet	Daylight	Cloudy/Rain	V1:Southbound	V1: Other	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
12/24/2009	12:00 PM	Non-fatal injury	2	1	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
2/6/2010	11:05 PM	Non-fatal injury	1	1	0	Single vehicle crash	Dry	Dark - lighted roadway	Clear	V1:Northbound	V1: Reported but invalid	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
2/10/2010	7:20 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Cloudy	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Changing lanes	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
3/21/2010	11:34 AM	Non-fatal injury	2	1	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning right	V1: Motorcycle / V2:Passenger car	
6/3/2010	12:30 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Not reported / V2:Not reported	
6/11/2010	5:05 PM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Daylight	Not Reported	V1:Westbound / V2:Westbound / V3:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic / V3:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V3:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

8/7/2010	9:12 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	P5:Pedestrian
8/31/2010	9:51 AM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Changing lanes	V1: Motorcycle / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/5/2010	10:15 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	Dry	Dark - lighted roadway	Not Reported	V1:Northbound	V1: Collision with median barrier	V1: Changing lanes	V1: Passenger car	
10/2/2010	12:04 PM	Not Reported	2	0	0	Angle	Unknown	Unknown	Clear/Unknown	V1:Not reported / V2:Not reported	V1: Collision with parked motor vehicle / V2: Not reported	V1: Parked / V2:Not reported	V1: Passenger car / V2:Not reported	
11/13/2010	3:00 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
12/7/2010	6:48 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Dawn	Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	

Neptune Rd at Bremen St

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
3/13/2008	7:00 PM	Non-fatal injury	2	1	0	Rear-end	Snow	Dusk	Clear	V1:Eastbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Not reported / V2:Not reported	

North Shore Rd at Revere St

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
3/24/2008	9:00 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

3/26/2008	6:30 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
7/3/2008	5:45 AM	Fatal injury	1	0	1	Single vehicle crash	Dry	Daylight	Unknown	V1:Southbound	V1: Collision with curb	V1: Travelling straight ahead	V1: Passenger car	
8/17/2008	7:00 AM	Not Reported	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Southbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Parked / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
8/18/2008	6:45 AM	Non-fatal injury	1	1	0	Single vehicle crash	Dry	Daylight	Clear	V1:Southbound	V1: Overturn/rollover	V1: Travelling straight ahead	V1: Not reported	
8/20/2008	10:15 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Unknown heavy truck, cannot classify	
11/15/2008	1:30 PM	Non-fatal injury	2	1	0	Rear-end	Wet	Daylight	Rain	V1:Southbound / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Not reported / V2:Not reported	
11/17/2008	4:45 PM	Property damage only (none injured)	3	0	0	Rear-end	Dry	Dusk	Clear	V1:Eastbound / V2:Not reported / V3:Eastbound	V1: Not reported / V2: Not reported / V3: Not reported	V1: Slowing or stopped in traffic / V2:Not reported / V3:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V3:Passenger car	
12/22/2008	4:00 PM	Unknown	2	0	0	Sideswipe, same direction	Slush	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Turning right / V2:Turning right	V1: Not reported / V2:Not reported	
1/21/2009	9:00 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning left / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
5/16/2009	2:19 PM	Non-fatal injury	2	2	0	Angle	Dry	Dark - lighted roadway	Cloudy	V1:Southbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Passenger car / V2:Passenger car	
7/2/2009	12:30 PM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Daylight	Rain	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
8/4/2009	2:30 PM	Unknown	2	0	0	Head-on	Dry	Daylight	Clear	V1:Northbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Not reported	V1: Not reported / V2:Not reported	
8/16/2009	6:55 PM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Not reported / V2:Passenger car	
9/6/2009	11:31 AM	Property damage only (none injured)	2	0	0	Angle	Dry	Daylight	Clear	V1:Westbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	

11/14/2009	10:15 AM	Unknown	2	0	0	Rear-end	Wet	Daylight	Cloudy/Rain	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
2/13/2010	1:09 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	Dry	Dark - lighted roadway	Clear	V1:Southbound	V1: Collision with other fixed object (wall, building, tunnel, etc.)	V1: Travelling straight ahead	V1: Passenger car	
5/18/2010	3:20 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Bus (seats for more than 15 people, including driver)	
9/1/2010	8:19 AM	Non-fatal injury	2	10	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Bus (seats for more than 15 people, including driver) / V2:Passenger car	
10/14/2010	11:45 PM	Property damage only (none injured)	2	0	0	Angle	Wet	Dark - lighted roadway	Rain/Rain	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Not reported	

North Shore Rd at Wonderland

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
7/1/2008	6:00 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Not reported	
9/4/2008	4:45 PM	Non-fatal injury	5	1	0	Rear-end	Dry	Daylight	Clear	V1:Northbound / V2:Not reported / V3:Not reported / V4:Not reported / V5:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic / V4: Collision with motor vehicle in traffic / V5: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic / V3:Slowing or stopped in traffic / V4:Slowing or stopped in traffic / V5:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V3:Passenger car / V4:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V5:Light truck(van, mini-van, panel, pickup, sport	

9/23/2008	10:00 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
1/13/2009	11:30 PM	Non-fatal injury	1	1	0	Single vehicle crash	Wet	Dark - lighted roadway	Rain	V1:Southbound	V1: Collision with light pole or other post/support	V1: Travelling straight ahead	V1: Passenger car	
3/31/2009	11:30 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
7/27/2009	10:00 AM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Clear/Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
10/15/2009	7:25 AM	Non-fatal injury	2	2	0	Rear-end	Dry	Daylight	Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
3/13/2010	8:00 PM	Property damage only (none injured)	1	0	0	Not reported	Not reported	Not reported	Not Reported	V1:Southbound	V1: Not reported	V1: Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	P2:Pedestrian
8/5/2010	2:10 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear/Clear	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/19/2010	5:15 PM	Non-fatal injury	2	1	0	Head-on	Dry	Daylight	Clear	V1:Southbound / V2:Northbound	V1: Collision with median barrier / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Motorcycle / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

Route 1A at Curtis St

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
12/9/2008	10:30 PM	Non-fatal injury	2	1	0	Rear-end	Wet	Dark - lighted roadway	Rain	V1:Southbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

7/24/2009	3:10 PM	Not Reported	2	0	0	Rear-end	Wet	Daylight	Cloudy/Rain	V1:Eastbound / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Not reported	V1: Slowing or stopped in traffic / V2:Not reported	V1: Passenger car / V2:Not reported	

Squire St at Charger St

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
7/27/2008	9:30 PM	Non-fatal injury	2	2	0	Rear-end	Wet	Dark - lighted roadway	Cloudy	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
10/20/2008	10:00 PM	Non-fatal injury	2	1	0	Rear-end	Dry	Dark - lighted roadway	Not Reported	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
10/22/2008	1:48 PM	Non-fatal injury	2	1	0	Rear-end	Wet	Daylight	Rain	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Other	
11/17/2008	5:00 PM	Non-fatal injury	2	3	0	Angle	Dry	Dawn	Clear/Clear	V1:Northbound / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car	
3/3/2009	12:02 PM	Not Reported	2	0	0	Angle	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Turning right	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	
7/7/2009	1:55 PM	Non-fatal injury	3	2	0	Rear-end	Wet	Daylight	Rain	V1:Westbound / V2:Westbound / V3:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3:Travelling straight ahead	V1: Passenger car / V2:Passenger car / V3:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

10/30/2009	3:32 AM	Non-fatal injury	2	1	0	Single vehicle crash	Dry	Daylight	Clear	V1:Northbound / V2:Westbound	V1: Collision with cyclist (bicycle, tricycle, unicycle, pedal car) / V2: Not reported	V1: Turning right / V2:Not reported	V1: Not reported / V2:Not reported	
11/15/2009	10:41 PM	Property damage only (none injured)	2	0	0	Angle	Dry	Dark - lighted roadway	Clear/Clear	V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Truck/trailer	

Squire St at Sigourney St

Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type
4/10/2008	00:00 AM	Unknown	2	0	0	Not reported	Dry	Daylight	Clear	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
4/18/2008	4:15 PM	Unknown	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
8/26/2008	10:11 AM	Non-fatal injury	3	1	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound / V3:Eastbound	V1: Not reported / V2: Not reported / V3: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic / V3:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car / V3:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
9/7/2008	2:40 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Changing lanes	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Not reported	
11/7/2008	7:20 PM	Non-fatal injury	2	1	0	Angle	Wet	Daylight	Cloudy/Rain	V1:Eastbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Entering traffic lane	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	
2/7/2009	10:30 AM	Property damage only (none injured)	4	0	0	Rear-end	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound / V3:Not reported / V4:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic / V4: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead / V3:Travelling straight ahead / V4:Travelling straight ahead	V1: Unknown heavy truck, cannot classify / V2:Passenger car / V3:Passenger car / V4:Unknown heavy truck, cannot classify	
4/5/2009	6:00 PM	Not Reported	2	0	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Not reported / V2:Not reported	V1: Passenger car / V2:Passenger car	

6/26/2009	9:13 AM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Clear	V1:Westbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Motorcycle / V2:Passenger car	
7/31/2009	2:00 PM	Property damage only (none injured)	2	0	0	Angle	Wet	Daylight	Rain/Rain	V1:Northbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Turning right / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car	
8/22/2009	6:05 PM	Non-fatal injury	2	3	0	Rear-end	Dry	Daylight	Clear	V1:Westbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Not reported / V2:Not reported	
9/11/2009	9:00 PM	Non-fatal injury	1	1	0	Single vehicle crash	Wet	Dark - lighted roadway	Rain	V1:Not reported	V1: Not reported	V1: Travelling straight ahead	V1: Passenger car	
8/3/2010	3:48 PM	Non-fatal injury	5	5	0	Head-on	Dry	Daylight	Clear	V1:Eastbound / V2:Eastbound / V3:Eastbound / V4:Not reported / V5:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic / V4: Not reported / V5: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead / V3:Travelling straight ahead / V4:Not reported / V5:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V3:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V4:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V5:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	

Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

Trip Generation/ Trip Distribution Data

Full Build Program
Suffolk Downs Resort
Trip Generation

CAR TRIPS= 84%

Peak Hour Trips		Friday	Saturday	Friday Trip Rate/ Gaming Position	
VOR	In	917	949	0.306	52%
2.0	Out	847	794	0.282	48%
3,528	TOTAL TRIPS	1,764	1,743	0.59	100%
people					

SHUTTLE TRIPS= 5%

Peak Hour Trips		Friday	Saturday	Friday Trip Rate/ Gaming Position	
VOR	In	4	4	0.018	52%
30.0	Out	3	3	0.017	48%
210	TOTAL TRIPS	7	7	0.04	100%
people					

TRANSIT TRIPS= 11%

Peak Hour Trips		Friday	Saturday	Friday Trip Rate/ Gaming Position	
VOR	In	240	249	0.040	52%
1.0	Out	222	208	0.037	48%
462	TOTAL TRIPS	462	456	0.08	100%
people					

** Backup see CasinoTripGenMatrix ssheet

EMPLOYEE TRIPS= 63% Vehicular

Peak Hour Trips		Friday	Saturday
VOR	In	59	116
1.2	Out	39	50
	TOTAL TRIPS	98	165

EMPLOYEE TRIPS= 30% Transit

Peak Hour Trips		Friday	Saturday
VOR	In	34	66
1.0	Out	22	28
	TOTAL TRIPS	56	94

EMPLOYEE TRIPS= 7% Walk/Bike

Peak Hour Trips		Friday	Saturday
VOR	In	8	15
1.0	Out	5	7
	TOTAL TRIPS	13	22

Peak Hour Trips VEHICULAR		Friday	Saturday
	In	980	1,068
	Out	889	847
	TOTAL TRIPS	1,869	1,915
Rates/Position			
	Total Vehicular Rate	0.31	0.32
6,000	positions		
	Total Transit Rate	0.09	0.09
	Total Walk/Bike Rate	0.00	0.00
	TOTAL TRIP RATE OVERALL	**0.40**	**0.41**
	Employee	0.03	0.05
	Patron	0.70	0.69
	Overall Person Trip Rate	**0.73**	**0.74**

Total as of 4-23-13 via EMA	
Slots	4,072
Tables	1,062
Poker	432
Total positions	**5,566**

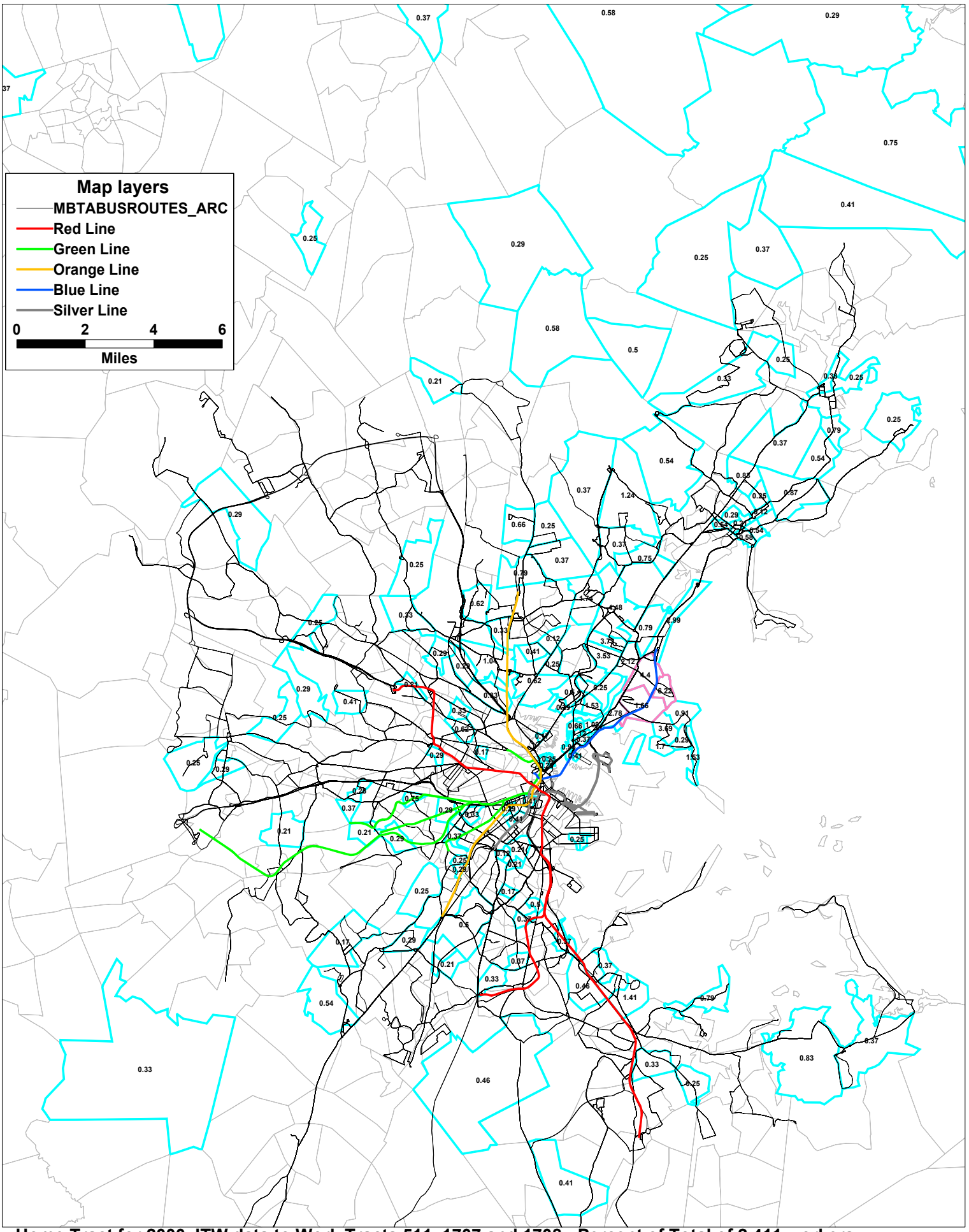
assumes BTD mode splits and assumptions for outside boston 10.62%

ZONE	Percentage of 90%	Transit Trips	Auto	Auto true percentage	Transit Scaled to 100%	Auto Scaled to 100%
Orange	15.70%	0.30%	15.40%	17.34%	2.86%	19.40%
Blue	28.17%	1.24%	26.93%	30.33%	11.67%	33.93%
Green	29.26%	7.56%	21.70%	24.44%	71.13%	27.34%
Brown	16.86%	1.52%	15.34%	17.27%	14.35%	19.32%
	90.00%	10.62%	79.37%	89.37%	100.00%	100.00%

	Revere CTPP 2000	Revere 06_08 ACS	Revere Tract 1707/1708	Boston CTPP 2000	Boston 06_08 ACS	Boston Tract 511
Drive Alone	5,765	7,385	955	236,125	244,665	1,080
Carpool 2 or 3	997	1,290	160	41,842	37,450	105
Carpool 4+	72	115	4	3,307	3,855	0
Transit	594	835	128	187,777	206,655	124
Bike	53	0	4	3,435	5,365	0
Walk	534	590	150	36,785	44,900	40
Other	84	460	4	4,494	6,710	4
Work at home	214	225	20	6,561	9,400	10
Total	8,313	10,900	1,425	520,326	559,000	1,363
Drive Alone	69.3%	67.8%	67.0%	45.4%	43.8%	79.2%
Carpool 2 or 3	12.0%	11.8%	11.2%	8.0%	6.7%	7.7%
Carpool 4+	0.9%	1.1%	0.3%	0.6%	0.7%	0.0%
Transit	7.1%	7.7%	9.0%	36.1%	37.0%	9.1%
Bike	0.6%	0.0%	0.3%	0.7%	1.0%	0.0%
Walk	6.4%	5.4%	10.5%	7.1%	8.0%	2.9%
Other	1.0%	4.2%	0.3%	0.9%	1.2%	0.3%
Work at home	2.6%	2.1%	1.4%	1.3%	1.7%	0.7%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

2000 JTW by Tract	1071	1072	1073	1074	1075	1076	1077	Total		Cleveland	
Total, Means of Trans	19,155	8,090	3,555	1,180	1,305	51,825	13,175	33,285		291,915	
Drove alone	13,260	5,790	2,970	950	1,155	34,255	9,150	24,125		219,605	
2-person carpool	1,825	820	330	150	90	4,720	1,255	3,215		25,275	
3-person carpool	215	160	35	10	0	450	180	420		3,375	
4-person carpool	20	20	4	4	0	145	60	48		910	
5-or-6-person carpool	35	10	10	0	0	35	4	55		340	
7-or-more-person car	20	10	0	0	0	55	20	30		250	
Bus or trolley bus	2,935	970	180	45	30	8,720	1,915	4,160		25,450	
Streetcar or trolley ca	150	35	0	0	0	500	80	185		950	
Subway or elevated	330	80	4	0	0	1,560	195	414		2,570	
Railroad	45	0	0	0	4	415	30	49		605	
Ferryboat	4	10	0	10	0	0	0	24		30	
Bicycle	20	4	0	0	10	35	10	34		550	
Walked	185	110	4	0	4	600	195	303		7,040	
Taxicab	0	50	4	0	0	25	0	54		275	
Motorcycle	4	0	0	4	0	0	0	8		130	
Other means	110	20	4	10	10	300	70	154		1,685	
Worked at home	0	0	0	0	0	10	4	0		2,880	
Total	19,158	8,089	3,545	1,183	1,303	51,825	13,168	33,278		291,920	

Tracts	1071	1072	1073	1074	1075	1076	1077	Total				1071, 1072, 1076, 1077	
Drive Alone	13,260	5,790	2,970	950	1,155	34,255	9,150	24,125	72.5%	219,605	75.2%	77,430	68.9%
Carpool 2 or 3	2,040	980	365	160	90	5,170	1,435	3,635	10.9%	28,650	9.8%	11,825	10.5%
Carpool 4+	75	40	14	4	0	235	84	133	0.4%	1,500	0.5%	483	0.4%
Transit	3,464	1,095	184	55	34	11,195	2,220	4,832	14.5%	29,605	10.1%	20,586	18.3%
Bike	20	4	0	0	10	35	10	34	0.1%	550	0.2%	93	0.1%
Walk	185	110	4	0	4	600	195	303	0.9%	7,040	2.4%	1,198	1.1%
Other	114	70	8	14	10	325	70	216	0.6%	2,090	0.7%	725	0.6%
Work at home	0	0	0	0	0	10	4	0	0.0%	2,880	1.0%	10	0.0%
Total	19,158	8,089	3,545	1,183	1,303	51,825	13,168	33,278	100.0%	291,920	100.0%	112,350	100.0%
	0.180812	0.135369	0.051904	0.046492	0.026094	0.216015	0.168591	0.145201					



Home Tract for 2000 JTW data to Work Tracts 511, 1707 and 1708 - Percent of Total of 2,411 workers
MBTA RapidTransit and Bus Routes

Casino Trip Generation Comparison Summary
Suffolk Downs :: Boston/Revere, MA
Vehicular Trip Rates

Location	Gaming Positions		Direction	Friday Peak Hour Total Overall Trips	Friday Peak Hour Total Overall Trip Rate	Saturday Peak Hour Total Overall Trips	Saturday Peak Hour Total Overall Trip Rate
Proposed Caesars Resort at Suffolk Downs*	*Slots*	*5,000*	**In**	1,261	0.21	1,399	0.23
	Tables	*1,000*	**Out**	1,138	0.19	1,089	0.18
	Total Positions	***6,000***	**Total**	2,399	0.40	2,488	0.41
Parx Philadelphia Casino & Race Track*	*Slots*	*3,535*	**In**	922	0.19	932	0.19
	Tables	*1,248*	**Out**	859	0.18	1,243	0.26
	Total Positions	***4,783***	**Total**	1,781	0.37	2,175	0.45
Horseshoe Hammond Casino	*Slots*	*3,015*	**In**	384	0.09	416	0.10
	Tables	*1,035*	**Out**	435	0.11	594	0.15
	Total Positions	***4,050***	**Total**	819	0.20	1,010	0.25
Chester Harrah's Casino & Race Track*	*Slots*	*2,832*	**In**	845	0.23	642	0.17
	Tables	*849*	**Out**	717	0.19	492	0.13
	Total Positions	***3,681***	**Total**	1,562	0.42	1,134	0.31
Sugarhouse Casino	*Slots*	***1,609***	**In**	230	0.11	258	0.12
	Tables	***495***	**Out**	263	0.13	258	0.12
	Total Positions	***2,104***	**Total**	493	0.23	516	0.25
Twin River Casino	*Slots*	*4,700*	**In**	1,020	0.22	826	0.18
	Tables	*0*	**Out**	623	0.13	917	0.20
	Total Positions	***4,700***	**Total**	1,643	0.35	1,743	0.37
Casino at Ocean Downs*	*Slots*	*800*	**In**	105	0.13	165	0.21
	Tables	*0*	**Out**	120	0.15	86	0.11
	Total Positions	***800***	**Total**	225	0.28	251	0.31
Newport Grand Slots	*Slots*	*1,100*	**In**	146	0.13	248	0.23
	Tables	*0*	**Out**	112	0.10	80	0.07
	Total Positions	***1,100***	**Total**	258	0.23	328	0.30

* Counts at Harrah's, Parx and Ocean Downs include racing vehicular traffic. The Suffolk Downs rate does not a racing traffic but leaves the existing racing traffic within the network

Notes: Suffolk Downs trip rates include 50% of employees driving to site - the rate is doesn't consider the off-site parking
Suffolk Downs transit accounts for 35% of employees with this rate and 10% of patrons, both of which are not viable options at the other locations.

\- Assumes a negligible amount of alternative modes of transportation at these locations - does not account for local bus ser

Sources: Parx Counts performed March 2013
Horseshoe Hammond Counts performed April 2013
Chester Counts performed April 2013

Sugarhouse Counts performed November 2010

Counter: 000000016867
Job Code: 4709.900
Location: Horseshoe Casino
Direction: ROAD TOTAL

File: D0415010.prn
City: Hammond
Road: Casino Dr. SB

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	268	17	2	1	0	0	0	0	0	0	0	0	0	7	295
02:00	0	252	16	1	2	0	0	0	0	0	0	0	0	0	2	273
03:00	0	209	21	0	0	0	1	0	0	0	0	0	0	0	3	234
04:00	0	205	9	1	0	0	0	1	0	0	0	0	0	0	1	217
05:00	0	152	11	0	0	0	0	0	0	0	0	0	0	0	1	164
06:00	0	139	7	1	1	0	0	1	0	0	0	0	0	0	0	149
07:00	0	158	10	0	1	0	0	0	0	0	0	0	0	0	0	169
08:00	0	105	7	1	0	1	0	1	1	0	0	0	0	0	0	116
09:00	0	66	15	0	2	0	0	0	1	0	0	0	0	0	0	84
10:00	0	94	13	1	6	1	0	0	1	0	0	0	0	0	1	117
11:00	0	123	17	1	2	0	0	1	0	0	0	0	0	0	1	145
12:00	0	148	15	1	4	0	0	1	0	0	0	0	0	0	3	172
13:00	0	223	27	2	3	1	0	0	0	0	0	0	0	0	1	257
14:00	0	257	30	3	9	1	0	2	0	0	2	0	0	0	6	310
15:00	0	379	38	1	1	0	0	1	1	0	0	0	1	0	8	430
16:00	0	375	35	2	8	0	0	0	0	0	0	0	0	0	8	428
17:00	0	342	30	1	4	1	0	0	0	0	0	0	0	0	6	384
18:00	0	335	27	3	8	0	0	0	0	0	0	0	0	0	4	377
19:00	0	348	36	2	2	0	0	2	0	0	0	0	0	0	8	398
20:00	0	353	25	3	7	0	0	0	0	0	0	0	0	0	3	391
21:00	0	370	37	3	2	0	0	0	0	0	2	0	1	0	15	430
22:00	0	421	28	2	6	0	0	3	0	0	2	0	0	0	12	474
23:00	0	457	40	2	0	0	0	0	0	0	1	0	0	0	15	515
24:00	0	499	32	5	10	0	0	0	0	0	3	0	1	0	20	570
DAY TOTAL	0	6278	543	38	79	5	1	13	4	0	10	0	3	0	125	7099
PERCENTS	0.0%	88.5%	7.7%	0.6%	1.2%	0.1%	0.0%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	1.7%	100%

Passenger Vehicles 96.0% Trucks & Buses 3.9%

AM Times	01:00	03:00	01:00	10:00	08:00	03:00	04:00	08:00						01:00	01:00
AM Peaks	268	21	2	6	1	1	1	1						7	295
PM Times	24:00	23:00	24:00	24:00	13:00		22:00	15:00		24:00		15:00		24:00	24:00
PM Peaks	499	40	5	10	1		3	1		3		1		20	570

Counter: 000000016867
Job Code: 4709.900
Location: Horseshoe Casino
Direction: ROAD TOTAL

File: D0415010.prn
City: Hammond
Road: Casino Dr. SB

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	481	39	2	1	0	0	1	0	0	1	0	0	0	8	533
02:00	0	390	33	2	1	0	0	1	0	0	1	0	1	0	21	450
03:00	1	394	30	0	0	0	0	0	0	0	0	0	0	0	11	436
04:00	0	328	18	2	0	0	0	0	0	0	1	0	0	0	14	363
05:00	0	281	19	0	0	0	0	0	0	0	0	0	0	0	6	306
06:00	0	196	16	1	0	1	0	0	0	0	0	0	0	0	0	214
07:00	0	177	15	0	1	0	0	0	0	0	0	0	0	0	3	196
08:00	0	125	7	1	1	1	0	1	0	0	0	0	0	0	1	137
09:00	0	111	9	1	1	1	0	1	0	0	0	0	0	0	1	125
10:00	0	87	10	2	5	0	0	0	1	0	0	0	0	0	0	105
11:00	0	128	7	1	4	0	0	0	0	0	0	0	0	0	1	141
12:00	0	145	14	1	3	0	0	0	0	0	0	0	0	0	2	165
13:00	0	220	18	1	2	0	0	0	0	0	0	0	0	0	3	244
14:00	1	305	25	2	4	1	0	2	0	0	0	0	0	0	6	346
15:00	0	363	22	4	1	0	0	0	0	0	0	0	0	0	9	399
16:00	1	370	23	4	9	0	0	1	1	0	0	0	0	0	7	416
17:00	0	427	31	3	6	0	0	0	0	0	2	0	0	0	10	479
18:00	0	449	32	0	9	2	0	2	0	0	0	0	0	0	10	504
19:00	0	429	24	1	5	1	0	0	0	0	0	0	0	0	12	472
20:00	1	442	23	5	8	0	0	2	1	0	2	0	2	0	19	505
21:00	0	458	40	4	3	0	0	1	1	0	0	0	2	0	14	523
22:00	0	495	26	3	5	1	0	3	1	0	1	0	0	0	13	548
23:00	0	559	41	5	1	1	0	1	0	0	3	0	0	0	20	631
24:00	0	697	61	5	9	0	0	3	0	0	4	0	0	0	23	802
DAY TOTAL	4	8057	583	50	79	9	0	19	5	0	15	0	5	0	214	9040
PERCENTS	0.1%	89.2%	6.5%	0.6%	0.9%	0.1%	0.0%	0.2%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	2.3%	100%
Passenger Vehicles		95.6%							Trucks & Buses		4.3%					
AM Times	03:00	01:00	01:00	01:00	10:00	06:00		01:00	10:00		01:00		02:00		02:00	01:00
AM Peaks	1	481	39	2	5	1		1	1		1		1		21	533
PM Times	14:00	24:00	24:00	20:00	16:00	18:00		22:00	16:00		24:00		20:00		24:00	24:00
PM Peaks	1	697	61	5	9	2		3	1		4		2		23	802

Counter: 000000016867
Job Code: 4709.900
Location: Horseshoe Casino
Direction: ROAD TOTAL

File: D0415009.prn
City: Hammond
Road: Casino Dr. SB

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	268	17	2	1	0	0	0	0	0	0	0	0	0	7	295
02:00	0	252	16	1	2	0	0	0	0	0	0	0	0	0	2	273
03:00	0	209	21	0	0	0	1	0	0	0	0	0	0	0	3	234
04:00	0	205	9	1	0	0	0	1	0	0	0	0	0	0	1	217
05:00	0	152	11	0	0	0	0	0	0	0	0	0	0	0	1	164
06:00	0	139	7	1	1	0	0	1	0	0	0	0	0	0	0	149
07:00	0	158	10	0	1	0	0	0	0	0	0	0	0	0	0	169
08:00	0	105	7	1	0	1	0	1	1	0	0	0	0	0	0	116
09:00	0	66	15	0	2	0	0	0	1	0	0	0	0	0	0	84
10:00	0	94	13	1	6	1	0	0	1	0	0	0	0	0	1	117
11:00	0	123	17	1	2	0	0	1	0	0	0	0	0	0	1	145
12:00	0	148	15	1	4	0	0	1	0	0	0	0	0	0	3	172
13:00	0	223	27	2	3	1	0	0	0	0	0	0	0	0	1	257
14:00	0	257	30	3	9	1	0	2	0	0	2	0	0	0	6	310
15:00	0	379	38	1	1	0	0	1	1	0	0	0	1	0	8	430
16:00	0	375	35	2	8	0	0	0	0	0	0	0	0	0	8	428
17:00	0	342	30	1	4	1	0	0	0	0	0	0	0	0	6	384
18:00	0	335	27	3	8	0	0	0	0	0	0	0	0	0	4	377
19:00	0	348	36	2	2	0	0	2	0	0	0	0	0	0	8	398
20:00	0	353	25	3	7	0	0	0	0	0	0	0	0	0	3	391
21:00	0	370	37	3	2	0	0	0	0	0	2	0	1	0	15	430
22:00	0	421	28	2	6	0	0	3	0	0	2	0	0	0	12	474
23:00	0	457	40	2	0	0	0	0	0	0	1	0	0	0	15	515
24:00	0	499	32	5	10	0	0	0	0	0	3	0	1	0	20	570
DAY TOTAL	0	6278	543	38	79	5	1	13	4	0	10	0	3	0	125	7099
PERCENTS	0.0%	88.5%	7.7%	0.6%	1.2%	0.1%	0.0%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	1.7%	100%

Passenger Vehicles 96.0% Trucks & Buses 3.9%

AM Times	01:00	03:00	01:00	10:00	08:00	03:00	04:00	08:00						01:00	01:00
AM Peaks	268	21	2	6	1	1	1	1						7	295
PM Times	24:00	23:00	24:00	24:00	13:00		22:00	15:00		24:00		15:00		24:00	24:00
PM Peaks	499	40	5	10	1		3	1		3		1		20	570

Counter: 000000016867
Job Code: 4709.900
Location: Horseshoe Casino
Direction: ROAD TOTAL

File: D0415009.prn
City: Hammond
Road: Casino Dr. SB

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	481	39	2	1	0	0	1	0	0	1	0	0	0	8	533
02:00	0	390	33	2	1	0	0	1	0	0	1	0	1	0	21	450
03:00	1	394	30	0	0	0	0	0	0	0	0	0	0	0	11	436
04:00	0	328	18	2	0	0	0	0	0	0	1	0	0	0	14	363
05:00	0	281	19	0	0	0	0	0	0	0	0	0	0	0	6	306
06:00	0	196	16	1	0	1	0	0	0	0	0	0	0	0	0	214
07:00	0	177	15	0	1	0	0	0	0	0	0	0	0	0	3	196
08:00	0	125	7	1	1	1	0	1	0	0	0	0	0	0	1	137
09:00	0	111	9	1	1	1	0	1	0	0	0	0	0	0	1	125
10:00	0	87	10	2	5	0	0	0	1	0	0	0	0	0	0	105
11:00	0	128	7	1	4	0	0	0	0	0	0	0	0	0	1	141
12:00	0	145	14	1	3	0	0	0	0	0	0	0	0	0	2	165
13:00	0	220	18	1	2	0	0	0	0	0	0	0	0	0	3	244
14:00	1	305	25	2	4	1	0	2	0	0	0	0	0	0	6	346
15:00	0	363	22	4	1	0	0	0	0	0	0	0	0	0	9	399
16:00	1	370	23	4	9	0	0	1	1	0	0	0	0	0	7	416
17:00	0	427	31	3	6	0	0	0	0	0	2	0	0	0	10	479
18:00	0	449	32	0	9	2	0	2	0	0	0	0	0	0	10	504
19:00	0	429	24	1	5	1	0	0	0	0	0	0	0	0	12	472
20:00	1	442	23	5	8	0	0	2	1	0	2	0	2	0	19	505
21:00	0	458	40	4	3	0	0	1	1	0	0	0	2	0	14	523
22:00	0	495	26	3	5	1	0	3	1	0	1	0	0	0	13	548
23:00	0	559	41	5	1	1	0	1	0	0	3	0	0	0	20	631
24:00	0	697	61	5	9	0	0	3	0	0	4	0	0	0	23	802
DAY TOTAL	4	8057	583	50	79	9	0	19	5	0	15	0	5	0	214	9040
PERCENTS	0.1%	89.2%	6.5%	0.6%	0.9%	0.1%	0.0%	0.2%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	2.3%	100%
Passenger Vehicles		95.6%							Trucks & Buses		4.3%					
AM Times	03:00	01:00	01:00	01:00	10:00	06:00		01:00	10:00		01:00		02:00		02:00	01:00
AM Peaks	1	481	39	2	5	1		1	1		1		1		21	533
PM Times	14:00	24:00	24:00	20:00	16:00	18:00		22:00	16:00		24:00		20:00		24:00	24:00
PM Peaks	1	697	61	5	9	2		3	1		4		2		23	802

Counter: 000000016088
Job Code: 4709.900
Location: Horseshoe Casino
Direction: ROAD TOTAL

File: D0415014.prn
City: Hammond
Road: Casino Dr. NB2

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	143	8	1	1	0	0	0	0	0	0	0	0	0	0	153
02:00	0	76	5	1	0	1	2	0	0	0	0	0	0	0	0	85
03:00	0	71	4	0	1	0	0	0	0	0	0	0	0	0	0	76
04:00	0	55	5	1	0	0	1	0	0	0	0	0	0	0	0	62
05:00	0	50	7	0	0	0	0	0	0	0	0	0	0	0	0	57
06:00	0	91	11	1	1	0	0	0	1	0	0	0	0	0	0	105
07:00	0	83	19	0	0	0	1	2	1	0	0	0	0	0	0	106
08:00	0	92	13	1	1	0	0	0	1	0	0	0	0	0	0	108
09:00	0	168	17	1	2	1	1	0	0	0	0	0	1	0	0	191
10:00	1	268	20	1	4	1	0	0	1	0	1	0	0	0	0	297
11:00	0	281	20	2	2	0	0	2	1	1	0	0	1	0	0	310
12:00	0	351	38	1	7	2	3	2	2	1	0	0	1	0	0	408
13:00	0	383	30	1	4	3	1	4	2	1	2	1	3	0	0	435
14:00	0	405	35	3	4	3	0	2	5	0	2	3	1	0	0	463
15:00	0	391	29	2	1	2	3	2	2	0	2	2	1	0	0	437
16:00	1	399	26	1	3	1	2	0	2	0	0	0	0	0	0	435
17:00	0	388	26	1	3	3	5	3	2	0	3	1	0	0	0	435
18:00	0	455	40	3	4	9	7	4	3	2	5	1	3	0	0	536
19:00	2	486	23	1	3	4	4	0	3	0	2	1	7	0	0	536
20:00	1	481	37	3	9	3	6	3	9	1	1	2	5	0	0	561
21:00	0	521	47	3	1	7	5	1	4	1	3	3	3	0	0	599
22:00	0	506	42	1	0	4	3	1	1	0	1	3	3	0	0	565
23:00	1	375	22	2	3	3	2	3	2	0	1	0	1	0	0	415
24:00	0	363	28	3	2	1	1	0	6	0	2	2	1	0	0	409
DAY TOTAL	6	6882	552	34	56	48	47	29	48	7	25	19	31	0	0	7784
PERCENTS	0.1%	88.5%	7.1%	0.5%	0.8%	0.7%	0.6%	0.3%	0.6%	0.0%	0.3%	0.2%	0.3%	0.0%	0.0%	100%
Passenger Vehicles		95.5%							Trucks & Buses		4.4%					
AM Times	10:00	12:00	12:00	11:00	12:00	12:00	12:00	07:00	12:00	11:00	10:00		09:00			12:00
AM Peaks	1	351	38	2	7	2	3	2	2	1	1		1			408
PM Times	19:00	21:00	21:00	14:00	20:00	18:00	18:00	13:00	20:00	18:00	18:00	14:00	19:00			21:00
PM Peaks	2	521	47	3	9	9	7	4	9	2	5	3	7			599

Counter: 000000016088
Job Code: 4709.900
Location: Horseshoe Casino
Direction: ROAD TOTAL

File: D0415014.prn
City: Hammond
Road: Casino Dr. NB2

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	217	17	1	0	0	1	1	2	0	0	0	0	0	0	239
02:00	2	167	10	1	1	1	0	0	0	0	0	0	0	0	1	183
03:00	0	126	6	0	0	1	0	0	1	0	0	0	0	0	0	134
04:00	0	75	6	1	0	0	0	0	0	0	1	1	0	0	0	84
05:00	0	72	2	0	0	0	0	0	0	0	0	0	0	0	0	74
06:00	1	73	3	0	0	2	1	0	0	0	0	0	0	0	0	80
07:00	0	93	5	1	1	1	0	0	1	0	0	0	0	0	0	102
08:00	0	115	8	0	2	0	0	1	0	0	0	0	0	0	0	126
09:00	0	165	10	1	0	2	1	1	0	0	0	0	0	0	0	180
10:00	0	213	8	3	4	1	0	0	0	0	0	0	0	0	0	229
11:00	0	306	21	1	5	1	0	1	0	0	0	0	0	0	0	335
12:00	0	378	36	5	3	0	1	0	1	0	0	0	0	0	0	424
13:00	1	511	25	1	2	3	1	1	0	0	0	0	1	0	0	546
14:00	0	503	42	2	3	5	0	2	4	0	1	1	1	0	0	564
15:00	1	507	26	2	2	4	0	1	0	1	1	2	1	0	0	548
16:00	1	540	32	3	4	1	3	2	1	1	2	2	2	0	0	594
17:00	0	570	41	1	6	3	3	1	1	0	1	4	1	0	0	632
18:00	1	553	45	4	5	3	3	7	1	1	1	3	4	0	0	631
19:00	4	562	49	2	2	5	8	3	4	0	1	9	5	0	0	654
20:00	4	601	58	4	2	10	13	8	11	6	3	6	13	0	1	740
21:00	2	506	36	0	5	4	8	3	5	6	5	1	7	0	0	588
22:00	0	437	33	3	1	2	11	1	3	1	5	2	4	0	0	503
23:00	2	335	20	2	4	0	10	2	5	0	0	0	2	0	0	382
24:00	0	322	25	2	3	3	8	4	5	0	3	0	3	0	0	378
DAY TOTAL	19	7947	564	40	55	52	72	39	45	16	24	31	44	0	2	8950
PERCENTS	0.3%	88.8%	6.4%	0.5%	0.7%	0.6%	0.8%	0.4%	0.5%	0.1%	0.2%	0.3%	0.4%	0.0%	0.0%	100%
Passenger Vehicles		95.3%							Trucks & Buses		4.6%					
AM Times	02:00	12:00	12:00	12:00	11:00	06:00	01:00	01:00	01:00		04:00	04:00			02:00	12:00
AM Peaks	2	378	36	5	5	2	1	1	2		1	1			1	424
PM Times	19:00	20:00	20:00	18:00	17:00	20:00	20:00	20:00	20:00	20:00	21:00	19:00	20:00		20:00	20:00
PM Peaks	4	601	58	4	6	10	13	8	11	6	5	9	13		1	740

Counter: 000000016088
Job Code: 4709.900
Location: Horseshoe Casino
Direction: ROAD TOTAL

File: D0415013.prn
City: Hammond
Road: Casino Dr. NB

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	143	8	1	1	0	0	0	0	0	0	0	0	0	0	153
02:00	0	76	5	1	0	1	2	0	0	0	0	0	0	0	0	85
03:00	0	71	4	0	1	0	0	0	0	0	0	0	0	0	0	76
04:00	0	55	5	1	0	0	1	0	0	0	0	0	0	0	0	62
05:00	0	50	7	0	0	0	0	0	0	0	0	0	0	0	0	57
06:00	0	91	11	1	1	0	0	0	1	0	0	0	0	0	0	105
07:00	0	83	19	0	0	0	1	2	1	0	0	0	0	0	0	106
08:00	0	92	13	1	1	0	0	0	1	0	0	0	0	0	0	108
09:00	0	168	17	1	2	1	1	0	0	0	0	0	1	0	0	191
10:00	1	268	20	1	4	1	0	0	1	0	1	0	0	0	0	297
11:00	0	281	20	2	2	0	0	2	1	1	0	0	1	0	0	310
12:00	0	351	38	1	7	2	3	2	2	1	0	0	1	0	0	408
13:00	0	383	30	1	4	3	1	4	2	1	2	1	3	0	0	435
14:00	0	405	35	3	4	3	0	2	5	0	2	3	1	0	0	463
15:00	0	391	29	2	1	2	3	2	2	0	2	2	1	0	0	437
16:00	1	399	26	1	3	1	2	0	2	0	0	0	0	0	0	435
17:00	0	388	26	1	3	3	5	3	2	0	3	1	0	0	0	435
18:00	0	455	40	3	4	9	7	4	3	2	5	1	3	0	0	536
19:00	2	486	23	1	3	4	4	0	3	0	2	1	7	0	0	536
20:00	1	481	37	3	9	3	6	3	9	1	1	2	5	0	0	561
21:00	0	521	47	3	1	7	5	1	4	1	3	3	3	0	0	599
22:00	0	506	42	1	0	4	3	1	1	0	1	3	3	0	0	565
23:00	1	375	22	2	3	3	2	3	2	0	1	0	1	0	0	415
24:00	0	363	28	3	2	1	1	0	6	0	2	2	1	0	0	409
DAY TOTAL	6	6882	552	34	56	48	47	29	48	7	25	19	31	0	0	7784
PERCENTS	0.1%	88.5%	7.1%	0.5%	0.8%	0.7%	0.6%	0.3%	0.6%	0.0%	0.3%	0.2%	0.3%	0.0%	0.0%	100%
Passenger Vehicles		95.5%							Trucks & Buses		4.4%					
AM Times	10:00	12:00	12:00	11:00	12:00	12:00	12:00	07:00	12:00	11:00	10:00		09:00			12:00
AM Peaks	1	351	38	2	7	2	3	2	2	1	1		1			408
PM Times	19:00	21:00	21:00	14:00	20:00	18:00	18:00	13:00	20:00	18:00	18:00	14:00	19:00			21:00
PM Peaks	2	521	47	3	9	9	7	4	9	2	5	3	7			599

Counter: 000000016088
Job Code: 4709.900
Location: Horseshoe Casino
Direction: ROAD TOTAL

File: D0415013.prn
City: Hammond
Road: Casino Dr. NB

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	217	17	1	0	0	1	1	2	0	0	0	0	0	0	239
02:00	2	167	10	1	1	1	0	0	0	0	0	0	0	0	1	183
03:00	0	126	6	0	0	1	0	0	1	0	0	0	0	0	0	134
04:00	0	75	6	1	0	0	0	0	0	0	1	1	0	0	0	84
05:00	0	72	2	0	0	0	0	0	0	0	0	0	0	0	0	74
06:00	1	73	3	0	0	2	1	0	0	0	0	0	0	0	0	80
07:00	0	93	5	1	1	1	0	0	1	0	0	0	0	0	0	102
08:00	0	115	8	0	2	0	0	1	0	0	0	0	0	0	0	126
09:00	0	165	10	1	0	2	1	1	0	0	0	0	0	0	0	180
10:00	0	213	8	3	4	1	0	0	0	0	0	0	0	0	0	229
11:00	0	306	21	1	5	1	0	1	0	0	0	0	0	0	0	335
12:00	0	378	36	5	3	0	1	0	1	0	0	0	0	0	0	424
13:00	1	511	25	1	2	3	1	1	0	0	0	0	1	0	0	546
14:00	0	503	42	2	3	5	0	2	4	0	1	1	1	0	0	564
15:00	1	507	26	2	2	4	0	1	0	1	1	2	1	0	0	548
16:00	1	540	32	3	4	1	3	2	1	1	2	2	2	0	0	594
17:00	0	570	41	1	6	3	3	1	1	0	1	4	1	0	0	632
18:00	1	553	45	4	5	3	3	7	1	1	1	3	4	0	0	631
19:00	4	562	49	2	2	5	8	3	4	0	1	9	5	0	0	654
20:00	4	601	58	4	2	10	13	8	11	6	3	6	13	0	1	740
21:00	2	506	36	0	5	4	8	3	5	6	5	1	7	0	0	588
22:00	0	437	33	3	1	2	11	1	3	1	5	2	4	0	0	503
23:00	2	335	20	2	4	0	10	2	5	0	0	0	2	0	0	382
24:00	0	322	25	2	3	3	8	4	5	0	3	0	3	0	0	378
DAY TOTAL	19	7947	564	40	55	52	72	39	45	16	24	31	44	0	2	8950
PERCENTS	0.3%	88.8%	6.4%	0.5%	0.7%	0.6%	0.8%	0.4%	0.5%	0.1%	0.2%	0.3%	0.4%	0.0%	0.0%	100%
Passenger Vehicles		95.3%							Trucks & Buses		4.6%					
AM Times	02:00	12:00	12:00	12:00	11:00	06:00	01:00	01:00	01:00		04:00	04:00			02:00	12:00
AM Peaks	2	378	36	5	5	2	1	1	2		1	1			1	424
PM Times	19:00	20:00	20:00	18:00	17:00	20:00	20:00	20:00	20:00	20:00	21:00	19:00	20:00		20:00	20:00
PM Peaks	4	601	58	4	6	10	13	8	11	6	5	9	13		1	740

Tri-State Traffic Data, Inc

www.TSTData.com

Street: Parking Garage
Location: Entrance Part 1
Weather: Clear
Counter: MIO

Site Code:
Station ID:
Station ID:

Latitude: 0' 0.0000 Undefined

Start Time	Sun A.M.	Sun P.M.	Mon A.M.	Mon P.M.	Tue A.M.	Tue P.M.	Daily Average A.M.	Daily Average P.M.
12:00	*	*	33	88	33	87	33	**88**
12:15	*	*	26	71	30	**84**	28	**78**
12:30	*	*	16	78	18	**81**	17	**80**
12:45	*	*	20	83	36	**97**	28	**90**
01:00	*	*	24	76	16	**92**	20	84
01:15	*	*	17	66	23	65	20	66
01:30	*	*	13	68	15	82	14	75
01:45	*	*	9	70	12	83	10	76
02:00	*	*	13	66	9	78	11	72
02:15	*	*	13	75	5	81	9	78
02:30	*	*	10	69	8	79	9	74
02:45	*	*	8	100	7	79	8	90
03:00	*	*	9	72	8	95	8	84
03:15	*	*	8	63	10	76	9	70
03:30	*	*	8	69	9	76	8	72
03:45	*	*	6	77	6	79	6	78
04:00	*	*	6	78	3	76	4	77
04:15	*	*	4	73	5	91	4	82
04:30	*	*	6	83	6	82	6	82
04:45	*	*	2	75	3	63	2	69
05:00	*	*	4	52	7	65	6	58
05:15	*	*	1	74	5	65	3	70
05:30	*	*	8	65	8	84	8	74
05:45	*	*	10	72	8	75	9	74
06:00	*	*	11	86	7	60	9	73
06:15	*	*	10	64	15	73	12	68
06:30	*	*	15	96	12	92	14	94
06:45	*	*	12	68	7	73	10	70
07:00	*	*	14	**81**	16	61	15	71
07:15	*	*	13	**80**	14	82	14	81
07:30	*	*	12	**98**	16	91	14	94
07:45	*	*	17	**81**	16	94	16	88
08:00	*	*	19	71	19	56	19	64
08:15	*	89	22	63	26	66	24	73
08:30	*	85	33	62	53	62	43	70
08:45	*	89	31	53	67	58	49	67
09:00	*	67	29	48	66	45	48	53
09:15	*	85	42	49	71	45	56	60
09:30	*	76	46	55	62	51	54	61
09:45	*	98	46	46	61	60	54	68
10:00	*	67	56	38	76	46	66	50
10:15	*	87	62	38	37	40	50	55
10:30	*	57	64	48	62	44	63	50
10:45	*	67	**75**	54	68	49	**72**	57
11:00	*	**67**	**70**	39	**76**	50	**73**	52
11:15	*	**94**	**75**	41	**69**	41	**72**	59
11:30	*	**102**	**69**	49	**80**	35	**74**	62
11:45	*	**87**	67	40	**71**	34	69	54
Total	0	1217	1184	3211	1357	3323	1270	3435
Combined Total	1217		4395		4680		4705	
Peak	-	11:00	- 10:45	07:00	- 11:00	00:15	- 10:45	12:00
Vol.	-	350	- 289	340	- 296	354	- 291	336
P.H.F.		0.858	0.963	0.867	0.925	0.912	0.983	0.933

Tri-State Traffic Data, Inc

www.TSTData.com

Street: Parking Garage
Location: Entrance Part 1
Weather: Clear
Counter: MIO

Site Code:
Station ID:
Station ID:

Latitude: 0' 0.0000 Undefined

Start Time	Wed A.M.	10-Apr-1 P.M.		Thu A.M.	11-Apr-1 P.M.		Fri A.M.	12-Apr-1 P.M.		Daily Average A.M.	Daily Average P.M.
12:00	24	99		29	77		*	*		26	88
12:15	20	89		24	105		*	*		22	97
12:30	20	80		19	97		*	*		20	88
12:45	33	87		22	137		*	*		28	**112**
01:00	9	87		19	134		*	*		14	**110**
01:15	23	84		14	121		*	*		18	**102**
01:30	11	89		9	99		*	*		10	**94**
01:45	8	80		12	118		*	*		10	99
02:00	14	90		18	**131**		*	*		16	110
02:15	11	75		13	**138**		*	*		12	106
02:30	11	79		8	**102**		*	*		10	90
02:45	7	83		11	**126**		*	*		9	104
03:00	7	70		10	116		*	*		8	93
03:15	9	76		7	91		*	*		8	84
03:30	8	63		13	104		*	*		10	84
03:45	8	63		9	98		*	*		8	80
04:00	5	66		2	110		*	*		4	88
04:15	4	88		8	105		*	*		6	96
04:30	2	78		7	108		*	*		4	93
04:45	3	68		6	90		*	*		4	79
05:00	2	68		5	82		*	*		4	75
05:15	3	66		5	81		*	*		4	74
05:30	7	70		5	95		*	*		6	82
05:45	10	88		10	105		*	*		10	96
06:00	12	89		9	94		*	*		10	92
06:15	12	88		10	111		*	*		11	100
06:30	6	**88**		12	121		*	*		9	104
06:45	7	**83**		13	117		*	*		10	100
07:00	4	**105**		4	104		*	*		4	104
07:15	7	**95**		13	97		*	*		10	96
07:30	14	75		16	117		*	*		15	96
07:45	11	86		21	111		*	*		16	98
08:00	14	69		17	90		*	*		16	80
08:15	20	71		19	*		*	*		20	71
08:30	29	60		30	*		*	*		30	60
08:45	24	55		34	*		*	*		29	55
09:00	30	44		47	*		*	*		38	44
09:15	36	52		50	*		*	*		43	52
09:30	44	71		55	*		*	*		50	71
09:45	47	64		56	*		*	*		52	64
10:00	67	42		66	*		*	*		66	42
10:15	48	45		67	*		*	*		58	45
10:30	53	45		80	*		*	*		66	45
10:45	70	45		61	*		*	*		66	45
11:00	**52**	46		**81**	*		*	*		**66**	46
11:15	**77**	43		**90**	*		*	*		**84**	43
11:30	**82**	29		**76**	*		*	*		**79**	29
11:45	**89**	37		**97**	*		*	*		**93**	37
Total	1114	3413		1309	3532		0	0		1212	3843
Combined Total	4527			4841			0			5055	
Peak	11:00	06:30	-	11:00	02:00	-	-	-	-	11:00	00:45
Vol.	300	371	-	344	497	-	-	-	-	322	418
P.H.F.	0.843	0.883		0.887	0.900					0.866	0.933
ADT		ADT 4,914		AADT 4,914							

Tri-State Traffic Data, Inc

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Road: Paddock Entrance and Exit
Location: 50 ft S of Harrah's Blvd
Counter: 21486
Weather: Clear

Site Code: 0407136
Station ID:
Station ID:
A is NB Exit (Some Entrances as well)
B is SB Entrance
Latitude: 39' 84919.0000 North

Start Time	07-Apr-13 Sun	EXIT A.M.	EXIT P.M.	ENTER A.M.	ENTER P.M.	Combined A.M.	Combined P.M.	08-Apr- Mon	EXIT A.M.	EXIT P.M.	ENTER A.M.	ENTER P.M.	Combined A.M.	Combined P.M.
12:00		*	*	*	*	*	*		1	1	0	***0***	1	1
12:15		*	*	*	*	*	*		0	2	0	***0***	0	2
12:30		*	*	*	*	*	*		0	1	0	***0***	0	1
12:45		*	*	*	*	*	*		0	***3***	0	***2***	0	***5***
01:00		*	*	*	*	*	*		0	***8***	0	0	0	***8***
01:15		*	*	*	*	*	*		4	***4***	0	0	4	***4***
01:30		*	*	*	*	*	*		0	***3***	0	0	0	***3***
01:45		*	*	*	*	*	*		0	0	0	0	0	0
02:00		*	*	*	*	*	*		0	0	0	0	0	0
02:15		*	*	*	*	*	*		0	1	0	0	0	1
02:30		*	*	*	*	*	*		0	0	0	0	0	0
02:45		*	*	*	*	*	*		0	2	0	0	0	2
03:00		*	*	*	*	*	*		0	2	0	0	0	2
03:15		*	*	*	*	*	*		0	0	0	0	0	0
03:30		*	*	*	*	*	*		0	1	0	0	0	1
03:45		*	*	*	*	*	*		0	4	0	0	0	4
04:00		*	*	*	*	*	*		0	0	0	0	0	0
04:15		*	*	*	*	*	*		0	0	0	0	0	0
04:30		*	*	*	*	*	*		0	0	0	0	0	0
04:45		*	*	*	*	*	*		0	0	0	0	0	0
05:00		*	*	*	*	*	*		0	0	0	0	0	0
05:15		*	*	*	*	*	*		0	2	0	0	0	2
05:30		*	*	*	*	*	*		0	2	0	0	0	2
05:45		*	*	*	*	*	*		0	0	0	0	0	0
06:00		*	*	*	*	*	*		0	0	0	0	0	0
06:15		*	*	*	*	*	*		0	0	0	0	0	0
06:30		*	*	*	*	*	*		0	0	0	0	0	0
06:45		*	***0***	*	***1***	*	***1***		0	0	0	0	0	0
07:00		*	***8***	*	***10***	*	***18***		0	0	0	0	0	0
07:15		*	***1***	*	***0***	*	***1***		0	0	0	0	0	0
07:30		*	***1***	*	***0***	*	***1***		0	0	0	0	0	0
07:45		*	0	*	0	*	0		0	0	***0***	0	0	0
08:00		*	0	*	0	*	0		0	0	***0***	0	0	0
08:15		*	4	*	0	*	4		0	0	***0***	0	0	0
08:30		*	2	*	0	*	2		3	0	***2***	0	5	0
08:45		*	0	*	0	*	0		1	0	0	0	1	0
09:00		*	0	*	0	*	0		3	0	0	0	3	0
09:15		*	0	*	0	*	0		0	0	0	0	0	0
09:30		*	0	*	0	*	0		0	0	0	0	0	0
09:45		*	0	*	0	*	0		0	0	0	0	0	0
10:00		*	1	*	0	*	1		***0***	0	0	0	***0***	0
10:15		*	0	*	0	*	0		***12***	0	0	0	***12***	0
10:30		*	0	*	0	*	0		***0***	0	0	0	***0***	0
10:45		*	0	*	0	*	0		***4***	0	0	0	***4***	0
11:00		*	0	*	0	*	0		0	0	0	0	0	0
11:15		*	2	*	0	*	2		0	0	0	0	0	0
11:30		*	2	*	0	*	2		0	0	0	0	0	0
11:45		*	0	*	0	*	0		8	0	0	0	8	0
Total		0	21	0	11	0	32		36	36	2	2	38	38
Day Total			21		11		32			72		4		76
% Total		0.0%	65.6%	0.0%	34.4%				47.4%	47.4%	2.6%	2.6%		
Peak	-	-	06:45	-	06:45	-	06:45	-	10:00	00:45	07:45	12:00	10:00	00:45
Vol.	-	-	10	-	11	-	21	-	16	18	2	2	16	20
P.H.F.			0.313		0.275		0.292		0.333	0.563	0.250	0.250	0.333	0.625

Tri-State Traffic Data, Inc

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Road: Paddock Entrance and Exit
Location: 50 ft S of Harrah's Blvd
Counter: 21486
Weather: Clear

Site Code: 0407136
Station ID:
Station ID:
A is NB Exit (Some Entrances as well)
B is SB Entrance
Latitude: 39' 84919.0000 North

Start Time	09-Apr-13 Tue	EXIT A.M.	EXIT P.M.	ENTER A.M.	ENTER P.M.	Combined A.M.	Combined P.M.	10-Apr- Wed	EXIT A.M.	EXIT P.M.	ENTER A.M.	ENTER P.M.	Combined A.M.	Combined P.M.
12:00		0	3	0	0	0	3		0	1	0	***34***	0	***35***
12:15		0	0	0	0	0	0		0	8	0	***24***	0	***32***
12:30		0	1	0	0	0	1		0	2	0	***16***	0	***18***
12:45		0	1	0	0	0	1		0	2	0	***12***	0	***14***
01:00		0	0	0	0	0	0		0	0	0	5	0	5
01:15		0	2	0	0	0	2		0	6	0	12	0	18
01:30		0	4	0	0	0	4		0	3	0	4	0	7
01:45		0	1	0	0	0	1		0	10	0	14	0	24
02:00		0	1	0	0	0	1		0	5	0	6	0	11
02:15		0	1	0	0	0	1		0	9	0	7	0	16
02:30		0	1	0	0	0	1		0	6	0	2	0	8
02:45		0	0	0	0	0	0		0	8	0	0	0	8
03:00		0	0	0	0	0	0		0	14	0	6	0	20
03:15		0	2	0	0	0	2		0	12	0	2	0	14
03:30		0	0	0	0	0	0		0	10	0	0	0	10
03:45		0	***0***	0	0	0	***0***		0	10	0	2	0	12
04:00		0	***2***	0	0	0	***2***		0	14	0	3	0	17
04:15		0	***2***	0	0	0	***2***		0	12	0	0	0	12
04:30		0	***6***	0	0	0	***6***		0	***20***	0	0	0	20
04:45		0	0	0	0	0	0		0	***8***	0	0	0	8
05:00		0	0	0	0	0	0		0	***36***	0	0	0	36
05:15		1	0	0	0	1	0		0	***27***	0	4	0	31
05:30		0	0	***0***	0	0	0		0	14	0	0	0	14
05:45		4	0	***0***	0	4	0		0	8	0	2	0	10
06:00		0	0	***0***	0	0	0		0	6	0	0	0	6
06:15		2	0	***2***	0	4	0		0	2	2	0	2	2
06:30		1	1	0	0	1	1		2	0	0	0	2	0
06:45		2	0	0	0	2	0		2	0	0	2	2	2
07:00		4	4	0	0	4	4		3	1	0	3	3	4
07:15		5	0	0	0	5	0		0	1	2	0	2	1
07:30		4	0	0	0	4	0		4	0	2	0	6	0
07:45		3	0	0	0	3	0		0	0	2	0	2	0
08:00		4	0	0	***0***	4	0		4	0	10	0	14	0
08:15		19	0	0	***0***	19	0		0	1	12	0	12	1
08:30		***34***	0	0	***0***	***34***	0		1	0	30	0	31	0
08:45		***28***	0	0	***2***	***28***	2		1	0	13	0	14	0
09:00		***14***	0	0	0	***14***	0		1	4	4	0	5	4
09:15		***24***	2	0	0	***24***	2		2	0	12	0	14	0
09:30		14	0	0	0	14	0		2	0	16	0	18	0
09:45		4	0	0	0	4	0		***2***	0	22	0	24	0
10:00		6	0	0	0	6	0		***2***	0	35	2	37	2
10:15		2	0	0	0	2	0		***4***	1	15	0	19	1
10:30		6	0	0	0	6	0		***3***	0	17	0	20	0
10:45		14	0	0	0	14	0		0	0	***19***	0	***19***	0
11:00		34	0	0	0	34	0		1	0	***24***	0	***25***	0
11:15		25	0	0	0	25	0		0	0	***32***	0	***32***	0
11:30		17	0	0	0	17	0		4	0	***21***	0	***25***	0
11:45		2	0	0	0	2	0		0	0	6	0	6	0
Total		273	34	2	2	275	36		38	261	296	162	334	423
Day Total		307		4		311			299		458		757	
% Total		87.8%	10.9%	0.6%	0.6%				5.0%	34.5%	39.1%	21.4%		
Peak	-	08:30	03:45	05:30	08:00	08:30	03:45	-	09:45	04:30	10:45	12:00	10:45	12:00
Vol.	-	100	10	2	2	100	10	-	11	91	96	86	101	99
P.H.F.		0.735	0.417	0.250	0.250	0.735	0.417		0.688	0.632	0.750	0.632	0.682	0.707

Tri-State Traffic Data, Inc

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Road: Paddock Entrance and Exit
Location: 50 ft S of Harrah's Blvd
Counter: 21486
Weather: Clear

Site Code: 0407136
Station ID:
Station ID:
A is NB Exit (Some Entrances as well)
B is SB Entrance
Latitude: 39' 84919.0000 North

Start Time	11-Apr-13 Thu	EXIT A.M.	EXIT P.M.	ENTER A.M.	ENTER P.M.	Combined A.M.	Combined P.M.	12-Apr- Fri	EXIT A.M.	EXIT P.M.	ENTER A.M.	ENTER P.M.	Combined A.M.	Combined P.M.
12:00		0	0	0	***19***	0	19		0	3	0	***20***	0	23
12:15		0	0	0	***23***	0	23		0	4	0	***22***	0	26
12:30		0	0	0	***22***	0	22		0	4	0	***15***	0	19
12:45		0	0	0	***14***	0	14		0	1	0	***8***	0	9
01:00		0	2	0	18	0	20		0	5	0	0	0	5
01:15		0	3	0	4	0	7		0	2	0	12	0	14
01:30		0	9	0	6	0	15		0	2	0	5	0	7
01:45		0	5	0	7	0	12		0	6	0	12	0	18
02:00		0	8	0	12	0	20		0	8	0	2	0	10
02:15		0	10	0	7	0	17		0	10	0	3	0	13
02:30		0	14	0	2	0	16		0	20	0	10	0	30
02:45		0	8	0	3	0	11		0	5	0	4	0	9
03:00		0	3	0	1	0	4		0	11	0	8	0	19
03:15		0	6	0	6	0	12		0	9	0	8	0	17
03:30		0	10	0	0	0	10		0	11	0	2	0	13
03:45		0	17	0	3	0	20		0	12	0	0	0	12
04:00		0	14	0	3	0	17		0	14	0	6	0	20
04:15		0	14	0	0	0	14		0	12	2	0	2	12
04:30		0	***24***	0	0	0	***24***		2	***24***	0	1	2	***25***
04:45		0	***30***	0	5	0	***35***		0	***19***	0	2	0	***21***
05:00		0	***28***	0	1	0	***29***		0	***36***	0	1	0	***37***
05:15		0	***30***	0	2	0	***32***		0	***28***	0	6	0	***34***
05:30		0	12	2	0	2	12		0	13	0	2	0	15
05:45		0	12	0	4	0	16		0	14	1	6	1	20
06:00		0	1	2	0	2	1		0	0	0	2	0	2
06:15		2	3	0	0	2	3		0	1	2	6	2	7
06:30		0	0	0	2	0	2		0	2	0	4	0	6
06:45		***0***	2	0	0	0	2		2	1	0	5	2	6
07:00		***2***	2	3	3	5	5		2	2	1	4	3	6
07:15		***4***	0	2	0	6	0		0	0	1	0	1	0
07:30		***2***	0	2	0	4	0		0	1	2	2	2	3
07:45		0	0	9	0	9	0		0	1	5	4	5	5
08:00		0	0	8	1	8	1		***4***	2	14	0	18	2
08:15		0	0	10	0	10	0		***1***	0	18	0	19	0
08:30		2	0	28	0	30	0		***4***	0	16	0	20	0
08:45		0	0	13	0	13	0		***2***	0	24	2	26	2
09:00		0	2	17	2	17	4		2	1	9	0	11	1
09:15		0	0	23	0	23	0		2	2	10	0	12	2
09:30		0	0	12	2	12	2		0	0	16	0	16	0
09:45		0	2	22	0	22	2		0	1	14	0	14	1
10:00		0	0	16	0	16	0		0	0	12	0	12	0
10:15		0	0	***18***	0	***18***	0		1	0	23	0	24	0
10:30		0	0	***48***	0	***48***	0		2	0	15	0	17	0
10:45		0	0	***38***	0	***38***	0		2	0	***24***	0	***26***	0
11:00		0	0	***21***	0	***21***	0		2	0	***26***	0	***28***	0
11:15		0	0	13	0	13	0		0	0	***15***	0	***15***	0
11:30		0	0	15	0	15	0		0	2	***28***	0	***28***	2
11:45		0	0	30	0	30	0		1	1	24	0	25	1
Total		12	271	352	172	364	443		29	290	302	184	331	474
Day Total		283		524		807			319		486		805	
% Total		1.5%	33.6%	43.6%	21.3%				3.6%	36.0%	37.5%	22.9%		
Peak	-	06:45	04:30	10:15	12:00	10:15	04:30	-	08:00	04:30	10:45	12:00	10:45	04:30
Vol.	-	8	112	125	78	125	120	-	11	107	93	65	97	117
P.H.F.		0.500	0.933	0.651	0.848	0.651	0.857		0.688	0.743	0.830	0.739	0.866	0.791

Tri-State Traffic Data, Inc

www.TSTData.com

Road: Paddock Entrance and Exit
Location: 50 ft S of Harrah's Blvd
Counter: 21486
Weather: Clear

Site Code: 0407136
Station ID:
Station ID:
A is NB Exit (Some Entrances as well)
B is SB Entrance
Latitude: 39' 84919.0000 North

Start Time	13-Apr-13 Sat	EXIT A.M.	EXIT P.M.	ENTER A.M.	ENTER P.M.	Combined A.M.	Combined P.M.	14-Apr- Sun	EXIT A.M.	EXIT P.M.	ENTER A.M.	ENTER P.M.	Combined A.M.	Combined P.M.
12:00		0	4	0	0	0	4		7	0	0	***22***	7	22
12:15		4	4	0	0	4	4		0	0	0	***45***	0	45
12:30		1	3	0	0	1	3		2	0	0	***19***	2	19
12:45		0	3	0	0	0	3		2	0	0	***20***	2	20
01:00		1	0	0	0	1	0		1	0	0	16	1	16
01:15		0	5	0	0	0	5		4	6	0	0	4	6
01:30		0	4	0	0	0	4		3	8	0	17	3	25
01:45		0	14	0	0	0	14		3	16	0	6	3	22
02:00		0	8	0	0	0	8		6	4	0	10	6	14
02:15		6	3	0	0	6	3		0	6	0	8	0	14
02:30		0	8	0	0	0	8		4	11	0	8	4	19
02:45		3	4	0	0	3	4		6	9	0	0	6	9
03:00		2	10	0	0	2	10		3	12	0	0	3	12
03:15		2	2	0	0	2	2		5	4	0	2	5	6
03:30		0	6	0	0	0	6		***8***	10	0	3	8	13
03:45		0	6	0	0	0	6		***2***	7	0	4	2	11
04:00		0	6	0	0	0	6		***4***	10	0	0	4	10
04:15		1	8	0	0	1	8		***10***	24	0	0	10	24
04:30		2	10	0	0	2	10		2	10	0	0	2	10
04:45		1	4	0	0	1	4		6	***13***	0	4	6	***17***
05:00		1	13	0	0	1	13		4	***29***	0	2	4	***31***
05:15		0	9	0	0	0	9		0	***34***	0	2	0	***36***
05:30		0	13	0	0	0	13		2	***26***	0	0	2	***26***
05:45		2	10	0	0	2	10		0	2	0	0	0	2
06:00		0	4	0	0	0	4		0	0	0	0	0	0
06:15		0	***10***	0	0	0	***10***		1	2	0	0	1	2
06:30		1	***15***	0	0	1	***15***		2	0	0	0	2	0
06:45		3	***13***	0	0	3	***13***		0	0	0	0	0	0
07:00		0	***20***	0	0	0	***20***		1	0	0	0	1	0
07:15		0	10	0	0	0	10		2	1	2	0	4	1
07:30		2	10	0	0	2	10		0	0	4	0	4	0
07:45		4	6	0	0	4	6		2	0	1	0	3	0
08:00		2	4	0	0	2	4		0	0	18	0	18	0
08:15		6	6	0	0	6	6		1	0	10	0	11	0
08:30		0	1	0	0	0	1		2	0	11	0	13	0
08:45		2	2	0	0	2	2		0	2	19	0	19	2
09:00		4	2	0	0	4	2		0	0	12	0	12	0
09:15		3	2	0	0	3	2		0	0	14	0	14	0
09:30		6	7	0	0	6	7		0	1	4	0	4	1
09:45		2	2	0	0	2	2		0	1	10	0	10	1
10:00		6	4	0	0	6	4		0	*	13	*	13	*
10:15		6	12	0	0	6	12		0	*	17	*	17	*
10:30		2	6	0	0	2	6		0	*	22	*	22	*
10:45		***2***	6	0	0	***2***	6		0	*	19	*	19	*
11:00		***7***	6	0	0	***7***	6		0	*	***27***	*	***27***	*
11:15		***11***	1	0	0	***11***	1		0	*	***22***	*	***22***	*
11:30		***3***	6	0	0	***3***	6		0	*	***32***	*	***32***	*
11:45		1	2	0	0	1	2		0	*	***34***	*	***34***	*
Total		99	314	0	0	99	314		95	248	291	188	386	436
Day Total		413		0		413			343		479		822	
% Total		24.0%	76.0%	0.0%	0.0%				11.6%	30.2%	35.4%	22.9%		
Peak	-	10:45	06:15	-	-	10:45	06:15	-	03:30	04:45	11:00	12:00	11:00	04:45
Vol.	-	23	58	-	-	23	58	-	24	102	115	106	115	110
P.H.F.		0.523	0.725			0.523	0.725		0.600	0.750	0.846	0.589	0.846	0.611

ADT	ADT 571	AADT 571

Tri-State Traffic Data, Inc

www.TSTData.com

Road: East Parking Lot Dr
Location: 75 ft S of Harrah's Blvd
Counter: 22699
Weather: Clear

Site Code: 0407131
Station ID:
Station ID:
A to B NB (Exit)
B to A SB
Latitude: 39' 85280.0000 North

Start	07-Apr-13	Exit		Enter		Combined		08-Apr-	Exit		Enter		Combined	
Time	Sun	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	Mon	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
12:00		*	*	*	*	*	*		5	20	2	3	7	23
12:15		*	*	*	*	*	*		9	6	6	8	15	14
12:30		*	*	*	*	*	*		4	10	2	9	6	19
12:45		*	*	*	*	*	*		8	6	0	12	8	18
01:00		*	*	*	*	*	*		2	6	6	11	8	17
01:15		*	*	*	*	*	*		8	12	3	10	11	22
01:30		*	*	*	*	*	*		5	7	1	***19***	6	26
01:45		*	*	*	*	*	*		6	14	2	***14***	8	28
02:00		*	*	*	*	*	*		10	6	4	***10***	14	16
02:15		*	*	*	*	*	*		0	12	6	***12***	6	24
02:30		*	*	*	*	*	*		3	8	6	7	9	15
02:45		*	*	*	*	*	*		8	14	6	8	14	22
03:00		*	*	*	*	*	*		12	16	7	6	19	22
03:15		*	*	*	*	*	*		8	15	8	5	16	20
03:30		*	*	*	*	*	*		10	9	16	9	26	18
03:45		*	*	*	*	*	*		8	4	13	4	21	8
04:00		*	*	*	*	*	*		12	8	4	7	16	15
04:15		*	*	*	*	*	*		8	7	10	3	18	10
04:30		*	*	*	*	*	*		6	6	3	8	9	14
04:45		*	*	*	*	*	*		5	11	5	8	10	19
05:00		*	*	*	*	*	*		2	6	2	7	4	13
05:15		*	*	*	*	*	*		4	9	6	3	10	12
05:30		*	*	*	*	*	*		1	10	12	12	13	22
05:45		*	6	*	12	*	18		4	2	15	6	19	8
06:00		*	***14***	*	17	*	31		7	15	18	8	25	23
06:15		*	***14***	*	16	*	30		14	12	24	10	38	22
06:30		*	***12***	*	16	*	28		3	6	11	12	14	18
06:45		*	***12***	*	6	*	18		7	8	18	11	25	19
07:00		*	12	*	19	*	31		4	12	7	10	11	22
07:15		*	8	*	***22***	*	***30***		12	***16***	10	9	22	***25***
07:30		*	12	*	***21***	*	***33***		6	***10***	20	19	26	***29***
07:45		*	8	*	***20***	*	***28***		3	***16***	16	8	19	***24***
08:00		*	12	*	***34***	*	***46***		4	***14***	6	16	10	***30***
08:15		*	2	*	19	*	21		3	4	11	10	14	14
08:30		*	2	*	10	*	12		2	6	9	2	11	8
08:45		*	8	*	10	*	18		6	2	8	4	14	6
09:00		*	12	*	4	*	16		4	5	10	2	14	7
09:15		*	8	*	13	*	21		3	10	8	14	11	24
09:30		*	12	*	18	*	30		6	3	11	14	17	17
09:45		*	7	*	12	*	19		5	6	16	11	21	17
10:00		*	10	*	17	*	27		11	10	6	7	17	17
10:15		*	16	*	8	*	24		5	18	13	12	18	30
10:30		*	4	*	9	*	13		6	9	20	9	26	18
10:45		*	10	*	10	*	20		4	6	16	9	20	15
11:00		*	4	*	10	*	14		***10***	4	***17***	18	***27***	22
11:15		*	8	*	6	*	14		***12***	5	***20***	6	***32***	11
11:30		*	1	*	7	*	8		***8***	5	***22***	6	***30***	11
11:45		*	0	*	2	*	2		***12***	6	***22***	4	***34***	10
Total		0	214	0	338	0	552		305	432	484	432	789	864
Day Total			214		338		552			737		916		1653
% Total		0.0%	38.8%	0.0%	61.2%				18.5%	26.1%	29.3%	26.1%		
Peak	-	-	06:00	-	07:15	-	07:15	-	11:00	07:15	11:00	01:30	11:00	07:15
Vol.	-	-	52	-	97	-	137	-	42	56	81	55	123	108
P.H.F.			0.929		0.713		0.745		0.750	0.875	0.920	0.724	0.904	0.900

Tri-State Traffic Data, Inc

www.TSTData.com

Road: East Parking Lot Dr
Location: 75 ft S of Harrah's Blvd
Counter: 22699
Weather: Clear

Site Code: 0407131
Station ID:
Station ID:
A to B NB (Exit)
B to A SB
Latitude: 39' 85280.0000 North

Start Time	09-Apr-13 Tue	Exit A.M.	Exit P.M.	Enter A.M.	Enter P.M.	Combined A.M.	Combined P.M.	10-Apr- Wed	Exit A.M.	Exit P.M.	Enter A.M.	Enter P.M.	Combined A.M.	Combined P.M.
12:00		7	18	1	9	8	27		2	14	4	5	6	19
12:15		4	8	2	10	6	18		8	7	1	8	9	15
12:30		4	10	2	6	6	16		3	3	1	9	4	12
12:45		4	6	0	15	4	21		4	7	2	6	6	13
01:00		1	6	6	***11***	7	17		6	8	0	***16***	6	24
01:15		0	16	5	***10***	5	***26***		6	7	1	***14***	7	21
01:30		4	12	2	***22***	6	***34***		5	5	1	***22***	6	27
01:45		2	7	4	***18***	6	***25***		8	15	6	***10***	14	25
02:00		7	***23***	1	10	8	***33***		0	12	12	14	12	26
02:15		7	***12***	5	11	12	23		0	10	6	10	6	20
02:30		4	***6***	2	15	6	21		2	11	8	12	10	23
02:45		6	***18***	3	6	9	24		7	15	4	10	11	25
03:00		2	14	3	2	5	16		8	2	2	16	10	18
03:15		4	14	7	2	11	16		9	10	10	2	19	12
03:30		8	6	14	8	22	14		8	8	16	12	24	20
03:45		10	10	12	3	22	13		16	10	6	5	22	15
04:00		6	8	13	7	19	15		3	6	14	7	17	13
04:15		5	16	2	5	7	21		2	16	10	7	12	23
04:30		10	14	4	6	14	20		8	6	2	4	10	10
04:45		0	8	7	10	7	18		8	4	6	8	14	12
05:00		1	12	4	7	5	19		2	18	5	6	7	24
05:15		5	7	8	10	13	17		4	16	6	20	10	***36***
05:30		2	10	9	7	11	17		6	16	11	16	17	***32***
05:45		6	6	17	12	23	18		4	9	18	11	22	***20***
06:00		7	12	16	7	23	19		8	18	13	13	21	***31***
06:15		14	15	14	20	28	35		10	14	15	11	25	25
06:30		3	8	7	9	10	17		2	14	7	15	9	29
06:45		15	16	12	12	27	28		6	9	7	8	13	17
07:00		8	10	8	20	16	30		4	16	8	11	12	27
07:15		8	10	6	10	14	20		9	11	5	16	14	27
07:30		11	13	20	19	31	32		7	14	14	22	21	36
07:45		3	18	7	8	10	26		4	16	8	6	12	22
08:00		2	8	8	10	10	18		5	15	5	14	10	29
08:15		5	5	16	2	21	7		2	12	9	5	11	17
08:30		6	3	13	6	19	9		0	1	20	4	20	5
08:45		7	3	12	6	19	9		4	6	12	6	16	12
09:00		3	11	8	6	11	17		4	12	7	8	11	20
09:15		1	3	6	10	7	13		***5***	11	8	12	13	23
09:30		10	6	13	22	23	28		***6***	12	22	10	28	22
09:45		3	12	16	9	19	21		***24***	2	8	10	32	12
10:00		***6***	8	18	4	24	12		***8***	8	16	9	24	17
10:15		***13***	16	12	16	25	32		2	***14***	9	12	11	26
10:30		***20***	10	2	8	22	18		9	***17***	14	4	23	21
10:45		***8***	8	7	12	15	20		6	***15***	***14***	9	***20***	24
11:00		3	8	***8***	7	***11***	15		10	***16***	***10***	7	***20***	23
11:15		12	16	***16***	1	***28***	17		8	3	***19***	15	***27***	18
11:30		12	3	***18***	2	***30***	5		8	7	***26***	1	***34***	8
11:45		13	3	***20***	5	***33***	8		12	4	6	3	18	7
Total		302	492	416	453	718	945		292	502	434	481	726	983
Day Total		794		869		1663			794		915		1709	
% Total		18.2%	29.6%	25.0%	27.2%				17.1%	29.4%	25.4%	28.1%		
Peak	-	10:00	02:00	11:00	01:00	11:00	01:15	-	09:15	10:15	10:45	01:00	10:45	05:15
Vol.	-	47	59	62	61	102	118	-	43	62	69	62	101	119
P.H.F.		0.588	0.641	0.775	0.693	0.773	0.868		0.448	0.861	0.663	0.705	0.743	0.826

Tri-State Traffic Data, Inc

www.TSTData.com

Road: East Parking Lot Dr
Location: 75 ft S of Harrah's Blvd
Counter: 22699
Weather: Clear

Site Code: 0407131
Station ID:
Station ID:
A to B NB (Exit)
B to A SB
Latitude: 39' 85280.0000 North

Start Time	11-Apr-13 Thu	Exit A.M.	Exit P.M.	Enter A.M.	Enter P.M.	Combined A.M.	Combined P.M.	12-Apr- Fri	Exit A.M.	Exit P.M.	Enter A.M.	Enter P.M.	Combined A.M.	Combined P.M.
12:00		4	7	0	14	4	21		0	19	4	8	4	27
12:15		3	6	2	7	5	13		0	4	6	5	6	9
12:30		8	6	3	***18***	11	24		1	4	6	16	7	20
12:45		9	8	2	***24***	11	32		0	8	1	***14***	1	22
01:00		8	11	8	***14***	16	25		7	6	2	***22***	9	28
01:15		4	9	1	***14***	5	23		6	8	0	***20***	6	28
01:30		4	10	2	12	6	22		5	10	6	***25***	11	35
01:45		11	16	16	14	27	30		6	8	11	11	17	19
02:00		1	8	6	9	7	17		0	6	8	20	8	26
02:15		5	***28***	0	17	5	45		0	18	4	16	4	34
02:30		6	***7***	1	10	7	17		2	***16***	4	16	6	32
02:45		5	***21***	10	15	15	36		0	***20***	12	9	12	29
03:00		1	***12***	2	10	3	22		6	***10***	6	8	12	18
03:15		5	14	7	15	12	29		6	***23***	7	18	13	41
03:30		6	5	17	13	23	18		2	2	19	7	21	9
03:45		12	9	4	6	16	15		11	1	7	4	18	5
04:00		12	13	18	5	30	18		14	7	6	7	20	14
04:15		7	12	8	7	15	19		0	9	11	8	11	17
04:30		3	8	1	6	4	14		3	7	9	15	12	22
04:45		4	14	6	8	10	22		5	12	4	14	9	26
05:00		4	14	3	8	7	22		6	11	5	11	11	22
05:15		2	8	5	13	7	21		6	7	12	13	18	20
05:30		6	10	6	11	12	21		2	9	13	14	15	23
05:45		4	10	25	14	29	24		14	7	17	24	31	31
06:00		6	18	9	28	15	***46***		8	17	7	12	15	29
06:15		7	18	13	10	20	***28***		6	9	20	14	26	23
06:30		9	10	8	12	17	***22***		6	9	8	10	14	19
06:45		8	14	12	14	20	***28***		***12***	11	12	16	24	27
07:00		6	12	4	17	10	29		***4***	24	4	24	8	***48***
07:15		13	10	10	12	23	22		***14***	8	4	20	18	***28***
07:30		9	8	11	23	20	31		***12***	14	10	18	22	***32***
07:45		2	7	12	13	14	20		6	14	7	15	13	***29***
08:00		6	20	7	12	13	32		6	12	10	11	16	23
08:15		16	6	10	8	26	14		5	7	11	9	16	16
08:30		6	7	12	11	18	18		2	6	11	18	13	24
08:45		4	2	13	21	17	23		6	2	16	13	22	15
09:00		9	7	14	10	23	17		4	10	10	14	14	24
09:15		8	8	9	16	17	24		4	6	8	14	12	20
09:30		4	10	23	13	27	23		6	11	8	24	14	35
09:45		7	6	14	12	21	18		2	10	18	16	20	26
10:00		6	12	16	13	22	25		4	10	15	14	19	24
10:15		4	26	15	18	19	44		6	20	12	13	18	33
10:30		12	8	12	12	24	20		5	12	***20***	8	***25***	20
10:45		***10***	12	10	8	20	20		12	20	***16***	6	***28***	26
11:00		***7***	14	***20***	5	***27***	19		8	7	***10***	10	***18***	17
11:15		***12***	11	***21***	9	***33***	20		10	18	***24***	1	***34***	19
11:30		***13***	2	***15***	5	***28***	7		6	6	17	0	23	6
11:45		8	3	***15***	2	***23***	5		10	6	16	2	26	8
Total		326	517	458	588	784	1105		266	501	474	627	740	1128
Day Total		843		1046		1889			767		1101		1868	
% Total		17.3%	27.4%	24.2%	31.1%				14.2%	26.8%	25.4%	33.6%		
Peak	-	10:45	02:15	11:00	00:30	11:00	06:00	-	06:45	02:30	10:30	00:45	10:30	07:00
Vol.	-	42	68	71	70	111	124	-	42	69	70	81	105	137
P.H.F.		0.808	0.607	0.845	0.729	0.841	0.674		0.750	0.750	0.729	0.810	0.772	0.714

Tri-State Traffic Data, Inc

www.TSTData.com

Road: East Parking Lot Dr
Location: 75 ft S of Harrah's Blvd
Counter: 22699
Weather: Clear

Site Code: 0407131
Station ID:
Station ID:
A to B NB (Exit)
B to A SB
Latitude: 39' 85280.0000 North

Start Time	13-Apr-13 Sat	Exit A.M.	Exit P.M.	Enter A.M.	Enter P.M.	Combined A.M.	Combined P.M.	14-Apr- Sun	Exit A.M.	Exit P.M.	Enter A.M.	Enter P.M.	Combined A.M.	Combined P.M.
12:00		8	15	6	5	14	20		4	20	12	16	16	36
12:15		2	12	4	6	6	18		5	6	5	16	10	22
12:30		9	2	2	15	11	17		0	6	8	13	8	19
12:45		2	6	2	14	4	20		6	6	1	16	7	22
01:00		6	4	2	10	8	14		4	5	0	2	4	7
01:15		8	12	1	16	9	28		6	6	5	13	11	19
01:30		4	10	3	23	7	33		6	7	6	16	12	23
01:45		12	10	6	15	18	25		6	14	1	13	7	27
02:00		14	4	3	5	17	9		12	10	4	12	16	22
02:15		12	13	18	15	30	28		10	15	9	11	19	26
02:30		8	9	5	10	13	19		7	8	1	4	8	12
02:45		7	13	6	14	13	27		5	10	8	4	13	14
03:00		10	14	1	16	11	30		8	12	7	6	15	18
03:15		***8***	18	4	8	12	26		8	14	8	6	16	20
03:30		***12***	7	24	11	36	18		12	4	18	13	***30***	17
03:45		***13***	7	9	6	22	13		***14***	6	20	4	***34***	10
04:00		***20***	3	2	9	22	12		***17***	12	9	6	***26***	18
04:15		4	5	3	6	7	11		***12***	6	5	6	***17***	12
04:30		8	6	12	10	20	16		***14***	8	6	2	20	10
04:45		4	12	7	16	11	28		5	6	6	4	11	10
05:00		8	15	4	9	12	24		4	15	4	8	8	23
05:15		7	16	6	7	13	23		10	5	4	10	14	15
05:30		2	10	13	18	15	28		4	10	8	17	12	27
05:45		17	16	7	11	24	27		4	6	16	8	20	14
06:00		5	10	10	16	15	26		9	14	12	***14***	21	***28***
06:15		9	10	14	13	23	23		18	16	17	***16***	35	***32***
06:30		6	16	18	13	24	29		12	7	6	***23***	18	***30***
06:45		18	8	7	16	25	24		10	15	14	***20***	24	***35***
07:00		9	11	2	13	11	24		5	14	3	9	8	23
07:15		8	10	5	***22***	13	***32***		6	***20***	6	16	12	36
07:30		8	24	14	***36***	22	***60***		8	***10***	10	20	18	30
07:45		4	13	7	***8***	11	***21***		10	***14***	5	10	15	24
08:00		4	14	4	***29***	8	***43***		6	***16***	6	12	12	28
08:15		7	7	6	2	13	9		3	7	6	14	9	21
08:30		4	8	7	3	11	11		2	10	6	13	8	23
08:45		2	2	3	12	5	14		3	6	10	6	13	12
09:00		4	4	5	4	9	8		8	4	4	10	12	14
09:15		3	12	9	14	12	26		2	*	11	*	13	*
09:30		4	14	20	26	24	40		0	*	9	*	9	*
09:45		10	12	14	17	24	29		4	*	16	*	20	*
10:00		6	***14***	10	10	16	24		5	*	10	*	15	*
10:15		1	***18***	12	18	13	36		3	*	10	*	13	*
10:30		8	***16***	10	19	18	35		2	*	20	*	22	*
10:45		4	***15***	***18***	12	22	27		5	*	16	*	21	*
11:00		8	8	***12***	14	***20***	22		8	*	***16***	*	24	*
11:15		7	10	***26***	10	***33***	20		4	*	***16***	*	20	*
11:30		3	4	***28***	8	***31***	12		6	*	***25***	*	31	*
11:45		9	6	18	3	***27***	9		8	*	***20***	*	28	*
Total		356	505	429	613	785	1118		330	370	445	409	775	779
Day Total		861		1042		1903			700		854		1554	
% Total		18.7%	26.5%	22.5%	32.2%				21.2%	23.8%	28.6%	26.3%		
Peak	-	03:15	10:00	10:45	07:15	11:00	07:15	-	03:45	07:15	11:00	06:00	03:30	06:00
Vol.	-	53	63	84	95	111	156	-	57	60	77	73	107	125
P.H.F.		0.663	0.656	0.750	0.660	0.841	0.650		0.838	0.750	0.770	0.793	0.787	0.893

ADT	ADT 1,780	AADT 1,780

Tri-State Traffic Data, Inc

www.TSTData.com

Road: Bus Entrance
Location: 100 ft S of Harrah's Blvd
Counter: 18498
Weather: Clear

Site Code: 0407135
Station ID:
Station ID:

Latitude: 39' 84976.0000 North

Start Time	Sun 07-Apr-1 A.M.	Sun 07-Apr-1 P.M.	Mon 08-Apr-1 A.M.	Mon 08-Apr-1 P.M.	Tue 09-Apr-1 A.M.	Tue 09-Apr-1 P.M.	Daily Average A.M.	Daily Average P.M.
12:00	*	*	2	4	6	6	4	5
12:15	*	*	2	0	1	2	2	1
12:30	*	*	0	**8**	2	6	1	7
12:45	*	*	2	**4**	2	2	2	3
01:00	*	*	2	**11**	4	4	3	8
01:15	*	*	2	**2**	1	2	2	2
01:30	*	*	0	6	2	2	1	4
01:45	*	*	3	6	0	6	2	6
02:00	*	*	4	2	6	2	5	2
02:15	*	*	2	8	4	**6**	3	**7**
02:30	*	*	0	6	0	**10**	0	**8**
02:45	*	*	2	3	2	**2**	2	**2**
03:00	*	*	4	8	2	**8**	3	**8**
03:15	*	*	1	2	2	0	2	1
03:30	*	*	1	8	0	8	0	8
03:45	*	*	0	2	1	4	0	3
04:00	*	*	2	7	4	6	3	6
04:15	*	*	2	2	0	4	1	3
04:30	*	*	0	2	4	4	2	3
04:45	*	*	6	2	0	4	3	3
05:00	*	*	2	8	3	7	2	8
05:15	*	*	2	0	2	2	2	1
05:30	*	*	2	9	2	9	2	9
05:45	*	*	3	0	2	2	2	1
06:00	*	*	2	4	1	4	2	4
06:15	*	*	6	4	5	6	6	5
06:30	*	*	2	3	2	6	2	4
06:45	*	*	4	4	3	2	4	3
07:00	*	0	2	6	3	4	2	3
07:15	*	**8**	2	8	2	8	2	8
07:30	*	**4**	2	2	3	4	2	3
07:45	*	**1**	4	5	1	7	2	4
08:00	*	**6**	2	2	6	2	4	3
08:15	*	2	6	10	1	8	4	7
08:30	*	3	3	0	4	1	4	1
08:45	*	1	2	6	**6**	9	4	5
09:00	*	2	6	4	**8**	2	7	3
09:15	*	4	0	4	**0**	6	0	5
09:30	*	3	5	3	**9**	2	7	3
09:45	*	1	2	6	2	4	2	4
10:00	*	4	6	3	5	6	6	4
10:15	*	2	3	0	4	0	4	1
10:30	*	4	3	4	3	4	3	4
10:45	*	1	**5**	0	8	2	**6**	1
11:00	*	2	**4**	8	6	6	**5**	5
11:15	*	1	**7**	2	4	0	**6**	1
11:30	*	2	**5**	3	2	6	**4**	4
11:45	*	2	2	0	4	1	3	1
Total	0	53	131	201	144	208	140	195
Combined Total	53		332		352		335	
Peak	- 07:15		- 10:45	00:30	- 08:45	02:15	- 10:45	02:15
Vol.	- 19		- 21	25	- 23	26	- 21	25
P.H.F.	0.594		0.750	0.568	0.639	0.650	0.875	0.781

Tri-State Traffic Data, Inc

www.TSTData.com

Road: Bus Entrance
Location: 100 ft S of Harrah's Blvd
Counter: 18498
Weather: Clear

Site Code: 0407135
Station ID:
Station ID:

Latitude: 39' 84976.0000 North

Start Time	Wed A.M.	10-Apr-1 P.M.		Thu A.M.	11-Apr-1 P.M.		Fri A.M.	12-Apr-1 P.M.		Daily Average A.M.	Daily Average P.M.
12:00	8	8		5	10		2	8		5	9
12:15	2	0		3	2		4	0		3	1
12:30	2	6		2	6		4	6		3	6
12:45	0	2		0	5		0	4		0	4
01:00	6	4		2	6		1	7		3	6
01:15	1	6		2	4		2	6		2	5
01:30	2	2		4	4		4	4		3	3
01:45	0	3		0	**6**		0	8		0	**6**
02:00	4	**11**		2	**8**		0	4		2	**8**
02:15	2	**5**		4	**4**		6	6		4	**5**
02:30	1	**6**		0	**6**		0	8		0	**7**
02:45	0	**4**		0	4		0	1		0	3
03:00	2	4		2	8		2	10		2	7
03:15	0	2		0	2		1	6		0	3
03:30	3	5		0	6		3	6		2	6
03:45	0	5		2	6		0	6		1	6
04:00	2	10		4	2		4	4		3	5
04:15	2	4		0	7		2	5		1	5
04:30	3	3		0	3		2	6		2	4
04:45	2	7		5	6		2	**6**		3	6
05:00	2	8		3	7		2	**12**		2	9
05:15	4	0		3	2		4	**6**		4	3
05:30	2	5		2	9		3	**7**		2	7
05:45	2	4		4	2		4	6		3	4
06:00	4	7		4	4		2	7		3	6
06:15	3	6		6	6		6	8		5	7
06:30	1	6		2	8		2	6		2	7
06:45	3	4		4	4		4	2		4	3
07:00	4	6		3	6		6	7		4	6
07:15	2	2		2	5		4	2		3	3
07:30	5	6		3	4		6	6		5	5
07:45	2	5		8	6		4	6		5	6
08:00	2	2		4	3		9	4		5	3
08:15	6	2		6	7		4	8		5	6
08:30	6	4		4	2		4	0		5	2
08:45	4	7		3	4		3	4		3	5
09:00	8	3		6	2		6	4		7	3
09:15	0	4		2	6		0	4		1	5
09:30	6	1		7	4		6	5		6	3
09:45	4	2		1	6		2	5		2	4
10:00	**8**	6		**8**	2		**9**	6		**8**	5
10:15	**3**	3		**10**	3		**8**	0		**7**	2
10:30	**7**	2		**7**	7		**3**	4		**6**	4
10:45	**7**	2		**6**	0		**6**	0		**6**	1
11:00	6	6		7	8		2	10		5	8
11:15	3	4		8	4		8	0		6	3
11:30	8	3		8	3		6	6		7	4
11:45	6	0		2	3		2	0		3	1
Total	160	207		170	232		164	246		163	230
Combined Total	367			402			410			393	
Peak	10:00	02:00	-	10:00	01:45	-	10:00	04:45	-	10:00	01:45
Vol.	25	26	-	31	24	-	26	31	-	27	26
P.H.F.	0.781	0.591		0.775	0.750		0.722	0.646		0.844	0.813

Tri-State Traffic Data, Inc

www.TSTData.com

Road: Bus Entrance
Location: 100 ft S of Harrah's Blvd
Counter: 18498
Weather: Clear

Site Code: 0407135
Station ID:
Station ID:

Latitude: 39' 84976.0000 North

Start Time	Sat A.M.	13-Apr-1 P.M.		Sun A.M.	14-Apr-1 P.M.		Mon A.M.	15-Apr-1 P.M.		Daily Average A.M.	Daily Average P.M.
12:00	8	**4**		**4**	**9**		*	*		6	**6**
12:15	0	**4**		**8**	**4**		*	*		4	**4**
12:30	6	**10**		**2**	**6**		*	*		4	**8**
12:45	0	**8**		**6**	**4**		*	*		3	**6**
01:00	8	3		4	5		*	*		6	4
01:15	2	2		6	2		*	*		4	2
01:30	4	8		2	6		*	*		3	7
01:45	0	2		3	2		*	*		2	2
02:00	4	4		4	2		*	*		4	3
02:15	4	2		2	5		*	*		3	4
02:30	2	6		0	4		*	*		1	5
02:45	0	7		5	4		*	*		2	6
03:00	3	6		2	0		*	*		2	3
03:15	0	3		0	6		*	*		0	4
03:30	0	6		2	4		*	*		1	5
03:45	0	4		0	4		*	*		0	4
04:00	0	4		1	4		*	*		0	4
04:15	2	2		4	3		*	*		3	2
04:30	1	6		0	4		*	*		0	5
04:45	0	4		3	4		*	*		2	4
05:00	4	10		2	4		*	*		3	7
05:15	0	2		0	4		*	*		0	3
05:30	1	8		4	5		*	*		2	6
05:45	4	6		0	4		*	*		2	5
06:00	1	4		8	2		*	*		4	3
06:15	4	1		3	1		*	*		4	1
06:30	4	8		2	2		*	*		3	5
06:45	4	0		2	6		*	*		3	3
07:00	2	6		4	4		*	*		3	5
07:15	3	0		4	3		*	*		4	2
07:30	2	8		1	7		*	*		2	8
07:45	6	3		2	4		*	*		4	4
08:00	2	2		2	4		*	*		2	3
08:15	8	6		4	4		*	*		6	5
08:30	0	4		4	4		*	*		2	4
08:45	6	4		2	3		*	*		4	4
09:00	2	4		6	5		*	*		4	4
09:15	2	4		2	2		*	*		2	3
09:30	6	2		4	4		*	*		5	3
09:45	4	6		4	*		*	*		4	6
10:00	3	2		7	*		*	*		5	2
10:15	6	3		4	*		*	*		5	3
10:30	0	8		5	*		*	*		2	8
10:45	**10**	4		2	*		*	*		**6**	4
11:00	**4**	3		6	*		*	*		**5**	3
11:15	**2**	7		0	*		*	*		**1**	7
11:30	**10**	1		6	*		*	*		**8**	1
11:45	2	4		3	*		*	*		2	4
Total	146	215		151	154		0	0		147	204
Combined Total	361			305			0			351	
Peak	10:45	12:00	-	12:00	12:00	-	-	-	-	10:45	12:00
Vol.	26	26	-	20	23	-	-	-	-	20	24
P.H.F.	0.650	0.650		0.625	0.639					0.625	0.750
ADT		ADT 362		AADT 362							

Tri-State Traffic Data, Inc

www.TSTData.com

Road: Valet Ramp Entrance
Location: 25 ft S of Harrah's Blvd
Counter: 13398
Weather: Clear

Site Code: 0407132
Station ID:
Station ID:
EB Harrah's Blvd Entrance

Latitude: 39' 85105.0000 North

Start Time	07-Apr-13 Sun	Enter Morning	Enter Afternoon	Hour Totals Morning	Hour Totals Afternoon
12:00		*	*		
12:15		*	*		
12:30		*	*		
12:45		*	*	0	0
01:00		*	*		
01:15		*	*		
01:30		*	*		
01:45		*	*	0	0
02:00		*	*		
02:15		*	*		
02:30		*	*		
02:45		*	*	0	0
03:00		*	*		
03:15		*	*		
03:30		*	*		
03:45		*	*	0	0
04:00		*	*		
04:15		*	*		
04:30		*	*		
04:45		*	*	0	0
05:00		*	*		
05:15		*	*		
05:30		*	*		
05:45		*	*	0	0
06:00		*	*		
06:15		*	*		
06:30		*	*		
06:45		*	8	0	8
07:00		*	4		
07:15		*	5		
07:30		*	4		
07:45		*	4	0	17
08:00		*	3		
08:15		*	3		
08:30		*	3		
08:45		*	4	0	13
09:00		*	2		
09:15		*	3		
09:30		*	1		
09:45		*	1	0	7
10:00		*	4		
10:15		*	2		
10:30		*	1		
10:45		*	1	0	8
11:00		*	3		
11:15		*	3		
11:30		*	4		
11:45		*	0	0	10
Total		0	63		
Percent		0.0%	100.0%		

Tri-State Traffic Data, Inc

www.TSTData.com

Road: Valet Ramp Entrance
Location: 25 ft S of Harrah's Blvd
Counter: 13398
Weather: Clear

Site Code: 0407132
Station ID:
Station ID:
EB Harrah's Blvd Entrance

Latitude: 39' 85105.0000 North

Start Time	08-Apr-13 Mon	Enter Morning	Enter Afternoon	Hour Totals Morning	Hour Totals Afternoon
12:00		4	0		
12:15		0	1		
12:30		0	0		
12:45		1	2	5	3
01:00		1	1		
01:15		1	1		
01:30		0	0		
01:45		3	2	5	4
02:00		1	4		
02:15		1	2		
02:30		1	1		
02:45		2	2	5	9
03:00		2	6		
03:15		2	0		
03:30		1	3		
03:45		1	2	6	11
04:00		0	1		
04:15		1	5		
04:30		0	0		
04:45		1	1	2	7
05:00		0	3		
05:15		0	1		
05:30		2	0		
05:45		0	3	2	7
06:00		0	3		
06:15		0	3		
06:30		3	0		
06:45		1	3	4	9
07:00		2	4		
07:15		0	6		
07:30		0	4		
07:45		2	3	4	17
08:00		0	2		
08:15		0	3		
08:30		0	1		
08:45		4	0	4	6
09:00		1	3		
09:15		0	1		
09:30		2	0		
09:45		0	1	3	5
10:00		1	1		
10:15		2	4		
10:30		2	2		
10:45		2	4	7	11
11:00		0	4		
11:15		0	0		
11:30		2	0		
11:45		1	2	3	6
Total		50	95		
Percent		34.5%	65.5%		

Tri-State Traffic Data, Inc

www.TSTData.com

Road: Valet Ramp Entrance
Location: 25 ft S of Harrah's Blvd
Counter: 13398
Weather: Clear

Site Code: 0407132
Station ID:
Station ID:
EB Harrah's Blvd Entrance

Latitude: 39' 85105.0000 North

Start Time	09-Apr-13 Tue	Enter Morning	Enter Afternoon	Hour Totals Morning	Hour Totals Afternoon
12:00		0	0		
12:15		0	1		
12:30		0	2		
12:45		0	2	0	5
01:00		2	0		
01:15		1	3		
01:30		1	1		
01:45		0	2	4	6
02:00		0	5		
02:15		1	0		
02:30		1	4		
02:45		0	3	2	12
03:00		0	0		
03:15		1	5		
03:30		1	2		
03:45		2	2	4	9
04:00		1	0		
04:15		0	1		
04:30		0	2		
04:45		1	2	2	5
05:00		2	5		
05:15		1	2		
05:30		1	2		
05:45		1	1	5	10
06:00		0	0		
06:15		0	1		
06:30		0	7		
06:45		0	3	0	11
07:00		0	1		
07:15		1	2		
07:30		2	4		
07:45		1	3	4	10
08:00		0	1		
08:15		0	4		
08:30		0	3		
08:45		0	2	0	10
09:00		0	0		
09:15		0	2		
09:30		3	3		
09:45		1	2	4	7
10:00		1	2		
10:15		2	4		
10:30		2	0		
10:45		1	0	6	6
11:00		2	2		
11:15		4	2		
11:30		2	3		
11:45		1	0	9	7
Total		40	98		
Percent		29.0%	71.0%		

Tri-State Traffic Data, Inc

www.TSTData.com

Road: Valet Ramp Entrance
Location: 25 ft S of Harrah's Blvd
Counter: 13398
Weather: Clear

Site Code: 0407132
Station ID:
Station ID:
EB Harrah's Blvd Entrance

Latitude: 39' 85105.0000 North

Start Time	10-Apr-13 Wed	Enter Morning	Enter Afternoon	Hour Totals Morning	Hour Totals Afternoon
12:00		0	0		
12:15		3	2		
12:30		0	4		
12:45		2	5	5	11
01:00		2	3		
01:15		3	5		
01:30		2	1		
01:45		0	3	7	12
02:00		1	4		
02:15		2	3		
02:30		1	3		
02:45		2	5	6	15
03:00		1	3		
03:15		1	2		
03:30		2	2		
03:45		1	2	5	9
04:00		0	2		
04:15		1	4		
04:30		0	2		
04:45		0	1	1	9
05:00		0	4		
05:15		0	6		
05:30		0	4		
05:45		0	1	0	15
06:00		0	0		
06:15		1	1		
06:30		1	4		
06:45		2	1	4	6
07:00		2	2		
07:15		0	1		
07:30		0	0		
07:45		2	2	4	5
08:00		1	4		
08:15		1	2		
08:30		1	2		
08:45		0	1	3	9
09:00		0	2		
09:15		1	2		
09:30		0	1		
09:45		2	2	3	7
10:00		2	2		
10:15		2	2		
10:30		4	3		
10:45		0	5	8	12
11:00		2	4		
11:15		0	2		
11:30		4	4		
11:45		2	2	8	12
Total		54	122		
Percent		30.7%	69.3%		

Tri-State Traffic Data, Inc

www.TSTData.com

Road: Valet Ramp Entrance
Location: 25 ft S of Harrah's Blvd
Counter: 13398
Weather: Clear

Site Code: 0407132
Station ID:
Station ID:
EB Harrah's Blvd Entrance

Latitude: 39' 85105.0000 North

Start Time	11-Apr-13 Thu	Enter Morning	Enter Afternoon	Hour Totals Morning	Hour Totals Afternoon
12:00		2	0		
12:15		4	4		
12:30		0	3		
12:45		0	5	6	12
01:00		0	5		
01:15		3	1		
01:30		0	4		
01:45		1	2	4	12
02:00		0	6		
02:15		0	4		
02:30		0	4		
02:45		2	2	2	16
03:00		2	8		
03:15		0	3		
03:30		0	6		
03:45		1	4	3	21
04:00		1	2		
04:15		2	8		
04:30		0	2		
04:45		0	8	3	20
05:00		0	2		
05:15		0	0		
05:30		1	4		
05:45		0	3	1	9
06:00		0	6		
06:15		0	6		
06:30		0	6		
06:45		1	5	1	23
07:00		1	2		
07:15		2	3		
07:30		1	5		
07:45		2	5	6	15
08:00		0	5		
08:15		0	5		
08:30		0	2		
08:45		0	3	0	15
09:00		1	3		
09:15		1	2		
09:30		0	0		
09:45		2	2	4	7
10:00		2	7		
10:15		1	2		
10:30		3	6		
10:45		1	4	7	19
11:00		2	5		
11:15		1	7		
11:30		0	2		
11:45		2	3	5	17
Total		42	186		
Percent		18.4%	81.6%		

Tri-State Traffic Data, Inc

www.TSTData.com

Road: Valet Ramp Entrance
Location: 25 ft S of Harrah's Blvd
Counter: 13398
Weather: Clear

Site Code: 0407132
Station ID:
Station ID:
EB Harrah's Blvd Entrance

Latitude: 39' 85105.0000 North

Start Time	12-Apr-13 Fri	Enter Morning	Enter Afternoon	Hour Totals Morning	Hour Totals Afternoon
12:00		2	4		
12:15		3	3		
12:30		3	4		
12:45		2	4	10	15
01:00		2	4		
01:15		0	2		
01:30		0	5		
01:45		2	4	4	15
02:00		0	0		
02:15		3	6		
02:30		0	0		
02:45		2	6	5	12
03:00		0	10		
03:15		0	1		
03:30		2	6		
03:45		1	3	3	20
04:00		0	4		
04:15		0	9		
04:30		1	2		
04:45		0	6	1	21
05:00		0	4		
05:15		1	4		
05:30		0	7		
05:45		1	6	2	21
06:00		1	6		
06:15		0	4		
06:30		0	7		
06:45		0	8	1	25
07:00		0	12		
07:15		0	8		
07:30		0	8		
07:45		0	7	0	35
08:00		1	4		
08:15		2	4		
08:30		0	8		
08:45		4	6	7	22
09:00		0	4		
09:15		1	6		
09:30		0	5		
09:45		4	5	5	20
10:00		1	1		
10:15		1	10		
10:30		2	2		
10:45		5	2	9	15
11:00		2	7		
11:15		4	2		
11:30		2	1		
11:45		4	2	12	12
Total		59	233		
Percent		20.2%	79.8%		

Tri-State Traffic Data, Inc

www.TSTData.com

Road: Valet Ramp Entrance
Location: 25 ft S of Harrah's Blvd
Counter: 13398
Weather: Clear

Site Code: 0407132
Station ID:
Station ID:
EB Harrah's Blvd Entrance

Latitude: 39' 85105.0000 North

Start Time	13-Apr-13 Sat	Enter Morning	Enter Afternoon	Hour Totals Morning	Hour Totals Afternoon
12:00		2	4		
12:15		3	2		
12:30		2	4		
12:45		4	6	11	16
01:00		1	4		
01:15		1	2		
01:30		2	6		
01:45		3	4	7	16
02:00		1	1		
02:15		0	2		
02:30		4	4		
02:45		1	5	6	12
03:00		4	5		
03:15		1	2		
03:30		2	7		
03:45		0	2	7	16
04:00		3	2		
04:15		1	6		
04:30		0	7		
04:45		2	8	6	23
05:00		1	10		
05:15		0	12		
05:30		1	14		
05:45		0	6	2	42
06:00		2	8		
06:15		1	8		
06:30		0	10		
06:45		1	10	4	36
07:00		1	6		
07:15		0	6		
07:30		1	12		
07:45		0	6	2	30
08:00		3	2		
08:15		0	4		
08:30		1	3		
08:45		1	2	5	11
09:00		0	3		
09:15		2	7		
09:30		1	5		
09:45		3	6	6	21
10:00		0	5		
10:15		1	4		
10:30		5	6		
10:45		1	2	7	17
11:00		0	4		
11:15		3	4		
11:30		2	4		
11:45		4	4	9	16
Total		72	256		
Percent		22.0%	78.0%		

Tri-State Traffic Data, Inc

www.TSTData.com

Road: Valet Ramp Entrance
Location: 25 ft S of Harrah's Blvd
Counter: 13398
Weather: Clear

Site Code: 0407132
Station ID:
Station ID:
EB Harrah's Blvd Entrance

Latitude: 39' 85105.0000 North

Start Time	14-Apr-13 Sun	Enter Morning	Enter Afternoon	Hour Totals Morning	Hour Totals Afternoon
12:00		3	2		
12:15		4	5		
12:30		2	7		
12:45		1	5	10	19
01:00		0	4		
01:15		3	4		
01:30		2	9		
01:45		0	2	5	19
02:00		6	4		
02:15		3	3		
02:30		2	5		
02:45		1	6	12	18
03:00		2	2		
03:15		2	4		
03:30		2	7		
03:45		1	5	7	18
04:00		0	3		
04:15		2	3		
04:30		0	4		
04:45		0	5	2	15
05:00		0	6		
05:15		0	3		
05:30		0	2		
05:45		0	3	0	14
06:00		0	5		
06:15		1	8		
06:30		1	2		
06:45		0	3	2	18
07:00		1	5		
07:15		1	1		
07:30		0	3		
07:45		0	6	2	15
08:00		0	2		
08:15		1	2		
08:30		0	0		
08:45		0	4	1	8
09:00		0	2		
09:15		1	2		
09:30		1	*		
09:45		1	*	3	4
10:00		4	*		
10:15		2	*		
10:30		5	*		
10:45		2	*	13	0
11:00		2	*		
11:15		4	*		
11:30		1	*		
11:45		2	*	9	0
Total		66	148		
Percent		30.8%	69.2%		
Grand Total		383	1201		
Percent		24.2%	75.8%		
ADT		ADT 220		AADT 220	

Tri-State Traffic Data, Inc

www.TSTData.com

Road: Valet Ramp Entrance
Location: 25 ft S of Harrah's Blvd
Counter: 20391
Weather: Clear

Site Code: 0407132
Station ID:
Station ID:
Entrance from WB Harrah's Blvd

Latitude: 39' 85105.0000 North

Start Time	07-Apr-13 Sun	Entrance Morning	Entrance Afternoon	Hour Totals Morning	Hour Totals Afternoon
12:00		*	*		
12:15		*	*		
12:30		*	*		
12:45		*	*	0	0
01:00		*	*		
01:15		*	*		
01:30		*	*		
01:45		*	*	0	0
02:00		*	*		
02:15		*	*		
02:30		*	*		
02:45		*	*	0	0
03:00		*	*		
03:15		*	*		
03:30		*	*		
03:45		*	*	0	0
04:00		*	*		
04:15		*	*		
04:30		*	*		
04:45		*	*	0	0
05:00		*	*		
05:15		*	*		
05:30		*	*		
05:45		*	*	0	0
06:00		*	*		
06:15		*	*		
06:30		*	*		
06:45		*	4	0	4
07:00		*	6		
07:15		*	9		
07:30		*	4		
07:45		*	10	0	29
08:00		*	2		
08:15		*	2		
08:30		*	8		
08:45		*	6	0	18
09:00		*	4		
09:15		*	3		
09:30		*	6		
09:45		*	4	0	17
10:00		*	3		
10:15		*	4		
10:30		*	4		
10:45		*	4	0	15
11:00		*	6		
11:15		*	4		
11:30		*	4		
11:45		*	3	0	17
Total		0	100		
Percent		0.0%	100.0%		

Tri-State Traffic Data, Inc

www.TSTData.com

Road: Valet Ramp Entrance
Location: 25 ft S of Harrah's Blvd
Counter: 20391
Weather: Clear

Site Code: 0407132
Station ID:
Station ID:
Entrance from WB Harrah's Blvd

Latitude: 39' 85105.0000 North

Start Time	08-Apr-13 Mon	Entrance Morning	Entrance Afternoon	Hour Totals Morning	Hour Totals Afternoon
12:00		2	4		
12:15		1	6		
12:30		5	4		
12:45		3	1	11	15
01:00		0	2		
01:15		1	3		
01:30		2	8		
01:45		3	8	6	21
02:00		2	4		
02:15		1	4		
02:30		2	7		
02:45		1	4	6	19
03:00		0	4		
03:15		3	6		
03:30		0	2		
03:45		0	4	3	16
04:00		0	1		
04:15		2	2		
04:30		0	2		
04:45		0	2	2	7
05:00		0	4		
05:15		1	2		
05:30		1	4		
05:45		0	2	2	12
06:00		0	6		
06:15		1	6		
06:30		1	4		
06:45		2	7	4	23
07:00		1	2		
07:15		1	5		
07:30		2	4		
07:45		0	5	4	16
08:00		0	2		
08:15		2	6		
08:30		0	2		
08:45		2	2	4	12
09:00		1	1		
09:15		2	4		
09:30		0	5		
09:45		0	2	3	12
10:00		2	0		
10:15		2	1		
10:30		0	4		
10:45		1	1	5	6
11:00		2	2		
11:15		4	1		
11:30		4	2		
11:45		4	1	14	6
Total		64	165		
Percent		27.9%	72.1%		

Tri-State Traffic Data, Inc

www.TSTData.com

Road: Valet Ramp Entrance
Location: 25 ft S of Harrah's Blvd
Counter: 20391
Weather: Clear

Site Code: 0407132
Station ID:
Station ID:
Entrance from WB Harrah's Blvd

Latitude: 39' 85105.0000 North

Start Time	09-Apr-13 Tue	Entrance Morning	Entrance Afternoon	Hour Totals Morning	Hour Totals Afternoon
12:00		0	10		
12:15		0	3		
12:30		3	8		
12:45		1	2	4	23
01:00		0	7		
01:15		0	7		
01:30		0	2		
01:45		0	2	0	18
02:00		1	3		
02:15		3	4		
02:30		1	6		
02:45		1	3	6	16
03:00		1	5		
03:15		1	6		
03:30		1	7		
03:45		1	2	4	20
04:00		2	5		
04:15		0	2		
04:30		1	2		
04:45		1	2	4	11
05:00		0	3		
05:15		1	3		
05:30		1	2		
05:45		1	6	3	14
06:00		0	2		
06:15		1	5		
06:30		0	5		
06:45		0	4	1	16
07:00		0	6		
07:15		0	6		
07:30		2	3		
07:45		4	4	6	19
08:00		1	10		
08:15		1	2		
08:30		0	4		
08:45		2	5	4	21
09:00		4	0		
09:15		4	4		
09:30		3	1		
09:45		4	5	15	10
10:00		2	4		
10:15		3	1		
10:30		5	2		
10:45		4	3	14	10
11:00		2	5		
11:15		2	4		
11:30		3	2		
11:45		4	2	11	13
Total		72	191		
Percent		27.4%	72.6%		

Tri-State Traffic Data, Inc

www.TSTData.com

Road: Valet Ramp Entrance
Location: 25 ft S of Harrah's Blvd
Counter: 20391
Weather: Clear

Site Code: 0407132
Station ID:
Station ID:
Entrance from WB Harrah's Blvd

Latitude: 39' 85105.0000 North

Start Time	10-Apr-13 Wed	Entrance Morning	Entrance Afternoon	Hour Totals Morning	Hour Totals Afternoon
12:00		1	4		
12:15		2	4		
12:30		2	4		
12:45		1	2	6	14
01:00		0	3		
01:15		2	5		
01:30		3	3		
01:45		1	7	6	18
02:00		0	8		
02:15		0	8		
02:30		1	6		
02:45		0	6	1	28
03:00		2	4		
03:15		1	5		
03:30		1	6		
03:45		1	3	5	18
04:00		0	4		
04:15		1	6		
04:30		0	4		
04:45		0	1	1	15
05:00		1	3		
05:15		1	2		
05:30		0	6		
05:45		1	1	3	12
06:00		0	4		
06:15		0	5		
06:30		0	6		
06:45		0	6	0	21
07:00		0	6		
07:15		1	5		
07:30		1	1		
07:45		0	7	2	19
08:00		0	2		
08:15		2	7		
08:30		1	6		
08:45		3	3	6	18
09:00		2	5		
09:15		1	4		
09:30		2	4		
09:45		2	2	7	15
10:00		4	4		
10:15		2	4		
10:30		3	4		
10:45		2	2	11	14
11:00		0	4		
11:15		0	0		
11:30		6	5		
11:45		6	2	12	11
Total		60	203		
Percent		22.8%	77.2%		

Tri-State Traffic Data, Inc

www.TSTData.com

Road: Valet Ramp Entrance
Location: 25 ft S of Harrah's Blvd
Counter: 20391
Weather: Clear

Site Code: 0407132
Station ID:
Station ID:
Entrance from WB Harrah's Blvd

Latitude: 39' 85105.0000 North

Start Time	11-Apr-13 Thu	Entrance Morning	Entrance Afternoon	Hour Totals Morning	Hour Totals Afternoon
12:00		2	6		
12:15		0	4		
12:30		1	10		
12:45		2	7	5	27
01:00		2	8		
01:15		0	3		
01:30		0	6		
01:45		1	8	3	25
02:00		1	4		
02:15		1	5		
02:30		1	7		
02:45		0	10	3	26
03:00		1	8		
03:15		2	6		
03:30		1	6		
03:45		2	4	6	24
04:00		0	4		
04:15		0	5		
04:30		0	4		
04:45		0	6	0	19
05:00		1	3		
05:15		0	7		
05:30		0	5		
05:45		0	6	1	21
06:00		0	5		
06:15		0	4		
06:30		0	8		
06:45		0	8	0	25
07:00		0	4		
07:15		1	12		
07:30		2	9		
07:45		0	6	3	31
08:00		0	5		
08:15		2	3		
08:30		0	7		
08:45		2	5	4	20
09:00		0	6		
09:15		3	5		
09:30		2	4		
09:45		6	4	11	19
10:00		2	6		
10:15		2	3		
10:30		2	3		
10:45		4	4	10	16
11:00		4	5		
11:15		1	6		
11:30		6	2		
11:45		6	5	17	18
Total		63	271		
Percent		18.9%	81.1%		

Tri-State Traffic Data, Inc

www.TSTData.com

Road: Valet Ramp Entrance
Location: 25 ft S of Harrah's Blvd
Counter: 20391
Weather: Clear

Site Code: 0407132
Station ID:
Station ID:
Entrance from WB Harrah's Blvd

Latitude: 39' 85105.0000 North

Start Time	12-Apr-13 Fri	Entrance Morning	Entrance Afternoon	Hour Totals Morning	Hour Totals Afternoon
12:00		4	6		
12:15		1	4		
12:30		2	6		
12:45		2	6	9	22
01:00		2	5		
01:15		0	6		
01:30		1	6		
01:45		3	8	6	25
02:00		1	6		
02:15		3	8		
02:30		0	8		
02:45		2	8	6	30
03:00		0	7		
03:15		0	6		
03:30		0	6		
03:45		0	10	0	29
04:00		1	10		
04:15		0	6		
04:30		1	9		
04:45		3	5	5	30
05:00		0	14		
05:15		1	12		
05:30		1	12		
05:45		0	12	2	50
06:00		0	10		
06:15		0	22		
06:30		0	12		
06:45		0	11	0	55
07:00		0	11		
07:15		0	16		
07:30		0	12		
07:45		0	16	0	55
08:00		0	8		
08:15		2	11		
08:30		2	14		
08:45		2	6	6	39
09:00		0	6		
09:15		2	6		
09:30		3	7		
09:45		2	6	7	25
10:00		2	9		
10:15		2	4		
10:30		2	10		
10:45		6	8	12	31
11:00		4	8		
11:15		4	4		
11:30		3	8		
11:45		10	5	21	25
Total		74	416		
Percent		15.1%	84.9%		

Tri-State Traffic Data, Inc

www.TSTData.com

Road: Valet Ramp Entrance
Location: 25 ft S of Harrah's Blvd
Counter: 20391
Weather: Clear

Site Code: 0407132
Station ID:
Station ID:
Entrance from WB Harrah's Blvd

Latitude: 39' 85105.0000 North

Start Time	13-Apr-13 Sat	Entrance Morning	Entrance Afternoon	Hour Totals Morning	Hour Totals Afternoon
12:00		4	5		
12:15		2	4		
12:30		6	4		
12:45		4	6	16	19
01:00		4	8		
01:15		0	6		
01:30		2	10		
01:45		6	8	12	32
02:00		3	14		
02:15		5	12		
02:30		6	9		
02:45		2	6	16	41
03:00		4	12		
03:15		0	6		
03:30		0	5		
03:45		0	8	4	31
04:00		4	9		
04:15		3	12		
04:30		2	16		
04:45		0	14	9	51
05:00		1	18		
05:15		0	20		
05:30		0	9		
05:45		2	14	3	61
06:00		4	14		
06:15		0	11		
06:30		0	18		
06:45		2	14	6	57
07:00		1	6		
07:15		4	6		
07:30		0	15		
07:45		0	16	5	43
08:00		2	6		
08:15		0	15		
08:30		2	16		
08:45		4	20	8	57
09:00		2	7		
09:15		2	9		
09:30		4	5		
09:45		2	13	10	34
10:00		1	2		
10:15		3	7		
10:30		5	6		
10:45		2	8	11	23
11:00		0	8		
11:15		6	6		
11:30		4	8		
11:45		2	6	12	28
Total		112	477		
Percent		19.0%	81.0%		

Tri-State Traffic Data, Inc

www.TSTData.com

Road: Valet Ramp Entrance
Location: 25 ft S of Harrah's Blvd
Counter: 20391
Weather: Clear

Site Code: 0407132
Station ID:
Station ID:
Entrance from WB Harrah's Blvd

Latitude: 39' 85105.0000 North

Start Time	14-Apr-13 Sun	Entrance Morning	Entrance Afternoon	Hour Totals Morning	Hour Totals Afternoon
12:00		10	11		
12:15		2	9		
12:30		6	8		
12:45		2	12	20	40
01:00		2	8		
01:15		1	8		
01:30		5	9		
01:45		5	10	13	35
02:00		2	10		
02:15		4	10		
02:30		1	6		
02:45		6	14	13	40
03:00		5	12		
03:15		6	8		
03:30		1	12		
03:45		0	14	12	46
04:00		1	11		
04:15		3	6		
04:30		2	8		
04:45		1	10	7	35
05:00		2	11		
05:15		0	6		
05:30		2	8		
05:45		4	7	8	32
06:00		0	8		
06:15		0	10		
06:30		0	4		
06:45		2	0	2	22
07:00		0	10		
07:15		0	12		
07:30		0	4		
07:45		2	3	2	29
08:00		2	3		
08:15		0	4		
08:30		1	3		
08:45		2	8	5	18
09:00		1	2		
09:15		2	4		
09:30		4	*		
09:45		2	*	9	6
10:00		1	*		
10:15		3	*		
10:30		3	*		
10:45		11	*	18	0
11:00		5	*		
11:15		2	*		
11:30		4	*		
11:45		9	*	20	0
Total		129	303		
Percent		29.9%	70.1%		
Grand Total		574	2126		
Percent		21.3%	78.7%		
ADT		ADT 375		AADT 375	

Tri-State Traffic Data, Inc

www.TSTData.com

Street: Parking Garage
Location: Exit Part 1
Weather: Clear
Counter: MIO

Site Code:
Station ID:
Station ID:

Latitude: 0' 0.0000 Undefined

Start	08-Apr-13		Tue		Wed		Thu		Fri		Sat		Sun		Average Da	
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
12:00	*	*	*	*	*	*	*	*	69	79	**132**	78	110	44	104	67
12:15	*	*	*	*	*	*	*	*	**104**	61	**142**	51	**141**	60	**129**	57
12:30	*	*	*	*	*	*	*	*	**91**	75	**170**	56	**155**	84	**139**	72
12:45	*	*	*	*	*	*	*	*	**84**	89	**128**	62	**149**	91	**120**	81
01:00	*	*	*	*	*	*	*	*	**106**	59	131	59	**141**	64	**126**	61
01:15	*	*	*	*	*	*	*	*	63	98	127	70	138	70	109	79
01:30	*	*	*	*	*	*	*	*	67	110	104	78	139	94	103	94
01:45	*	*	*	*	*	*	*	*	84	104	105	84	132	83	107	90
02:00	*	*	*	*	*	*	*	*	66	118	119	90	102	98	96	102
02:15	*	*	*	*	*	*	*	*	64	101	104	78	149	103	106	94
02:30	*	*	*	*	*	*	*	*	58	97	114	114	94	96	89	102
02:45	*	*	*	*	*	*	*	*	58	91	123	87	96	99	92	92
03:00	*	*	*	*	*	*	*	*	50	101	80	89	87	109	72	100
03:15	*	*	*	*	*	*	*	*	47	83	77	100	88	117	71	100
03:30	*	*	*	*	*	*	*	*	48	95	77	90	79	101	68	95
03:45	*	*	*	*	*	*	*	*	34	91	42	115	71	112	49	106
04:00	*	*	*	*	*	*	*	*	48	102	56	111	72	125	59	113
04:15	*	*	*	*	*	*	*	*	38	108	56	94	41	145	45	116
04:30	*	*	*	*	*	*	*	*	36	90	50	109	58	127	48	109
04:45	*	*	*	*	*	*	*	*	28	117	42	108	37	127	36	117
05:00	*	*	*	*	*	*	*	*	29	148	40	111	52	148	40	136
05:15	*	*	*	*	*	*	*	*	27	151	33	102	45	129	35	127
05:30	*	*	*	*	*	*	*	*	30	127	25	97	27	114	27	113
05:45	*	*	*	*	*	*	*	*	27	135	31	134	29	149	29	139
06:00	*	*	*	*	*	*	*	*	24	142	20	125	31	113	25	127
06:15	*	*	*	*	*	*	*	*	19	139	39	105	30	**146**	29	130
06:30	*	*	*	*	*	*	*	*	20	127	25	123	19	**101**	21	117
06:45	*	*	*	*	*	*	*	*	18	133	27	116	30	**155**	25	**135**
07:00	*	*	*	*	*	*	*	*	26	107	14	122	22	**146**	21	**125**
07:15	*	*	*	*	*	*	*	*	26	148	22	135	25	115	24	**133**
07:30	*	*	*	*	*	*	*	*	19	134	24	121	31	119	25	**125**
07:45	*	*	*	*	*	*	*	*	19	**130**	20	115	40	91	26	112
08:00	*	*	*	*	*	*	*	92	23	**160**	31	125	16	*	23	126
08:15	*	*	*	*	*	*	*	96	17	**150**	18	127	29	*	21	124
08:30	*	*	*	*	*	*	*	98	21	**158**	29	141	21	*	24	132
08:45	*	*	*	*	*	*	*	87	23	119	22	115	22	*	22	107
09:00	*	*	*	*	*	*	*	**95**	18	125	20	117	29	*	22	112
09:15	*	*	*	*	*	*	*	**114**	29	139	26	127	32	*	29	127
09:30	*	*	*	*	*	*	*	**110**	26	157	23	143	32	*	27	137
09:45	*	*	*	*	*	*	*	**95**	23	115	29	141	27	*	26	117
10:00	*	*	*	*	*	*	*	89	37	144	31	**149**	53	*	40	127
10:15	*	*	*	*	*	*	*	89	29	136	45	**155**	43	*	39	127
10:30	*	*	*	*	*	*	*	80	47	137	38	**148**	40	*	42	122
10:45	*	*	*	*	*	*	*	82	41	141	38	**162**	48	*	42	128
11:00	*	*	*	*	*	*	*	80	52	154	51	145	46	*	50	126
11:15	*	*	*	*	*	*	*	62	50	133	48	106	45	*	48	100
11:30	*	*	*	*	*	*	*	81	59	111	55	110	52	*	55	101
11:45	*	*	*	*	*	*	*	65	57	116	61	120	37	*	52	100
Total	0	0	0	0	0	0	0	1415	2079	5685	2864	5260	3032	3475	2657	5279
Day Total	0		0		0		1415		7764		8124		6507		7936	
% Splits	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0 %	26.8%	73.2%	35.3%	64.7%	46.6%	53.4%	33.5%	66.5%
Peak	-	-	-	-	-	-	-	09:00	00:15	07:45	12:00	10:00	00:15	06:15	00:15	06:45
Vol.	-	-	-	-	-	-	-	414	385	598	572	614	586	548	514	518
P.H.F.								0.908	0.908	0.934	0.841	0.948	0.945	0.884	0.924	0.932

ADT ADT 7,936 AADT 7,936

Tri-State Traffic Data, Inc

www.TSTData.com

Street: Parking Garage
Location: Exit Part 1
Weather: Clear
Counter: TSTD

Site Code:
Station ID:
Station ID:

Latitude: 0' 0.0000 Undefined

Start	01-Apr-13		Tue		Wed		Thu		Fri		Sat		Sun		Average	Da
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
12:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12:15	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12:30	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12:45	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
01:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
01:15	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
01:30	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
01:45	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
02:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
02:15	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
02:30	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
02:45	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
03:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
03:15	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
03:30	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
03:45	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
04:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
04:15	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
04:30	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
04:45	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:15	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:30	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:45	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:15	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:30	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:45	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
07:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
07:15	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
07:30	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
07:45	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
08:00	*	*	*	*	*	*	*	*	*	*	*	*	*	**141**	*	**141**
08:15	*	*	*	*	*	*	*	*	*	*	*	*	*	**135**	*	**135**
08:30	*	*	*	*	*	*	*	*	*	*	*	*	*	**134**	*	**134**
08:45	*	*	*	*	*	*	*	*	*	*	*	*	*	**122**	*	**122**
09:00	*	*	*	*	*	*	*	*	*	*	*	*	*	118	*	118
09:15	*	*	*	*	*	*	*	*	*	*	*	*	*	118	*	118
09:30	*	*	*	*	*	*	*	*	*	*	*	*	*	116	*	116
09:45	*	*	*	*	*	*	*	*	*	*	*	*	*	93	*	93
10:00	*	*	*	*	*	*	*	*	*	*	*	*	*	100	*	100
10:15	*	*	*	*	*	*	*	*	*	*	*	*	*	118	*	118
10:30	*	*	*	*	*	*	*	*	*	*	*	*	*	107	*	107
10:45	*	*	*	*	*	*	*	*	*	*	*	*	*	94	*	94
11:00	*	*	*	*	*	*	*	*	*	*	*	*	*	85	*	85
11:15	*	*	*	*	*	*	*	*	*	*	*	*	*	89	*	89
11:30	*	*	*	*	*	*	*	*	*	*	*	*	*	76	*	76
11:45	*	*	*	*	*	*	*	*	*	*	*	*	*	71	*	71
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	1717	0	1717
Day Total	0		0		0		0		0		0		1717		1717	
% Splits	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0 %	0.0%	100.0%
Peak	-	-	-	-	-	-	-	-	-	-	-	-	-	08:00	-	08:00
Vol.	-	-	-	-	-	-	-	-	-	-	-	-	-	532	-	532
P.H.F.														0.943		0.943

Tri-State Traffic Data, Inc

www.TSTData.com

Street: Parking Garage
Location: Exit Part 1
Weather: Clear
Counter: TSTD

Site Code:
Station ID:
Station ID:

Latitude: 0' 0.0000 Undefined

Start	08-Apr-13		Tue		Wed		Thu		Fri		Sat		Sun		Average Da	
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
12:00	75	33	37	54	52	51	47	48	*	*	*	*	*	*	53	46
12:15	**106**	45	50	52	**70**	43	**64**	45	*	*	*	*	*	*	**72**	46
12:30	**68**	56	60	51	**52**	50	**50**	57	*	*	*	*	*	*	**58**	54
12:45	**81**	60	61	47	**46**	47	**51**	75	*	*	*	*	*	*	**60**	57
01:00	**99**	44	54	62	**54**	40	**48**	53	*	*	*	*	*	*	**64**	50
01:15	74	60	39	60	51	48	57	49	*	*	*	*	*	*	55	54
01:30	64	57	48	51	35	59	39	65	*	*	*	*	*	*	46	58
01:45	74	59	48	64	42	67	53	69	*	*	*	*	*	*	54	65
02:00	66	69	43	75	43	73	39	119	*	*	*	*	*	*	48	84
02:15	52	79	35	71	27	66	24	104	*	*	*	*	*	*	34	80
02:30	51	88	31	67	41	60	37	90	*	*	*	*	*	*	40	76
02:45	53	53	23	72	30	75	40	98	*	*	*	*	*	*	36	74
03:00	46	59	29	55	29	70	34	**130**	*	*	*	*	*	*	34	78
03:15	31	72	33	74	32	**65**	19	**100**	*	*	*	*	*	*	29	78
03:30	41	65	27	76	30	**88**	26	**93**	*	*	*	*	*	*	31	80
03:45	34	67	23	70	17	**89**	17	**114**	*	*	*	*	*	*	23	85
04:00	42	69	24	**96**	20	**91**	15	103	*	*	*	*	*	*	25	90
04:15	36	90	18	**79**	19	58	24	107	*	*	*	*	*	*	24	**84**
04:30	25	79	19	**79**	10	76	13	94	*	*	*	*	*	*	17	**82**
04:45	16	76	17	**73**	22	76	16	114	*	*	*	*	*	*	18	**85**
05:00	30	63	15	83	15	100	15	118	*	*	*	*	*	*	19	**91**
05:15	28	69	12	64	9	76	17	101	*	*	*	*	*	*	16	78
05:30	18	70	15	68	11	68	15	95	*	*	*	*	*	*	15	75
05:45	19	74	14	62	10	62	19	89	*	*	*	*	*	*	16	72
06:00	26	56	13	85	7	74	13	91	*	*	*	*	*	*	15	76
06:15	12	70	19	81	9	69	15	97	*	*	*	*	*	*	14	79
06:30	14	67	11	64	18	80	22	101	*	*	*	*	*	*	16	78
06:45	15	78	15	74	9	78	16	71	*	*	*	*	*	*	14	75
07:00	13	82	13	79	3	73	9	116	*	*	*	*	*	*	10	88
07:15	12	69	16	82	14	75	17	106	*	*	*	*	*	*	15	83
07:30	15	76	11	85	8	78	10	88	*	*	*	*	*	*	11	82
07:45	8	79	13	79	9	82	13	94	*	*	*	*	*	*	11	84
08:00	9	72	12	66	11	79	15	*	*	*	*	*	*	*	12	72
08:15	15	70	15	82	7	74	13	*	*	*	*	*	*	*	12	75
08:30	21	**88**	15	71	17	73	10	*	*	*	*	*	*	*	16	77
08:45	16	**84**	23	64	9	70	14	*	*	*	*	*	*	*	16	73
09:00	13	**73**	13	79	10	82	13	*	*	*	*	*	*	*	12	78
09:15	10	**77**	17	69	10	69	14	*	*	*	*	*	*	*	13	72
09:30	16	58	22	79	19	77	14	*	*	*	*	*	*	*	18	71
09:45	28	68	17	85	26	79	13	*	*	*	*	*	*	*	21	77
10:00	15	63	20	65	14	88	23	*	*	*	*	*	*	*	18	72
10:15	25	66	27	62	13	68	24	*	*	*	*	*	*	*	22	65
10:30	33	53	30	51	17	64	36	*	*	*	*	*	*	*	29	56
10:45	28	62	40	55	16	68	20	*	*	*	*	*	*	*	26	62
11:00	21	59	**33**	56	24	84	23	*	*	*	*	*	*	*	25	66
11:15	35	56	**48**	58	34	64	29	*	*	*	*	*	*	*	36	59
11:30	38	43	**45**	64	35	65	37	*	*	*	*	*	*	*	39	57
11:45	31	41	**116**	61	43	53	28	*	*	*	*	*	*	*	54	52
Total	1698	3166	1379	3301	1149	3364	1220	2894	0	0	0	0	0	0	1362	3451
Day Total		4864		4680		4513		4114		0		0		0		4813
% Splits	34.9%	65.1%	29.5%	70.5%	25.5%	74.5%	29.7%	70.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	28.3%	71.7%
Peak	00:15	08:30	11:00	04:00	00:15	03:15	00:15	03:00	-	-	-	-	-	-	00:15	04:15
Vol.	354	322	242	327	222	333	213	437	-	-	-	-	-	-	254	342
P.H.F.	0.835	0.915	0.522	0.852	0.793	0.915	0.832	0.840							0.882	0.940

ADT ADT 4,972 AADT 4,972

Tri-State Traffic Data, Inc

www.TSTData.com

Street: Parking Garage
Location: Entrance Part 2
Weather: Clear
Counter: MIO

Site Code:
Station ID:
Station ID:

Latitude: 0' 0.0000 Undefined

Start	08-Apr-13		Tue		Wed		Thu		Fri		Sat		Sun		Average	Da
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
12:00	*	*	*	*	*	*	*	*	37	130	55	123	56	145	49	133
12:15	*	*	*	*	*	*	*	*	23	125	52	124	47	**150**	41	133
12:30	*	*	*	*	*	*	*	*	27	115	44	131	43	**166**	38	137
12:45	*	*	*	*	*	*	*	*	31	136	42	120	44	**155**	39	137
01:00	*	*	*	*	*	*	*	*	26	112	36	118	48	**151**	37	127
01:15	*	*	*	*	*	*	*	*	21	106	25	127	34	135	27	123
01:30	*	*	*	*	*	*	*	*	19	144	44	116	46	141	36	134
01:45	*	*	*	*	*	*	*	*	10	142	27	114	34	135	24	130
02:00	*	*	*	*	*	*	*	*	16	109	30	123	32	132	26	121
02:15	*	*	*	*	*	*	*	*	13	116	24	107	35	120	24	114
02:30	*	*	*	*	*	*	*	*	14	128	19	124	30	117	21	123
02:45	*	*	*	*	*	*	*	*	20	121	22	116	13	130	18	122
03:00	*	*	*	*	*	*	*	*	10	124	16	132	17	132	14	129
03:15	*	*	*	*	*	*	*	*	15	118	12	108	25	123	17	116
03:30	*	*	*	*	*	*	*	*	17	147	16	114	18	121	17	127
03:45	*	*	*	*	*	*	*	*	13	136	10	120	8	135	10	130
04:00	*	*	*	*	*	*	*	*	12	137	19	141	16	133	16	137
04:15	*	*	*	*	*	*	*	*	3	161	8	120	18	122	10	134
04:30	*	*	*	*	*	*	*	*	5	145	5	125	13	127	8	132
04:45	*	*	*	*	*	*	*	*	9	145	13	125	10	93	11	121
05:00	*	*	*	*	*	*	*	*	14	158	7	128	12	100	11	129
05:15	*	*	*	*	*	*	*	*	6	155	9	135	19	110	11	133
05:30	*	*	*	*	*	*	*	*	18	194	10	**155**	9	106	12	**152**
05:45	*	*	*	*	*	*	*	*	12	159	17	**156**	18	116	16	**144**
06:00	*	*	*	*	*	*	*	*	22	152	16	**154**	13	122	17	**143**
06:15	*	*	*	*	*	*	*	*	14	170	15	**143**	21	120	17	**144**
06:30	*	*	*	*	*	*	*	*	19	172	23	137	31	104	24	138
06:45	*	*	*	*	*	*	*	*	17	**177**	16	164	37	116	23	152
07:00	*	*	*	*	*	*	*	*	17	**192**	23	134	30	111	23	146
07:15	*	*	*	*	*	*	*	*	24	**189**	36	142	25	85	28	139
07:30	*	*	*	*	*	*	*	*	19	**174**	32	166	38	95	30	145
07:45	*	*	*	*	*	*	*	*	33	138	29	130	35	94	32	121
08:00	*	*	*	*	*	*	*	84	34	140	36	135	30	*	33	120
08:15	*	*	*	*	*	*	*	90	42	141	38	114	38	*	39	115
08:30	*	*	*	*	*	*	*	73	48	125	41	141	44	*	44	113
08:45	*	*	*	*	*	*	*	72	60	129	44	148	60	*	55	116
09:00	*	*	*	*	*	*	*	78	84	103	56	143	70	*	70	108
09:15	*	*	*	*	*	*	*	64	64	112	72	117	62	*	66	98
09:30	*	*	*	*	*	*	*	66	103	94	76	112	64	*	81	91
09:45	*	*	*	*	*	*	*	80	78	100	89	121	72	*	80	100
10:00	*	*	*	*	*	*	*	66	101	112	78	121	91	*	90	100
10:15	*	*	*	*	*	*	*	83	84	82	85	132	83	*	84	99
10:30	*	*	*	*	*	*	*	**77**	114	116	79	116	91	*	95	103
10:45	*	*	*	*	*	*	*	**79**	107	108	86	125	91	*	95	104
11:00	*	*	*	*	*	*	*	**89**	**127**	136	**105**	145	**126**	*	**119**	123
11:15	*	*	*	*	*	*	*	**104**	**134**	127	**113**	116	**120**	*	**122**	116
11:30	*	*	*	*	*	*	*	77	**142**	114	**125**	136	**121**	*	**129**	109
11:45	*	*	*	*	*	*	*	46	**147**	51	**108**	84	**153**	*	**136**	60
Total	0	0	0	0	0	0	0	1228	2025	6417	1983	6178	2191	3942	2065	5921
Day Total		0		0		0		1228		8442		8161		6133		7986
% Splits	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0 %	24.0%	76.0%	24.3%	75.7%	35.7%	64.3%	25.9%	74.1%
Peak	-	-	-	-	-	-	-	10:30	11:00	06:45	11:00	05:30	11:00	00:15	11:00	05:30
Vol.	-	-	-	-	-	-	-	349	550	732	451	608	520	622	506	583
P.H.F.								0.839	0.935	0.953	0.902	0.974	0.850	0.937	0.930	0.959

ADT ADT 7,988 AADT 7,988

Tri-State Traffic Data, Inc.

www.TSTData.com

Location:Bensalem, PA
Intersection:Parx Dwy/Retail Cross St
Date:Friday, March 22, 2013
Counter:pb

File Name : EG0322-5
Site Code : 00000000
Start Date : 3/22/2013
Page No : 1

Groups Printed- Cars/Trucks - Buses - Taxis

	PARX DRIVEWAY Southbound					RETAIL CROSS STREET Westbound					PARX DRIVEWAY Northbound					RETAIL CROSS STREET Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
04:00 PM	7	78	0	0	85	0	0	0	0	0	0	28	11	0	39	13	3	1	0	17	141
04:15 PM	1	81	2	0	84	0	0	0	0	0	0	36	12	0	48	44	8	1	0	53	185
04:30 PM	4	76	0	0	80	2	1	2	0	5	2	50	6	0	58	19	6	5	0	30	173
04:45 PM	2	78	0	0	80	0	0	0	1	1	0	52	7	0	59	11	5	0	0	16	156
Total	14	313	2	0	329	2	1	2	1	6	2	166	36	0	204	87	22	7	0	116	655
05:00 PM	2	75	0	0	77	0	3	1	0	4	1	57	6	0	64	23	2	4	0	29	174
05:15 PM	3	74	0	0	77	1	2	2	0	5	0	42	6	0	48	16	2	2	0	20	150
05:30 PM	4	74	0	0	78	1	0	0	0	1	2	64	5	0	71	15	3	3	1	22	172
05:45 PM	7	74	0	0	81	0	1	1	0	2	0	40	4	0	44	14	2	2	0	18	145
Total	16	297	0	0	313	2	6	4	0	12	3	203	21	0	227	68	9	11	1	89	641
06:00 PM	3	72	1	0	76	2	0	0	0	2	1	70	8	0	79	19	3	1	0	23	180
06:15 PM	1	73	0	0	74	0	2	1	0	3	0	52	8	0	60	17	2	5	0	24	161
06:30 PM	2	84	0	0	86	1	0	0	0	1	0	48	3	0	51	8	1	5	0	14	152
06:45 PM	2	82	0	0	84	1	0	0	0	1	0	60	2	0	62	4	1	2	0	7	154
Total	8	311	1	0	320	4	2	1	0	7	1	230	21	0	252	48	7	13	0	68	647
07:00 PM	1	63	0	0	64	0	0	0	0	0	0	70	3	0	73	11	0	1	0	12	149
07:15 PM	2	73	0	0	75	0	0	0	0	0	2	71	3	0	76	12	0	0	0	12	163
07:30 PM	4	69	0	0	73	1	0	0	0	1	0	71	3	0	74	6	1	3	0	10	158
07:45 PM	3	85	0	0	88	0	1	0	0	1	0	74	1	0	75	10	1	4	0	15	179
Total	10	290	0	0	300	1	1	0	0	2	2	286	10	0	298	39	2	8	0	49	649
Grand Total	48	1211	3	0	1262	9	10	7	1	27	8	885	88	0	981	242	40	39	1	322	2592
Apprch %	3.8	96	0.2	0		33.3	37	25.9	3.7		0.8	90.2	9	0		75.2	12.4	12.1	0.3		
Total %	1.9	46.7	0.1	0	48.7	0.3	0.4	0.3	0	1	0.3	34.1	3.4	0	37.8	9.3	1.5	1.5	0	12.4	
Cars/Trucks	46	1182	3	0	1231	9	10	7	1	27	7	883	87	0	977	241	39	39	1	320	2555
% Cars/Trucks	95.8	97.6	100	0	97.5	100	100	100	100	100	87.5	99.8	98.9	0	99.6	99.6	97.5	100	100	99.4	98.6
Buses	0	25	0	0	25	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	26
% Buses	0	2.1	0	0	2	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	1
Taxis	2	4	0	0	6	0	0	0	0	0	1	1	1	0	3	1	1	0	0	2	11
% Taxis	4.2	0.3	0	0	0.5	0	0	0	0	0	12.5	0.1	1.1	0	0.3	0.4	2.5	0	0	0.6	0.4

Tri-State Traffic Data, Inc.

www.TSTData.com

Location: Bensalem, PA
Intersection:Richilieu Rd/Parx Entrance
Date:Friday, March 22, 2013
Counter:RZ

File Name : EG0322-4
Site Code : 00000000
Start Date : 3/22/2013
Page No : 1

Groups Printed- Cars - Buses - Taxis

	RICHILIE RD Southbound				PARX ENT ONLY Westbound				RICHILIE RD Northbound				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
04:00 PM	105	2	0	107	0	0	0	0	29	127	0	156	263
04:15 PM	117	0	0	117	0	0	0	0	18	134	0	152	269
04:30 PM	99	0	0	99	0	0	0	0	25	157	0	182	281
04:45 PM	102	1	0	103	0	0	0	0	28	154	0	182	285
Total	423	3	0	426	0	0	0	0	100	572	0	672	1098
05:00 PM	98	0	0	98	0	0	0	0	15	188	0	203	301
05:15 PM	77	0	0	77	0	0	0	0	26	152	0	178	255
05:30 PM	95	1	0	96	0	0	0	0	32	174	0	206	302
05:45 PM	97	0	0	97	0	0	0	0	28	146	0	174	271
Total	367	1	0	368	0	0	0	0	101	660	0	761	1129
06:00 PM	101	1	1	103	0	0	1	1	31	142	0	173	277
06:15 PM	87	3	0	90	0	0	0	0	25	109	0	134	224
06:30 PM	114	0	0	114	0	0	0	0	28	101	0	129	243
06:45 PM	86	1	0	87	0	0	0	0	28	117	0	145	232
Total	388	5	1	394	0	0	1	1	112	469	0	581	976
07:00 PM	79	0	0	79	0	0	0	0	19	91	0	110	189
07:15 PM	79	1	0	80	0	1	0	1	28	114	0	142	223
07:30 PM	84	0	0	84	0	0	0	0	27	79	0	106	190
07:45 PM	96	1	0	97	0	0	0	0	22	66	0	88	185
Total	338	2	0	340	0	1	0	1	96	350	0	446	787
Grand Total	1516	11	1	1528	0	1	1	2	409	2051	0	2460	3990
Apprch %	99.2	0.7	0.1		0	50	50		16.6	83.4	0		
Total %	38	0.3	0	38.3	0	0	0	0.1	10.3	51.4	0	61.7	
Cars	1506	11	1	1518	0	1	1	2	405	2032	0	2437	3957
% Cars	99.3	100	100	99.3	0	100	100	100	99	99.1	0	99.1	99.2
Buses	10	0	0	10	0	0	0	0	2	16	0	18	28
% Buses	0.7	0	0	0.7	0	0	0	0	0.5	0.8	0	0.7	0.7
Taxis	0	0	0	0	0	0	0	0	2	3	0	5	5
% Taxis	0	0	0	0	0	0	0	0	0.5	0.1	0	0.2	0.1

Tri-State Traffic Data, Inc.

www.TSTData.com

Location: Bensalem, PA
Intersection: Richlieu Rd/Parx
Date: Friday, March 22, 2013
Counter: MIO

File Name : EG0322-3
Site Code :
Start Date : 3/22/2013

Groups Printed- Car - Buses

	Richlieu Rd Southbound				PARX Driveway Westbound				Richlieu Rd Northbound				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
04:00 PM	97	14	0	111	28	10	0	38	2	129	0	131	280
04:15 PM	94	14	0	108	14	11	0	25	9	129	0	138	271
04:30 PM	87	18	0	105	24	14	0	38	4	148	0	152	295
04:45 PM	95	23	0	118	15	12	0	27	7	143	0	150	295
Total	373	69	0	442	81	47	0	128	22	549	0	571	1141
05:00 PM	84	12	0	96	36	9	0	45	5	179	0	184	325
05:15 PM	78	12	0	90	40	6	0	46	4	152	0	156	292
05:30 PM	86	13	0	99	23	6	0	29	10	154	0	164	292
05:45 PM	77	27	0	104	26	15	0	41	9	144	0	153	298
Total	325	64	0	389	125	36	0	161	28	629	0	657	1207
06:00 PM	82	13	0	95	29	13	0	42	9	131	0	140	277
06:15 PM	72	20	0	92	21	15	0	36	7	105	0	112	240
06:30 PM	99	16	0	115	17	8	0	25	5	94	0	99	239
06:45 PM	70	17	0	87	11	16	0	27	6	102	0	108	222
Total	323	66	0	389	78	52	0	130	27	432	0	459	978
07:00 PM	67	12	0	79	17	6	0	23	7	82	0	89	191
07:15 PM	71	17	0	88	12	9	0	21	7	103	0	110	219
07:30 PM	77	18	0	95	21	8	0	29	9	61	0	70	194
07:45 PM	86	20	0	106	28	14	0	42	3	66	0	69	217
Total	301	67	0	368	78	37	0	115	26	312	0	338	821
Grand Total	1322	266	0	1588	362	172	0	534	103	1922	0	2025	4147
Apprch %	83.2	16.8	0		67.8	32.2	0		5.1	94.9	0		
Total %	31.9	6.4	0	38.3	8.7	4.1	0	12.9	2.5	46.3	0	48.8	
Car	1313	266	0	1579	362	172	0	534	103	1907	0	2010	4123
% Car	99.3	100	0	99.4	100	100	0	100	100	99.2	0	99.3	99.4
Buses	9	0	0	9	0	0	0	0	0	15	0	15	24
% Buses	0.7	0	0	0.6	0	0	0	0	0	0.8	0	0.7	0.6

Tri-State Traffic Data, Inc.

www.TSTData.com

Location: Bensalem, PA
Intersection: Galloway Rd/Parx Stable
Date: Friday, March 22, 2013
Counter: MIO

File Name : EG0322-2
Site Code :
Start Date : 3/22/2013
Page No : 1

Groups Printed- Car - Buses

	Galloway Rd Westbound				PARX Stable Northbound				Galloway Rd Eastbound				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
04:00 PM	161	6	0	167	12	9	0	21	4	145	0	149	337
04:15 PM	151	10	0	161	15	13	0	28	5	160	0	165	354
04:30 PM	177	5	0	182	7	8	0	15	4	136	0	140	337
04:45 PM	145	3	0	148	12	11	0	23	1	136	0	137	308
Total	634	24	0	658	46	41	0	87	14	577	0	591	1336
05:00 PM	183	6	0	189	15	7	0	22	2	157	0	159	370
05:15 PM	173	2	0	175	7	3	0	10	3	149	0	152	337
05:30 PM	144	1	0	145	5	6	0	11	3	145	0	148	304
05:45 PM	146	3	0	149	8	1	0	9	4	127	0	131	289
Total	646	12	0	658	35	17	0	52	12	578	0	590	1300
06:00 PM	151	2	0	153	3	0	0	3	2	121	0	123	279
06:15 PM	145	5	0	150	5	1	0	6	0	127	0	127	283
06:30 PM	136	6	0	142	7	2	0	9	1	102	0	103	254
06:45 PM	131	2	0	133	3	2	0	5	0	131	0	131	269
Total	563	15	0	578	18	5	0	23	3	481	0	484	1085
07:00 PM	141	3	0	144	3	0	0	3	1	98	0	99	246
07:15 PM	116	5	0	121	4	2	0	6	3	88	0	91	218
07:30 PM	85	0	0	85	3	0	0	3	0	117	0	117	205
07:45 PM	79	2	0	81	4	1	0	5	1	94	0	95	181
Total	421	10	0	431	14	3	0	17	5	397	0	402	850
Grand Total	2264	61	0	2325	113	66	0	179	34	2033	0	2067	4571
Apprch %	97.4	2.6	0		63.1	36.9	0		1.6	98.4	0		
Total %	49.5	1.3	0	50.9	2.5	1.4	0	3.9	0.7	44.5	0	45.2	
Car	2239	61	0	2300	113	66	0	179	34	2015	0	2049	4528
% Car	98.9	100	0	98.9	100	100	0	100	100	99.1	0	99.1	99.1
Buses	25	0	0	25	0	0	0	0	0	18	0	18	43
% Buses	1.1	0	0	1.1	0	0	0	0	0	0.9	0	0.9	0.9

Tri-State Traffic Data, Inc.

www.TSTData.com

Location: Bensalem, PA
Intersection: Mechanicsville Rd/Byberry
Date: Friday, March 22, 2013
Counter: MIO

File Name : EG0322-1
Site Code :
Start Date : 3/22/2013
Page No : 1

Groups Printed- Car - Buses

	Mechanicsville Rd Southbound					Byberry Rd Westbound					Mechanicsville Rd Northbound					Byberry Rd Eastbound					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
04:00 PM	8	40	4	0	52	2	10	42	0	54	61	76	13	0	150	28	25	11	0	64	320
04:15 PM	9	56	0	0	65	9	10	38	0	57	37	78	19	0	134	21	14	4	0	39	295
04:30 PM	6	55	2	0	63	4	9	31	0	44	45	68	21	0	134	20	19	9	0	48	289
04:45 PM	13	59	5	0	77	4	10	37	0	51	50	73	24	0	147	16	15	10	0	41	316
Total	36	210	11	0	257	19	39	148	0	206	193	295	77	0	565	85	73	34	0	192	1220
05:00 PM	9	51	3	0	63	2	11	68	0	81	52	85	17	0	154	32	21	10	0	63	361
05:15 PM	13	55	6	0	74	2	16	28	0	46	57	88	24	0	169	17	10	10	0	37	326
05:30 PM	14	53	3	0	70	5	16	38	0	59	64	63	33	0	160	18	15	7	0	40	329
05:45 PM	16	51	0	0	67	4	10	28	0	42	58	60	20	0	138	31	13	5	0	49	296
Total	52	210	12	0	274	13	53	162	0	228	231	296	94	0	621	98	59	32	0	189	1312
06:00 PM	4	48	0	0	52	4	17	32	0	53	55	62	12	0	129	46	21	6	0	73	307
06:15 PM	10	50	1	0	61	4	10	23	0	37	44	65	13	0	122	19	19	10	0	48	268
06:30 PM	10	59	0	0	69	3	11	25	0	39	46	78	13	0	137	20	12	5	0	37	282
06:45 PM	13	61	1	0	75	4	12	23	0	39	48	62	8	0	118	23	11	4	0	38	270
Total	37	218	2	0	257	15	50	103	0	168	193	267	46	0	506	108	63	25	0	196	1127
07:00 PM	6	63	1	0	70	6	11	21	0	38	37	63	23	0	123	17	17	6	0	40	271
07:15 PM	13	27	1	0	41	8	18	19	0	45	41	55	27	0	123	13	9	5	0	27	236
07:30 PM	11	45	2	0	58	2	16	18	0	36	37	37	20	0	94	14	15	9	0	38	226
07:45 PM	8	39	1	0	48	3	9	26	0	38	41	41	23	0	105	20	10	3	0	33	224
Total	38	174	5	0	217	19	54	84	0	157	156	196	93	0	445	64	51	23	0	138	957
Grand Total	163	812	30	0	1005	66	196	497	0	759	773	1054	310	0	2137	355	246	114	0	715	4616
Apprch %	16.2	80.8	3	0		8.7	25.8	65.5	0		36.2	49.3	14.5	0		49.7	34.4	15.9	0		
Total %	3.5	17.6	0.6	0	21.8	1.4	4.2	10.8	0	16.4	16.7	22.8	6.7	0	46.3	7.7	5.3	2.5	0	15.5	
Car	163	812	29	0	1004	66	196	495	0	757	772	1043	310	0	2125	355	246	114	0	715	4601
% Car	100	100	96.7	0	99.9	100	100	99.6	0	99.7	99.9	99	100	0	99.4	100	100	100	0	100	99.7
Buses	0	0	1	0	1	0	0	2	0	2	1	11	0	0	12	0	0	0	0	0	15
% Buses	0	0	3.3	0	0.1	0	0	0.4	0	0.3	0.1	1	0	0	0.6	0	0	0	0	0	0.3

Tri-State Traffic Data, Inc.

www.TSTData.com

Location: Bensalem, PA
Intersection: Street Rd. / PARX Drive
Date: Saturday, March 23, 2013
Counter: ET / JT

File Name : EG0323-6
Site Code : 00000000
Start Date : 3/23/2013
Page No : 1

Groups Printed- Cars/Trucks - Buses - Taxis

	Street Road (Rte. 132) Southbound					PARX Casino Driveway Westbound					Street Road (Rte. 132) Northbound					Tilman Drive Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
03:00 PM	6	361	21	0	388	10	0	29	0	39	70	330	6	0	406	2	2	2	3	9	842
03:15 PM	5	372	18	0	395	11	1	22	0	34	57	378	4	0	439	5	3	2	0	10	878
03:30 PM	0	372	32	0	404	10	3	29	0	42	59	354	5	1	419	1	1	1	1	4	869
03:45 PM	6	390	23	0	419	11	2	18	0	31	54	352	7	0	413	7	4	3	2	16	879
Total	17	1495	94	0	1606	42	6	98	0	146	240	1414	22	1	1677	15	10	8	6	39	3468
04:00 PM	11	404	32	0	447	9	1	19	0	29	51	330	8	0	389	4	3	2	3	12	877
04:15 PM	10	455	29	1	495	17	2	34	0	53	69	337	10	0	416	6	1	1	0	8	972
04:30 PM	10	419	24	0	453	10	5	49	0	64	59	331	7	0	397	8	3	5	1	17	931
04:45 PM	16	433	22	0	471	13	0	39	0	52	50	343	11	0	404	7	3	3	3	16	943
Total	47	1711	107	1	1866	49	8	141	0	198	229	1341	36	0	1606	25	10	11	7	53	3723
05:00 PM	9	359	28	0	396	16	4	28	2	50	51	345	12	0	408	3	1	3	1	8	862
05:15 PM	11	381	19	0	411	14	1	24	0	39	67	312	12	0	391	2	0	3	2	7	848
05:30 PM	9	398	26	0	433	16	1	36	0	53	63	338	6	0	407	5	1	9	0	15	908
05:45 PM	10	385	26	0	421	17	1	30	0	48	68	328	15	0	411	8	3	4	1	16	896
Total	39	1523	99	0	1661	63	7	118	2	190	249	1323	45	0	1617	18	5	19	4	46	3514
06:00 PM	21	375	20	0	416	15	0	24	1	40	78	365	17	2	462	5	2	8	0	15	933
06:15 PM	9	370	12	0	391	22	0	24	0	46	41	350	11	0	402	9	1	7	1	18	857
06:30 PM	8	357	32	1	398	16	1	26	0	43	60	342	14	0	416	9	5	6	1	21	878
06:45 PM	11	350	33	0	394	20	1	29	0	50	80	306	9	0	395	11	4	9	0	24	863
Total	49	1452	97	1	1599	73	2	103	1	179	259	1363	51	2	1675	34	12	30	2	78	3531
Grand Total	152	6181	397	2	6732	227	23	460	3	713	977	5441	154	3	6575	92	37	68	19	216	14236
Apprch %	2.3	91.8	5.9	0		31.8	3.2	64.5	0.4		14.9	82.8	2.3	0		42.6	17.1	31.5	8.8		
Total %	1.1	43.4	2.8	0	47.3	1.6	0.2	3.2	0	5	6.9	38.2	1.1	0	46.2	0.6	0.3	0.5	0.1	1.5	
Cars/Trucks	151	6148	383	2	6684	216	23	458	3	700	958	5428	154	3	6543	92	37	67	19	215	14142
% Cars/Trucks	99.3	99.5	96.5	100	99.3	95.2	100	99.6	100	98.2	98.1	99.8	100	100	99.5	100	100	98.5	100	99.5	99.3
Buses	1	21	9	0	31	0	0	0	0	0	15	10	0	0	25	0	0	1	0	1	57
% Buses	0.7	0.3	2.3	0	0.5	0	0	0	0	0	1.5	0.2	0	0	0.4	0	0	1.5	0	0.5	0.4
Taxis	0	12	5	0	17	11	0	2	0	13	4	3	0	0	7	0	0	0	0	0	37
% Taxis	0	0.2	1.3	0	0.3	4.8	0	0.4	0	1.8	0.4	0.1	0	0	0.1	0	0	0	0	0	0.3

Tri-State Traffic Data, Inc.

www.TSTData.com

Location:Bensalem, PA
Intersection:Parx Dwy/Retail Cross St
Date:Saturday, March 23, 2013
Counter:pb

File Name : EG0323-5
Site Code : 00000000
Start Date : 3/23/2013
Page No : 1

Groups Printed- Cars/Trucks - Buses - Taxis

	PARX DRIVEWAY Southbound					RETAIL CROSS STREET Westbound					PARX DRIVEWAY Northbound					RETAIL CROSS STREET Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
03:00 PM	3	78	0	0	81	1	0	0	0	1	1	46	2	0	49	4	2	1	0	7	138
03:15 PM	6	63	0	0	69	0	0	1	0	1	1	64	7	0	72	14	2	2	0	18	160
03:30 PM	4	84	0	0	88	2	1	0	0	3	0	60	6	0	66	14	1	3	0	18	175
03:45 PM	1	120	0	0	121	1	0	0	0	1	3	57	4	0	64	6	0	1	0	7	193
Total	14	345	0	0	359	4	1	1	0	6	5	227	19	0	251	38	5	7	0	50	666
04:00 PM	1	92	0	0	93	4	0	0	0	4	0	66	6	0	72	23	1	3	1	28	197
04:15 PM	3	131	1	1	136	0	0	2	0	2	2	51	2	0	55	7	1	3	0	11	204
04:30 PM	6	111	0	0	117	1	0	0	0	1	0	56	3	0	59	5	2	1	0	8	185
04:45 PM	3	107	0	0	110	1	0	1	0	2	1	57	1	0	59	11	1	2	0	14	185
Total	13	441	1	1	456	6	0	3	0	9	3	230	12	0	245	46	5	9	1	61	771
05:00 PM	2	104	0	0	106	0	1	0	0	1	1	57	0	1	59	7	1	0	0	8	174
05:15 PM	4	111	0	0	115	2	0	1	0	3	0	61	3	0	64	3	3	4	0	10	192
05:30 PM	5	115	0	0	120	2	0	0	0	2	0	69	3	0	72	9	2	3	0	14	208
05:45 PM	2	93	1	0	96	0	0	0	0	0	1	65	1	0	67	8	2	4	0	14	177
Total	13	423	1	0	437	4	1	1	0	6	2	252	7	1	262	27	8	11	0	46	751
06:00 PM	2	106	0	0	108	2	0	1	0	3	2	64	3	0	69	10	2	3	0	15	195
06:15 PM	1	104	0	0	105	0	0	0	0	0	0	68	8	0	76	6	1	2	1	10	191
06:30 PM	2	81	0	0	83	3	0	0	0	3	3	73	3	0	79	16	1	2	0	19	184
06:45 PM	2	98	0	0	100	0	0	0	0	0	2	68	4	0	74	11	1	2	0	14	188
Total	7	389	0	0	396	5	0	1	0	6	7	273	18	0	298	43	5	9	1	58	758
Grand Total	47	1598	2	1	1648	19	2	6	0	27	17	982	56	1	1056	154	23	36	2	215	2946
Apprch %	2.9	97	0.1	0.1		70.4	7.4	22.2	0		1.6	93	5.3	0.1		71.6	10.7	16.7	0.9		
Total %	1.6	54.2	0.1	0	55.9	0.6	0.1	0.2	0	0.9	0.6	33.3	1.9	0	35.8	5.2	0.8	1.2	0.1	7.3	
Cars/Trucks	47	1565	2	1	1615	19	2	6	0	27	16	979	55	1	1051	153	23	36	2	214	2907
% Cars/Trucks	100	97.9	100	100	98	100	100	100	0	100	94.1	99.7	98.2	100	99.5	99.4	100	100	100	99.5	98.7
Buses	0	30	0	0	30	0	0	0	0	0	0	2	1	0	3	1	0	0	0	1	34
% Buses	0	1.9	0	0	1.8	0	0	0	0	0	0	0.2	1.8	0	0.3	0.6	0	0	0	0.5	1.2
Taxis	0	3	0	0	3	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	5
% Taxis	0	0.2	0	0	0.2	0	0	0	0	0	5.9	0.1	0	0	0.2	0	0	0	0	0	0.2

Tri-State Traffic Data, Inc.

www.TSTData.com

Location: Bensalem, PA
Intersection:Richilieu Rd/PARX Entrance
Date:Saturday, March 23, 2013
Counter:RZ

File Name : EG0323-4
Site Code : 00000000
Start Date : 3/23/2013
Page No : 1

Groups Printed- Cars/Trucks - Buses - Taxis

	RICHILIEU RD Southbound				ENT ONLY PARX Westbound				RICHILIEU RD Northbound				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
03:00 PM	100	0	0	100	0	0	0	0	19	96	0	115	215
03:15 PM	108	0	0	108	0	0	0	0	13	89	0	102	210
03:30 PM	114	0	0	114	0	0	0	0	36	83	0	119	233
03:45 PM	114	1	0	115	0	0	0	0	23	90	0	113	228
Total	436	1	0	437	0	0	0	0	91	358	0	449	886
04:00 PM	113	0	0	113	0	0	0	0	20	91	0	111	224
04:15 PM	109	0	0	109	0	0	0	0	17	66	0	83	192
04:30 PM	160	0	0	160	0	0	0	0	18	104	0	122	282
04:45 PM	116	0	1	117	0	0	0	0	11	112	0	123	240
Total	498	0	1	499	0	0	0	0	66	373	0	439	938
05:00 PM	107	0	0	107	0	0	0	0	16	98	0	114	221
05:15 PM	75	0	0	75	0	0	0	0	16	61	0	77	152
05:30 PM	115	1	0	116	0	0	0	0	26	92	0	118	234
05:45 PM	124	3	0	127	0	0	0	0	30	118	0	148	275
Total	421	4	0	425	0	0	0	0	88	369	0	457	882
06:00 PM	111	0	0	111	0	0	0	0	24	116	0	140	251
06:15 PM	112	4	0	116	0	0	0	0	27	120	0	147	263
06:30 PM	86	0	0	86	0	0	0	0	20	99	0	119	205
06:45 PM	100	1	0	101	0	0	0	0	26	94	0	120	221
Total	409	5	0	414	0	0	0	0	97	429	0	526	940
Grand Total	1764	10	1	1775	0	0	0	0	342	1529	0	1871	3646
Apprch %	99.4	0.6	0.1		0	0	0		18.3	81.7	0		
Total %	48.4	0.3	0	48.7	0	0	0	0	9.4	41.9	0	51.3	
Cars/Trucks	1760	10	1	1771	0	0	0	0	341	1523	0	1864	3635
% Cars/Trucks	99.8	100	100	99.8	0	0	0	0	99.7	99.6	0	99.6	99.7
Buses	4	0	0	4	0	0	0	0	0	5	0	5	9
% Buses	0.2	0	0	0.2	0	0	0	0	0	0.3	0	0.3	0.2
Taxis	0	0	0	0	0	0	0	0	1	1	0	2	2
% Taxis	0	0	0	0	0	0	0	0	0.3	0.1	0	0.1	0.1

Tri-State Traffic Data, Inc.

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Location: Bensalem, PA
Intersection: Richlieu Rd/PARX
Date: Saturday, March 23, 2013
Counter: MIO

File Name : EG0323-3
Site Code :
Start Date : 3/23/2013
Page No : 1

Groups Printed- Car - Buses

	Richlieu Rd Southbound				PARX (near Church) Westbound				Richlieu Rd Northbound				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
03:00 PM	86	22	0	108	17	11	0	28	4	92	0	96	232
03:15 PM	88	14	0	102	26	13	0	39	2	78	0	80	221
03:30 PM	90	12	0	102	22	24	0	46	10	70	0	80	228
03:45 PM	95	20	0	115	22	23	0	45	9	79	0	88	248
Total	359	68	0	427	87	71	0	158	25	319	0	344	929
04:00 PM	79	9	0	88	31	22	0	53	3	85	0	88	229
04:15 PM	97	10	0	107	32	39	0	71	3	73	0	76	254
04:30 PM	103	16	0	119	29	31	0	60	9	92	0	101	280
04:45 PM	93	20	0	113	20	19	0	39	10	102	0	112	264
Total	372	55	0	427	112	111	0	223	25	352	0	377	1027
05:00 PM	88	15	0	103	29	20	0	49	11	79	0	90	242
05:15 PM	70	13	0	83	25	21	0	46	4	73	0	77	206
05:30 PM	88	18	0	106	20	19	0	39	9	81	0	90	235
05:45 PM	100	14	0	114	18	20	0	38	3	112	0	115	267
Total	346	60	0	406	92	80	0	172	27	345	0	372	950
06:00 PM	85	14	0	99	25	24	0	49	3	120	0	123	271
06:15 PM	90	11	0	101	30	20	0	50	5	99	0	104	255
06:30 PM	81	10	0	91	12	11	0	23	7	91	0	98	212
06:45 PM	83	12	0	95	19	18	0	37	4	84	0	88	220
Total	339	47	0	386	86	73	0	159	19	394	0	413	958
Grand Total	1416	230	0	1646	377	335	0	712	96	1410	0	1506	3864
Apprch %	86	14	0		52.9	47.1	0		6.4	93.6	0		
Total %	36.6	6	0	42.6	9.8	8.7	0	18.4	2.5	36.5	0	39	
Car	1413	230	0	1643	376	335	0	711	96	1405	0	1501	3855
% Car	99.8	100	0	99.8	99.7	100	0	99.9	100	99.6	0	99.7	99.8
Buses	3	0	0	3	1	0	0	1	0	5	0	5	9
% Buses	0.2	0	0	0.2	0.3	0	0	0.1	0	0.4	0	0.3	0.2

Tri-State Traffic Data, Inc.

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Location: Bensalem, PA
Intersection: Galloway Rd/Parx Stable
Date: Saturay, March 23, 2013
Counter: MIO

File Name : EG0323-2
Site Code :
Start Date : 3/23/2013

Groups Printed- Car - Buses

	Galloway Rd Westbound				PARX Stable Northbound				Galloway Rd Eastbound				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
03:00 PM	116	0	0	116	8	4	0	12	2	136	0	138	266
03:15 PM	124	7	0	131	6	6	0	12	6	112	0	118	261
03:30 PM	120	7	1	128	5	3	0	8	3	141	0	144	280
03:45 PM	113	3	0	116	5	5	0	10	1	129	0	130	256
Total	473	17	1	491	24	18	0	42	12	518	0	530	1063
04:00 PM	136	5	0	141	14	4	0	18	1	120	0	121	280
04:15 PM	131	2	0	133	21	8	0	29	5	120	0	125	287
04:30 PM	136	6	0	142	18	9	1	28	2	116	0	118	288
04:45 PM	151	4	0	155	22	7	0	29	3	130	0	133	317
Total	554	17	0	571	75	28	1	104	11	486	0	497	1172
05:00 PM	100	4	0	104	18	6	0	24	2	113	0	115	243
05:15 PM	123	4	0	127	13	11	0	24	0	122	0	122	273
05:30 PM	104	4	0	108	8	7	0	15	2	105	0	107	230
05:45 PM	122	4	0	126	9	2	0	11	0	104	0	104	241
Total	449	16	0	465	48	26	0	74	4	444	0	448	987
06:00 PM	122	4	0	126	3	2	0	5	4	107	0	111	242
06:15 PM	141	4	0	145	4	3	0	7	1	112	0	113	265
06:30 PM	107	4	0	111	7	4	0	11	0	123	0	123	245
06:45 PM	132	4	0	136	6	3	0	9	2	98	1	101	246
Total	502	16	0	518	20	12	0	32	7	440	1	448	998
Grand Total	1978	66	1	2045	167	84	1	252	34	1888	1	1923	4220
Apprch %	96.7	3.2	0		66.3	33.3	0.4		1.8	98.2	0.1		
Total %	46.9	1.6	0	48.5	4	2	0	6	0.8	44.7	0	45.6	
Car	1975	66	1	2042	167	84	1	252	34	1886	1	1921	4215
% Car	99.8	100	100	99.9	100	100	100	100	100	99.9	100	99.9	99.9
Buses	3	0	0	3	0	0	0	0	0	2	0	2	5
% Buses	0.2	0	0	0.1	0	0	0	0	0	0.1	0	0.1	0.1

Tri-State Traffic Data, Inc.

www.TSTData.com

Location: Bensalem, PA
Intersection: Byberry Rd/Mechanicsville
Date: Saturday, March 23, 2013
Counter: MIO

File Name : EG0323-1
Site Code :
Start Date : 3/23/2013
Page No : 1

Groups Printed- Car - Buses

	Mechanicsville Rd Southbound					Byberry Rd Westbound					Mechanicsville Rd Northbound					Byberry Rd Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
03:00 PM	5	54	1	0	60	5	7	41	0	53	33	68	14	0	115	20	15	3	0	38	266
03:15 PM	10	53	5	0	68	3	14	25	0	42	35	59	18	0	112	16	12	4	0	32	254
03:30 PM	5	56	1	0	62	7	16	33	0	56	30	48	27	0	105	21	13	3	0	37	260
03:45 PM	3	49	3	0	55	3	12	31	0	46	49	52	27	0	128	23	16	8	0	47	276
Total	23	212	10	0	245	18	49	130	0	197	147	227	86	0	460	80	56	18	0	154	1056
04:00 PM	1	59	2	0	62	1	15	31	0	47	41	75	17	0	133	23	24	12	0	59	301
04:15 PM	9	51	5	0	65	6	9	18	0	33	35	64	19	0	118	38	39	13	0	90	306
04:30 PM	8	49	1	0	58	7	9	23	0	39	33	60	25	0	118	37	23	8	0	68	283
04:45 PM	10	70	2	0	82	4	21	48	0	73	35	60	24	0	119	30	13	4	0	47	321
Total	28	229	10	0	267	18	54	120	0	192	144	259	85	0	488	128	99	37	0	264	1211
05:00 PM	4	51	3	0	58	3	13	23	0	39	41	54	11	0	106	23	15	10	0	48	251
05:15 PM	14	46	3	0	63	2	11	24	0	37	37	55	25	0	117	22	12	5	0	39	256
05:30 PM	14	48	2	0	64	3	27	16	0	46	29	50	16	0	95	24	12	8	0	44	249
05:45 PM	10	43	1	0	54	2	13	29	0	44	47	52	14	0	113	28	15	7	0	50	261
Total	42	188	9	0	239	10	64	92	0	166	154	211	66	0	431	97	54	30	0	181	1017
06:00 PM	5	38	2	0	45	3	13	26	0	42	43	75	21	0	139	36	11	14	0	61	287
06:15 PM	5	50	1	0	56	3	17	33	0	53	41	57	9	0	107	28	14	8	0	50	266
06:30 PM	8	52	3	0	63	4	18	41	0	63	42	40	10	0	92	30	10	2	0	42	260
06:45 PM	17	44	0	0	61	4	17	43	0	64	32	73	20	0	125	14	7	6	0	27	277
Total	35	184	6	0	225	14	65	143	0	222	158	245	60	0	463	108	42	30	0	180	1090
Grand Total	128	813	35	0	976	60	232	485	0	777	603	942	297	0	1842	413	251	115	0	779	4374
Apprch %	13.1	83.3	3.6	0		7.7	29.9	62.4	0		32.7	51.1	16.1	0		53	32.2	14.8	0		
Total %	2.9	18.6	0.8	0	22.3	1.4	5.3	11.1	0	17.8	13.8	21.5	6.8	0	42.1	9.4	5.7	2.6	0	17.8	
Car	128	813	35	0	976	60	231	485	0	776	603	941	297	0	1841	413	251	115	0	779	4372
% Car	100	100	100	0	100	100	99.6	100	0	99.9	100	99.9	100	0	99.9	100	100	100	0	100	100
Buses	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	2
% Buses	0	0	0	0	0	0	0.4	0	0	0.1	0	0.1	0	0	0.1	0	0	0	0	0	0

Tri-State Traffic Data, Inc.

www.TSTData.com

Location: Bensalem, PA
Intersection: Street Rd / PARX Dr.
Date: Friday, March 22, 2013
Counter: ET / JT

File Name : EG0322-6
Site Code : 00000000
Start Date : 3/22/2013
Page No : 1

Groups Printed- Cars - Buses - Taxis

	Street Road (Rte. 132) Southbound					PARX Casino Driveway Westbound					Street Road (Rte. 132) Northbound					Tilman Drive Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
04:00 PM	5	405	17	0	427	15	0	32	0	47	48	343	6	0	397	29	0	7	0	36	907
04:15 PM	5	483	31	0	519	10	1	34	0	45	53	311	10	0	374	18	1	5	0	24	962
04:30 PM	6	489	24	0	519	8	2	38	0	48	47	385	16	0	448	9	3	6	0	18	1033
04:45 PM	9	448	25	0	482	5	3	22	0	30	44	400	11	0	455	20	2	7	0	29	996
Total	25	1825	97	0	1947	38	6	126	0	170	192	1439	43	0	1674	76	6	25	0	107	3898
05:00 PM	8	450	22	0	480	9	1	40	0	50	40	341	11	0	392	21	4	10	0	35	957
05:15 PM	4	432	33	0	469	10	1	19	0	30	46	399	14	0	459	16	2	9	0	27	985
05:30 PM	6	463	20	0	489	5	1	31	0	37	41	362	16	0	419	11	4	9	0	24	969
05:45 PM	13	450	29	0	492	6	2	19	0	27	46	345	10	0	401	9	2	8	0	19	939
Total	31	1795	104	0	1930	30	5	109	0	144	173	1447	51	0	1671	57	12	36	0	105	3850
06:00 PM	6	431	22	0	459	9	0	35	0	44	55	313	11	0	379	20	4	9	0	33	915
06:15 PM	9	403	21	0	433	9	0	21	0	30	53	366	10	0	429	10	0	4	0	14	906
06:30 PM	11	356	22	0	389	10	0	18	0	28	44	295	5	0	344	13	2	2	0	17	778
06:45 PM	8	378	30	0	416	8	1	20	0	29	52	346	14	0	412	7	1	4	0	12	869
Total	34	1568	95	0	1697	36	1	94	0	131	204	1320	40	0	1564	50	7	19	0	76	3468
07:00 PM	19	369	27	0	415	10	0	24	0	34	52	296	12	0	360	6	1	8	0	15	824
07:15 PM	14	325	32	0	371	10	0	19	0	29	89	323	9	0	421	8	1	5	0	14	835
07:30 PM	15	289	26	0	330	13	1	14	0	28	58	326	10	0	394	5	2	2	0	9	761
07:45 PM	6	287	22	0	315	7	0	22	0	29	70	267	11	0	348	4	1	2	0	7	699
Total	54	1270	107	0	1431	40	1	79	0	120	269	1212	42	0	1523	23	5	17	0	45	3119
Grand Total	144	6458	403	0	7005	144	13	408	0	565	838	5418	176	0	6432	206	30	97	0	333	14335
Apprch %	2.1	92.2	5.8	0		25.5	2.3	72.2	0		13	84.2	2.7	0		61.9	9	29.1	0		
Total %	1	45.1	2.8	0	48.9	1	0.1	2.8	0	3.9	5.8	37.8	1.2	0	44.9	1.4	0.2	0.7	0	2.3	
Cars	144	6436	383	0	6963	142	13	403	0	558	826	5404	176	0	6406	206	30	97	0	333	14260
% Cars	100	99.7	95	0	99.4	98.6	100	98.8	0	98.8	98.6	99.7	100	0	99.6	100	100	100	0	100	99.5
Buses	0	17	12	0	29	0	0	0	0	0	10	7	0	0	17	0	0	0	0	0	46
% Buses	0	0.3	3	0	0.4	0	0	0	0	0	1.2	0.1	0	0	0.3	0	0	0	0	0	0.3
Taxis	0	5	8	0	13	2	0	5	0	7	2	7	0	0	9	0	0	0	0	0	29
% Taxis	0	0.1	2	0	0.2	1.4	0	1.2	0	1.2	0.2	0.1	0	0	0.1	0	0	0	0	0	0.2

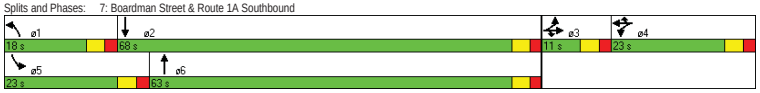
Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

Synchro 7 Capacity Analysis
Option 1 – At-Grade Solution

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	39	10	90	384	34	149	134	1045	60	124	2052	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	420		200	475		0
Storage Lanes	0		1	1		1	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			No			No
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		246			531			1411			1005	
Travel Time (s)		5.6			12.1			32.1			22.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Shared Lane Traffic (%)				44%		10%						
Lane Group Flow (vph)	0	53	98	234	236	146	146	1201	0	135	2245	0
Turn Type	Split		Prot	Split		Prot	Prot			Prot		
Protected Phases	3	3	3	4	4	4	1	6		5	2	
Permitted Phases												
Detector Phase	3	3	3	4	4	4	1	6		5	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	32.0		11.0	32.0	
Total Split (s)	11.0	11.0	11.0	23.0	23.0	23.0	18.0	63.0	0.0	23.0	68.0	0.0
Total Split (%)	9.2%	9.2%	9.2%	19.2%	19.2%	19.2%	15.0%	52.5%	0.0%	19.2%	56.7%	0.0%
Maximum Green (s)	6.0	6.0	6.0	18.0	18.0	18.0	13.0	58.0		18.0	63.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.60	0.60	0.92	0.96	0.43	0.88	0.39		0.66	0.85	
Control Delay		83.9	26.4	89.4	97.3	11.4	96.8	18.4		65.2	28.3	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		83.9	26.4	89.4	97.3	11.4	96.8	18.4		65.2	28.3	
Queue Length 50th (ft)		41	0	190	200	0	113	159		101	526	
Queue Length 95th (ft)		#102	#61	#352	#378	62	#235	199		164	598	
Internal Link Dist (ft)		166			451			1331			925	
Turn Bay Length (ft)			100	200		200	420			475		
Base Capacity (vph)		88	164	255	247	343	169	3099		263	2648	
Starvation Cap Reductn		0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn		0	0	0	0	0	0	0		0	0	
Storage Cap Reductn		0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio		0.60	0.60	0.92	0.96	0.43	0.86	0.39		0.51	0.85	

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	39	10	90	384	34	149	134	1045	60	124	2052	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.91	0.95	1.00	0.86		1.00	0.91	
Frt		1.00	0.85	1.00	0.99	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1758	1417	1698	1629	1461	1556	6006		1752	5027	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1758	1417	1698	1629	1461	1556	6006		1752	5027	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	42	11	98	417	37	162	146	1136	65	135	2230	15
RTOR Reduction (vph)	0	0	93	0	3	124	0	0	0	0	0	0
Lane Group Flow (vph)	0	53	5	234	233	22	146	1201	0	135	2245	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		Prot	Split		Prot	Prot			Prot		
Protected Phases	3	3	3	4	4	4	1	6		5	2	
Permitted Phases												
Actuated Green, G (s)		6.0	6.0	18.0	18.0	18.0	12.8	61.9		14.1	63.2	
Effective Green, g (s)		6.0	6.0	18.0	18.0	18.0	12.8	61.9		14.1	63.2	
Actuated g/C Ratio		0.05	0.05	0.15	0.15	0.15	0.11	0.52		0.12	0.53	
Clearance Time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		88	71	255	244	219	166	3098		206	2648	
v/s Ratio Prot		c0.03	0.00	0.14	c0.14	0.01	c0.09	0.20		0.08	c0.45	
v/s Ratio Perm												
v/c Ratio		0.60	0.07	0.92	0.96	0.10	0.88	0.39		0.66	0.85	
Uniform Delay, d1		55.8	54.3	50.3	50.6	44.0	52.8	17.6		50.6	24.3	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		11.1	0.4	34.7	45.2	0.2	37.2	0.4		7.3	3.6	
Delay (s)		66.9	54.8	85.0	95.8	44.2	90.0	17.9		57.9	27.9	
Level of Service		E	D	F	F	D	F	B		E	C	
Approach Delay (s)		59.0			79.5			25.8			29.6	
Approach LOS		E			E			C			C	

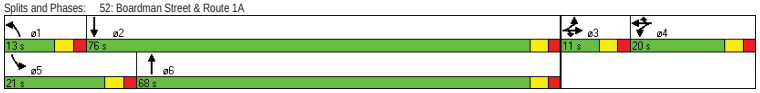
Intersection Summary			
HCM Average Control Delay	36.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	79.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	3	48	182	15	201	66	1850	23	152	1591	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	250		250	420		300	330		0
Storage Lanes	0		1	1		1	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			No			No
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		543			948			1485			370	
Travel Time (s)		9.3			16.2			25.3			6.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	5%	5%	5%
Shared Lane Traffic (%)				25%		37%						
Lane Group Flow (vph)	0	40	52	148	147	137	72	2036	0	165	1741	0
Turn Type	Split		Prot	Split		Prot	Prot			Prot		
Protected Phases	3	3	3	4	4	4	1	6		5	2	
Permitted Phases												
Detector Phase	3	3	3	4	4	4	1	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	10.0		6.0	10.0	
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	32.0		11.0	32.0	
Total Split (s)	11.0	11.0	11.0	20.0	20.0	20.0	13.0	68.0	0.0	21.0	76.0	0.0
Total Split (%)	9.2%	9.2%	9.2%	16.7%	16.7%	16.7%	10.8%	56.7%	0.0%	17.5%	63.3%	0.0%
Maximum Green (s)	6.0	6.0	6.0	15.0	15.0	15.0	8.0	63.0		16.0	71.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	3.0	5.0	5.0	4.0
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Min		None	C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.48	0.42	0.79	0.71	0.47	0.65	0.59		0.78	0.55	
Control Delay		74.3	25.5	79.3	54.7	13.7	81.9	19.0		75.8	14.3	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		74.3	25.5	79.3	54.7	13.7	81.9	19.0		75.8	14.3	
Queue Length 50th (ft)		31	0	117	85	0	55	313		124	294	
Queue Length 95th (ft)		#72	41	#222	#179	62	#123	352		#223	339	
Internal Link Dist (ft)		463			868			1405			290	
Turn Bay Length (ft)				250		250	420			330		
Base Capacity (vph)		84	124	202	221	301	114	3463		229	3160	
Starvation Cap Reductn		0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn		0	0	0	0	0	0	0		0	0	
Storage Cap Reductn		0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio		0.48	0.42	0.73	0.67	0.46	0.63	0.59		0.72	0.55	

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 52: Boardman Street & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	3	48	182	15	201	66	1850	23	152	1591	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.91	0.95	1.00	0.86		1.00	0.91	
Frt		1.00	0.85	1.00	0.92	0.85	1.00	1.00		1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1681	1495	1618	1471	1447	1703	6155		1719	4935	
Flt Permitted		0.96	1.00	0.95	0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1681	1495	1618	1471	1447	1703	6155		1719	4935	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	3	52	198	16	218	72	2011	25	165	1729	12
RTOR Reduction (vph)	0	0	50	0	37	121	0	0	0	0	0	0
Lane Group Flow (vph)	0	40	2	148	110	16	72	2036	0	165	1741	0
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	5%	5%	5%
Turn Type	Split		Prot	Split		Prot	Prot			Prot		
Protected Phases	3	3	3	4	4	4	1	6		5	2	
Permitted Phases												
Actuated Green, G (s)		4.8	4.8	14.0	14.0	14.0	6.4	66.5		14.7	74.8	
Effective Green, g (s)		4.8	4.8	14.0	14.0	14.0	6.4	66.5		14.7	74.8	
Actuated g/C Ratio		0.04	0.04	0.12	0.12	0.12	0.05	0.55		0.12	0.62	
Clearance Time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		67	60	189	172	169	91	3411		211	3076	
v/s Ratio Prot		c0.02	0.00	c0.09	0.07	0.01	0.04	c0.33		c0.10	0.35	
v/s Ratio Perm												
v/c Ratio		0.60	0.03	0.78	0.64	0.09	0.79	0.60		0.78	0.57	
Uniform Delay, d1		56.6	55.4	51.5	50.6	47.3	56.1	17.8		51.1	13.2	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		13.5	0.2	18.8	7.6	0.2	36.1	0.8		17.0	0.8	
Delay (s)		70.1	55.6	70.3	58.2	47.6	92.2	18.6		68.1	13.9	
Level of Service		E	E	E	E	D	F	B		E	B	
Approach Delay (s)		61.9			59.0			21.1			18.6	
Approach LOS		E			E			C			B	

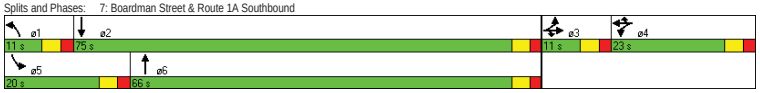
Intersection Summary					
HCM Average Control Delay	24.5	HCM Level of Service	C		
HCM Volume to Capacity ratio	0.65				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0		
Intersection Capacity Utilization	62.6%	ICU Level of Service	B		
Analysis Period (min)	15				

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	9	33	184	11	256	29	1475	239	126	1474	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	350		200	475		0
Storage Lanes	0		1	1		1	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			No			No
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		246			531			1411			1005	
Travel Time (s)		5.6			12.1			32.1			22.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	1%	1%	1%	3%	3%	3%
Shared Lane Traffic (%)				15%		43%						
Lane Group Flow (vph)	0	47	36	170	162	158	32	1863	0	137	1629	0
Turn Type	Split		Prot	Split		Prot	Prot			Prot		
Protected Phases	3	3	3	4	4	4	1	6		5	2	
Permitted Phases												
Detector Phase	3	3	3	4	4	4	1	6		5	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	32.0		11.0	32.0	
Total Split (s)	11.0	11.0	11.0	23.0	23.0	23.0	11.0	66.0	0.0	20.0	75.0	0.0
Total Split (%)	9.2%	9.2%	9.2%	19.2%	19.2%	19.2%	9.2%	55.0%	0.0%	16.7%	62.5%	0.0%
Maximum Green (s)	6.0	6.0	6.0	18.0	18.0	18.0	6.0	61.0		15.0	70.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.55	0.33	0.75	0.56	0.46	0.36	0.53		0.71	0.50	
Control Delay		79.2	25.3	69.5	27.0	11.7	67.1	18.6		71.4	12.9	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		79.2	25.3	69.5	27.0	11.7	67.1	18.6		71.4	12.9	
Queue Length 50th (ft)		36	0	132	46	0	24	280		103	269	
Queue Length 95th (ft)		#88	35	#224	124	64	59	318		171	312	
Internal Link Dist (ft)		166			451			1331			925	
Turn Bay Length (ft)			100	200		200	350			475		
Base Capacity (vph)		87	111	252	310	360	89	3521		219	3280	
Starvation Cap Reductn		0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn		0	0	0	0	0	0	0		0	0	
Storage Cap Reductn		0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio		0.54	0.32	0.67	0.52	0.44	0.36	0.53		0.63	0.50	

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	9	33	184	11	256	29	1475	239	126	1474	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.91	0.95	1.00	0.86		1.00	0.91	
Frt		1.00	0.85	1.00	0.89	0.85	1.00	0.98		1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1741	1538	1681	1493	1504	1787	6336		1752	5023	
Flt Permitted		0.96	1.00	0.95	0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1741	1538	1681	1493	1504	1787	6336		1752	5023	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	10	36	200	12	278	32	1603	260	137	1602	27
RTOR Reduction (vph)	0	0	35	0	87	137	0	0	0	0	0	0
Lane Group Flow (vph)	0	47	1	170	75	21	32	1863	0	137	1629	0
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	1%	1%	1%	3%	3%	3%
Turn Type	Split		Prot	Split		Prot	Prot			Prot		
Protected Phases	3	3	3	4	4	4	1	6		5	2	
Permitted Phases												
Actuated Green, G (s)		4.8	4.8	16.3	16.3	16.3	3.6	65.7		13.2	75.3	
Effective Green, g (s)		4.8	4.8	16.3	16.3	16.3	3.6	65.7		13.2	75.3	
Actuated g/C Ratio		0.04	0.04	0.14	0.14	0.14	0.03	0.55		0.11	0.63	
Clearance Time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		70	62	228	203	204	54	3469		193	3152	
v/s Ratio Prot		c0.03	0.00	c0.10	0.05	0.01	0.02	c0.29		c0.08	0.32	
v/s Ratio Perm												
v/c Ratio		0.67	0.02	0.75	0.37	0.11	0.59	0.54		0.71	0.52	
Uniform Delay, d1		56.8	55.3	49.9	47.2	45.5	57.5	17.4		51.6	12.3	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		22.4	0.2	12.4	1.1	0.2	16.2	0.6		11.3	0.6	
Delay (s)		79.3	55.5	62.3	48.3	45.7	73.7	18.0		62.9	12.9	
Level of Service		E	E	E	D	D	E	B		E	B	
Approach Delay (s)		69.0			52.3			18.9			16.8	
Approach LOS		E			D			B			B	

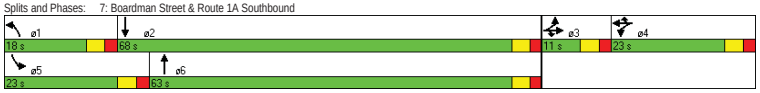
Intersection Summary					
HCM Average Control Delay	22.9	HCM Level of Service	C		
HCM Volume to Capacity ratio	0.60				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0		
Intersection Capacity Utilization	59.5%	ICU Level of Service	B		
Analysis Period (min)	15				

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	10	92	384	35	153	137	1300	62	127	2261	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	420		200	475		0
Storage Lanes	0		1	1		1	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			No			No
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		246			531			1411			1005	
Travel Time (s)		5.6			12.1			32.1			22.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Shared Lane Traffic (%)				43%		10%						
Lane Group Flow (vph)	0	54	100	238	234	149	149	1480	0	138	2473	0
Turn Type	Split		Prot	Split		Prot	Prot			Prot		
Protected Phases	3	3	3	4	4	4	1	6		5	2	
Permitted Phases												
Detector Phase	3	3	3	4	4	4	1	6		5	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	32.0		11.0	32.0	
Total Split (s)	11.0	11.0	11.0	23.0	23.0	23.0	18.0	63.0	0.0	23.0	68.0	0.0
Total Split (%)	9.2%	9.2%	9.2%	19.2%	19.2%	19.2%	15.0%	52.5%	0.0%	19.2%	56.7%	0.0%
Maximum Green (s)	6.0	6.0	6.0	18.0	18.0	18.0	13.0	58.0		18.0	63.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.61	0.60	0.93	0.95	0.43	0.89	0.48		0.66	0.93	
Control Delay		85.0	26.4	92.5	95.6	11.3	98.6	19.8		65.5	34.7	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		85.0	26.4	92.5	95.6	11.3	98.6	19.8		65.5	34.7	
Queue Length 50th (ft)		42	0	194	197	0	116	209		103	631	
Queue Length 95th (ft)		#103	#63	#358	#374	62	#240	256		168	715	
Internal Link Dist (ft)		166			451			1331			925	
Turn Bay Length (ft)			100	200		200	420			475		
Base Capacity (vph)		88	166	255	247	346	169	3094		263	2645	
Starvation Cap Reductn		0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn		0	0	0	0	0	0	0		0	0	
Storage Cap Reductn		0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio		0.61	0.60	0.93	0.95	0.43	0.88	0.48		0.52	0.93	

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	10	92	384	35	153	137	1300	62	127	2261	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.91	0.95	1.00	0.86		1.00	0.91	
Frt		1.00	0.85	1.00	0.99	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1757	1417	1698	1629	1461	1556	6013		1752	5028	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1757	1417	1698	1629	1461	1556	6013		1752	5028	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	11	100	417	38	166	149	1413	67	138	2458	15
RTOR Reduction (vph)	0	0	95	0	3	127	0	0	0	0	0	0
Lane Group Flow (vph)	0	54	5	238	231	22	149	1480	0	138	2473	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		Prot	Split		Prot	Prot			Prot		
Protected Phases	3	3	3	4	4	4	1	6		5	2	
Permitted Phases												
Actuated Green, G (s)		6.0	6.0	18.0	18.0	18.0	12.9	61.7		14.3	63.1	
Effective Green, g (s)		6.0	6.0	18.0	18.0	18.0	12.9	61.7		14.3	63.1	
Actuated g/C Ratio		0.05	0.05	0.15	0.15	0.15	0.11	0.51		0.12	0.53	
Clearance Time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		88	71	255	244	219	167	3092		209	2644	
v/s Ratio Prot		c0.03	0.00	0.14	c0.14	0.02	c0.10	0.25		0.08	c0.49	
v/s Ratio Perm												
v/c Ratio		0.61	0.07	0.93	0.95	0.10	0.89	0.48		0.66	0.94	
Uniform Delay, d1		55.9	54.3	50.4	50.5	44.0	52.9	18.8		50.5	26.5	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		12.0	0.4	38.5	43.0	0.2	40.2	0.5		7.6	7.8	
Delay (s)		67.9	54.8	88.9	93.6	44.2	93.1	19.3		58.1	34.3	
Level of Service		E	D	F	F	D	F	B		E	C	
Approach Delay (s)		59.4			79.9			26.1			35.6	
Approach LOS		E			E			C			D	

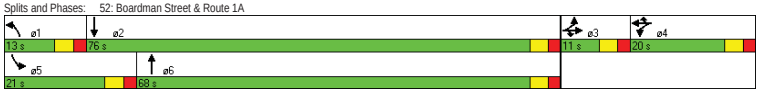
Intersection Summary			
HCM Average Control Delay	38.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	83.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	3	51	240	16	249	70	2735	79	194	2375	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	250		250	420		300	330		0
Storage Lanes	0		1	1		1	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			No			No
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		543			948			1485			370	
Travel Time (s)		9.3			16.2			25.3			6.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	5%	5%	5%
Shared Lane Traffic (%)				27%		36%						
Lane Group Flow (vph)	0	42	55	191	185	173	76	3059	0	211	2595	0
Turn Type	Split		Prot	Split		Prot	Prot			Prot		
Protected Phases	3	3	3	4	4	4	1	6		5	2	
Permitted Phases												
Detector Phase	3	3	3	4	4	4	1	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	10.0		6.0	10.0	
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	32.0		11.0	32.0	
Total Split (s)	11.0	11.0	11.0	20.0	20.0	20.0	13.0	68.0	0.0	21.0	76.0	0.0
Total Split (%)	9.2%	9.2%	9.2%	16.7%	16.7%	16.7%	10.8%	56.7%	0.0%	17.5%	63.3%	0.0%
Maximum Green (s)	6.0	6.0	6.0	15.0	15.0	15.0	8.0	63.0		16.0	71.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	3.0	5.0	5.0	4.0
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Min		None	C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.50	0.43	0.95	0.85	0.52	0.68	0.92		0.92	0.83	
Control Delay		76.0	25.2	103.2	72.8	13.1	84.9	31.1		94.0	22.0	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		76.0	25.2	103.2	72.8	13.1	84.9	31.1		94.0	22.0	
Queue Length 50th (ft)		32	0	156	124	0	59	627		164	598	
Queue Length 95th (ft)		#77	43	#310	#268	70	#134	689		#312	679	
Internal Link Dist (ft)		463			868			1405			290	
Turn Bay Length (ft)				250		250	420			330		
Base Capacity (vph)		84	127	202	218	332	114	3337		229	3117	
Starvation Cap Reductn		0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn		0	0	0	0	0	0	0		0	0	
Storage Cap Reductn		0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio		0.50	0.43	0.95	0.85	0.52	0.67	0.92		0.92	0.83	

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 52: Boardman Street & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	3	51	240	16	249	70	2735	79	194	2375	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.91	0.95	1.00	0.86		1.00	0.91	
Frt		1.00	0.85	1.00	0.92	0.85	1.00	1.00		1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1681	1495	1618	1474	1447	1703	6140		1719	4936	
Flt Permitted		0.96	1.00	0.95	0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1681	1495	1618	1474	1447	1703	6140		1719	4936	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	3	55	261	17	271	76	2973	86	211	2582	13
RTOR Reduction (vph)	0	0	53	0	34	151	0	0	0	0	0	0
Lane Group Flow (vph)	0	42	2	191	151	22	76	3059	0	211	2595	0
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	5%	5%	5%
Turn Type	Split		Prot	Split		Prot	Prot			Prot		
Protected Phases	3	3	3	4	4	4	1	6		5	2	
Permitted Phases												
Actuated Green, G (s)		4.8	4.8	15.0	15.0	15.0	6.4	64.2		16.0	73.8	
Effective Green, g (s)		4.8	4.8	15.0	15.0	15.0	6.4	64.2		16.0	73.8	
Actuated g/C Ratio		0.04	0.04	0.12	0.12	0.12	0.05	0.54		0.13	0.61	
Clearance Time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		67	60	202	184	181	91	3285		229	3036	
v/s Ratio Prot		c0.02	0.00	c0.12	0.10	0.01	0.04	c0.50		c0.12	0.53	
v/s Ratio Perm												
v/c Ratio		0.63	0.04	0.95	0.82	0.12	0.84	0.93		0.92	0.85	
Uniform Delay, d1		56.7	55.4	52.1	51.2	46.6	56.3	25.9		51.4	18.7	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		16.9	0.3	47.6	23.9	0.3	45.3	6.2		38.5	3.3	
Delay (s)		73.6	55.6	99.7	75.1	46.9	101.6	32.0		89.9	22.1	
Level of Service		E	E	F	E	D	F	C		F	C	
Approach Delay (s)		63.4			74.8			33.7			27.2	
Approach LOS		E			E			C			C	

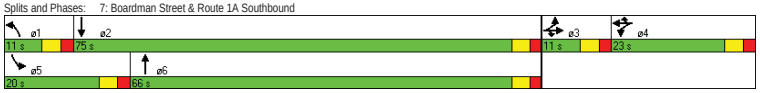
Intersection Summary			
HCM Average Control Delay	34.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	80.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	10	35	242	12	316	31	2336	323	173	2197	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	350		200	475		0
Storage Lanes	0		1	1		1	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			No			No
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		246			531			1411			1005	
Travel Time (s)		5.6			12.1			32.1			22.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	1%	1%	1%	3%	3%	3%
Shared Lane Traffic (%)				18%		42%						
Lane Group Flow (vph)	0	50	38	216	204	199	34	2890	0	188	2417	0
Turn Type	Split		Prot	Split		Prot	Prot			Prot		
Protected Phases	3	3	3	4	4	4	1	6		5	2	
Permitted Phases												
Detector Phase	3	3	3	4	4	4	1	6		5	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	32.0		11.0	32.0	
Total Split (s)	11.0	11.0	11.0	23.0	23.0	23.0	11.0	66.0	0.0	20.0	75.0	0.0
Total Split (%)	9.2%	9.2%	9.2%	19.2%	19.2%	19.2%	9.2%	55.0%	0.0%	16.7%	62.5%	0.0%
Maximum Green (s)	6.0	6.0	6.0	18.0	18.0	18.0	6.0	61.0		15.0	70.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.58	0.34	0.87	0.69	0.54	0.39	0.86		0.88	0.75	
Control Delay		81.9	25.3	82.0	41.2	15.7	68.3	28.2		88.7	18.5	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		81.9	25.3	82.0	41.2	15.7	68.3	28.2		88.7	18.5	
Queue Length 50th (ft)		39	0	173	96	18	26	568		145	521	
Queue Length 95th (ft)		#96	36	#316	#195	95	61	623		#276	590	
Internal Link Dist (ft)		166			451			1331			925	
Turn Bay Length (ft)			100	200		200	350			475		
Base Capacity (vph)		87	113	252	297	373	89	3378		219	3219	
Starvation Cap Reductn		0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn		0	0	0	0	0	0	0		0	0	
Storage Cap Reductn		0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio		0.57	0.34	0.86	0.69	0.53	0.38	0.86		0.86	0.75	

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	10	35	242	12	316	31	2336	323	173	2197	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.91	0.95	1.00	0.86		1.00	0.91	
Frt		1.00	0.85	1.00	0.89	0.85	1.00	0.98		1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1742	1538	1681	1498	1504	1787	6353		1752	5027	
Flt Permitted		0.96	1.00	0.95	0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1742	1538	1681	1498	1504	1787	6353		1752	5027	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	11	38	263	13	343	34	2539	351	188	2388	29
RTOR Reduction (vph)	0	0	36	0	72	147	0	0	0	0	0	0
Lane Group Flow (vph)	0	50	2	216	132	52	34	2890	0	188	2417	0
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	1%	1%	1%	3%	3%	3%
Turn Type	Split		Prot	Split		Prot	Prot			Prot		
Protected Phases	3	3	3	4	4	4	1	6		5	2	
Permitted Phases												
Actuated Green, G (s)		4.8	4.8	17.7	17.7	17.7	3.6	62.8		14.7	73.9	
Effective Green, g (s)		4.8	4.8	17.7	17.7	17.7	3.6	62.8		14.7	73.9	
Actuated g/C Ratio		0.04	0.04	0.15	0.15	0.15	0.03	0.52		0.12	0.62	
Clearance Time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		70	62	248	221	222	54	3325		215	3096	
v/s Ratio Prot		c0.03	0.00	c0.13	0.09	0.03	0.02	c0.45		c0.11	0.48	
v/s Ratio Perm												
v/c Ratio		0.71	0.02	0.87	0.60	0.23	0.63	0.87		0.87	0.78	
Uniform Delay, d1		56.9	55.4	50.0	47.8	45.2	57.5	25.0		51.7	17.1	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		29.1	0.2	26.6	4.3	0.5	20.8	3.4		30.1	2.0	
Delay (s)		86.0	55.5	76.6	52.1	45.7	78.3	28.4		81.9	19.1	
Level of Service		F	E	E	D	D	E	C		F	B	
Approach Delay (s)		72.8			58.6			29.0			23.6	
Approach LOS		E			E			C			C	

Intersection Summary			
HCM Average Control Delay	30.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	78.2%	ICU Level of Service	D
Analysis Period (min)	15		

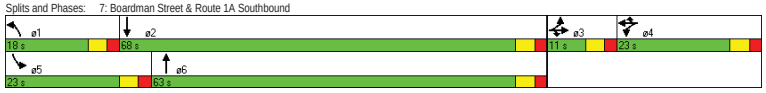
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	42	11	97	414	37	161	144	1365	65	133	2377	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	420		200	475		0
Storage Lanes	0		1	1		1	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			No			No
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		246			531			1411			1005	
Travel Time (s)		5.6			12.1			32.1			22.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Shared Lane Traffic (%)				44%		10%						
Lane Group Flow (vph)	0	58	105	252	256	157	157	1555	0	145	2600	0
Turn Type	Split		Prot	Split		Prot	Prot			Prot		
Protected Phases	3	3	3	4	4	4	1	6		5	2	
Permitted Phases												
Detector Phase	3	3	3	4	4	4	1	6		5	2	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	32.0		11.0	32.0	
Total Split (s)	11.0	11.0	11.0	23.0	23.0	23.0	18.0	63.0	0.0	23.0	68.0	0.0
Total Split (%)	9.2%	9.2%	9.2%	19.2%	19.2%	19.2%	15.0%	52.5%	0.0%	19.2%	56.7%	0.0%
Maximum Green (s)	6.0	6.0	6.0	18.0	18.0	18.0	13.0	58.0		18.0	63.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.66	0.61	0.99	1.04	0.44	0.93	0.51		0.68	0.98	
Control Delay		89.3	26.3	104.8	116.4	11.3	106.3	20.4		66.1	42.6	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		89.3	26.3	104.8	116.4	11.3	106.3	20.4		66.1	42.6	
Queue Length 50th (ft)		45	0	207	~232	0	123	225		109	698	
Queue Length 95th (ft)		#113	#65	#388	#419	64	#256	272		175	#846	
Internal Link Dist (ft)		166			451			1331			925	
Turn Bay Length (ft)			100	200		200	420			475		
Base Capacity (vph)		88	171	255	247	353	169	3076		263	2640	
Starvation Cap Reductn		0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn		0	0	0	0	0	0	0		0	0	
Storage Cap Reductn		0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio		0.66	0.61	0.99	1.04	0.44	0.93	0.51		0.55	0.98	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection
Natural Cycle: 110
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	42	11	97	414	37	161	144	1365	65	133	2377	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.91	0.95	1.00	0.86		1.00	0.91	
Frt		1.00	0.85	1.00	0.99	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1758	1417	1698	1629	1461	1556	6013		1752	5028	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1758	1417	1698	1629	1461	1556	6013		1752	5028	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	46	12	105	450	40	175	157	1484	71	145	2584	16
RTOR Reduction (vph)	0	0	100	0	3	133	0	0	0	0	0	0
Lane Group Flow (vph)	0	58	5	252	253	24	157	1555	0	145	2600	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		Prot	Split		Prot	Prot			Prot		
Protected Phases	3	3	3	4	4	4	1	6		5	2	
Permitted Phases												
Actuated Green, G (s)		6.0	6.0	18.0	18.0	18.0	13.0	61.4		14.6	63.0	
Effective Green, g (s)		6.0	6.0	18.0	18.0	18.0	13.0	61.4		14.6	63.0	
Actuated g/C Ratio		0.05	0.05	0.15	0.15	0.15	0.11	0.51		0.12	0.52	
Clearance Time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		88	71	255	244	219	169	3077		213	2640	
v/s Ratio Prot		c0.03	0.00	0.15	c0.16	0.02	c0.10	0.26		0.08	c0.52	
v/s Ratio Perm												
v/c Ratio		0.66	0.07	0.99	1.04	0.11	0.93	0.51		0.68	0.98	
Uniform Delay, d1		56.0	54.4	50.9	51.0	44.1	53.0	19.3		50.5	28.0	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		16.4	0.4	52.5	68.1	0.2	48.4	0.6		8.6	14.3	
Delay (s)		72.4	54.8	103.4	119.1	44.3	101.4	19.9		59.1	42.3	
Level of Service		E	D	F	F	D	F	B		E	D	
Approach Delay (s)		61.1			95.5			27.4			43.2	
Approach LOS		E			F			C			D	

Intersection Summary

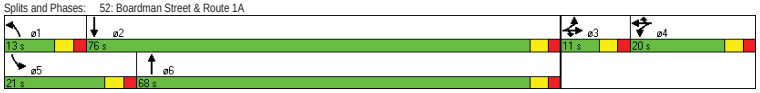
HCM Average Control Delay	45.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	87.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	3	54	252	17	261	74	2837	83	203	2471	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	250		250	420		300	330		0
Storage Lanes	0		1	1		1	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			No			No
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		543			948			1485			370	
Travel Time (s)		9.3			16.2			25.3			6.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	5%	5%	5%
Shared Lane Traffic (%)				27%		36%						
Lane Group Flow (vph)	0	44	59	200	194	182	80	3174	0	221	2699	0
Turn Type	Split		Prot	Split		Prot	Prot			Prot		
Protected Phases	3	3	3	4	4	4	1	6		5	2	
Permitted Phases												
Detector Phase	3	3	3	4	4	4	1	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	10.0		6.0	10.0	
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	32.0		11.0	32.0	
Total Split (s)	11.0	11.0	11.0	20.0	20.0	20.0	13.0	68.0	0.0	21.0	76.0	0.0
Total Split (%)	9.2%	9.2%	9.2%	16.7%	16.7%	16.7%	10.8%	56.7%	0.0%	17.5%	63.3%	0.0%
Maximum Green (s)	6.0	6.0	6.0	15.0	15.0	15.0	8.0	63.0		16.0	71.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	3.0	5.0	5.0	4.0
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Min		None	C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.52	0.45	0.99	0.89	0.54	0.72	0.95		0.97	0.89	
Control Delay		77.8	25.2	113.7	80.0	13.7	88.3	34.5		103.3	25.7	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		77.8	25.2	113.7	80.0	13.7	88.3	34.5		103.3	25.7	
Queue Length 50th (ft)		34	0	165	134	2	62	677		173	652	
Queue Length 95th (ft)		#84	44	#327	#287	74	#142	#797		#331	738	
Internal Link Dist (ft)		463			868			1405			290	
Turn Bay Length (ft)				250		250	420			330		
Base Capacity (vph)		84	131	202	218	338	114	3337		229	3018	
Starvation Cap Reductn		0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn		0	0	0	0	0	0	0		0	0	
Storage Cap Reductn		0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio		0.52	0.45	0.99	0.89	0.54	0.70	0.95		0.97	0.89	

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 52: Boardman Street & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	3	54	252	17	261	74	2837	83	203	2471	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.91	0.95	1.00	0.86		1.00	0.91	
Frt		1.00	0.85	1.00	0.92	0.85	1.00	1.00		1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1681	1495	1618	1474	1447	1703	6140		1719	4936	
Flt Permitted		0.96	1.00	0.95	0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1681	1495	1618	1474	1447	1703	6140		1719	4936	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	41	3	59	274	18	284	80	3084	90	221	2686	13
RTOR Reduction (vph)	0	0	57	0	33	157	0	0	0	0	0	0
Lane Group Flow (vph)	0	44	2	200	161	25	80	3174	0	221	2699	0
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	5%	5%	5%
Turn Type	Split		Prot	Split		Prot	Prot			Prot		
Protected Phases	3	3	3	4	4	4	1	6		5	2	
Permitted Phases												
Actuated Green, G (s)		4.8	4.8	15.0	15.0	15.0	7.8	64.2		16.0	72.4	
Effective Green, g (s)		4.8	4.8	15.0	15.0	15.0	7.8	64.2		16.0	72.4	
Actuated g/C Ratio		0.04	0.04	0.12	0.12	0.12	0.06	0.54		0.13	0.60	
Clearance Time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		67	60	202	184	181	111	3285		229	2978	
v/s Ratio Prot		c0.03	0.00	c0.12	0.11	0.02	0.05	c0.52		c0.13	0.55	
v/s Ratio Perm												
v/c Ratio		0.66	0.04	0.99	0.87	0.14	0.72	0.97		0.97	0.91	
Uniform Delay, d1		56.8	55.4	52.4	51.6	46.8	55.0	26.9		51.7	20.8	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		20.8	0.3	60.3	33.7	0.4	20.4	9.6		49.2	5.2	
Delay (s)		77.6	55.7	112.7	85.2	47.1	75.5	36.5		100.9	26.0	
Level of Service		E	E	F	F	D	E	D		F	C	
Approach Delay (s)		65.0			82.7			37.4			31.7	
Approach LOS		E			F			D			C	

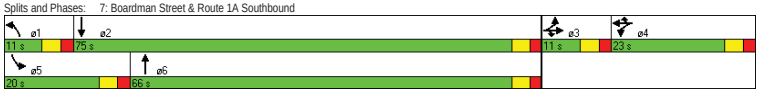
Intersection Summary					
HCM Average Control Delay	39.2	HCM Level of Service	D		
HCM Volume to Capacity ratio	0.95				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0		
Intersection Capacity Utilization	83.0%	ICU Level of Service	E		
Analysis Period (min)	15				

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	10	37	255	12	332	32	2455	339	182	2284	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	350		200	475		0
Storage Lanes	0		1	1		1	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			No			No
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		246			531			1411			1005	
Travel Time (s)		5.6			12.1			32.1			22.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	1%	1%	1%	3%	3%	3%
Shared Lane Traffic (%)				19%		42%						
Lane Group Flow (vph)	0	52	40	224	218	209	35	3036	0	198	2513	0
Turn Type	Split		Prot	Split		Prot	Prot			Prot		
Protected Phases	3	3	3	4	4	4	1	6		5	2	
Permitted Phases												
Detector Phase	3	3	3	4	4	4	1	6		5	2	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	32.0		11.0	32.0	
Total Split (s)	11.0	11.0	11.0	23.0	23.0	23.0	11.0	66.0	0.0	20.0	75.0	0.0
Total Split (%)	9.2%	9.2%	9.2%	19.2%	19.2%	19.2%	9.2%	55.0%	0.0%	16.7%	62.5%	0.0%
Maximum Green (s)	6.0	6.0	6.0	18.0	18.0	18.0	6.0	61.0		15.0	70.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.60	0.35	0.91	0.75	0.57	0.40	0.90		0.91	0.78	
Control Delay		83.9	25.1	88.8	47.7	17.7	68.9	30.8		93.2	19.4	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		83.9	25.1	88.8	47.7	17.7	68.9	30.8		93.2	19.4	
Queue Length 50th (ft)		40	0	181	113	26	27	622		154	563	
Queue Length 95th (ft)		#99	36	#333	#237	107	62	681		#296	637	
Internal Link Dist (ft)		166			451			1331			925	
Turn Bay Length (ft)			100	200		200	350			475		
Base Capacity (vph)		87	115	252	294	372	89	3371		219	3225	
Starvation Cap Reductn		0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn		0	0	0	0	0	0	0		0	0	
Storage Cap Reductn		0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio		0.60	0.35	0.89	0.74	0.56	0.39	0.90		0.90	0.78	

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	10	37	255	12	332	32	2455	339	182	2284	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.91	0.95	1.00	0.86		1.00	0.91	
Frt		1.00	0.85	1.00	0.90	0.85	1.00	0.98		1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1741	1538	1681	1500	1504	1787	6354		1752	5027	
Flt Permitted		0.96	1.00	0.95	0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1741	1538	1681	1500	1504	1787	6354		1752	5027	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	41	11	40	277	13	361	35	2668	368	198	2483	30
RTOR Reduction (vph)	0	0	38	0	69	147	0	0	0	0	0	0
Lane Group Flow (vph)	0	52	2	224	149	62	35	3036	0	198	2513	0
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	1%	1%	1%	3%	3%	3%
Turn Type	Split		Prot	Split		Prot	Prot			Prot		
Protected Phases	3	3	3	4	4	4	1	6		5	2	
Permitted Phases												
Actuated Green, G (s)		4.8	4.8	17.6	17.6	17.6	3.6	62.7		14.9	74.0	
Effective Green, g (s)		4.8	4.8	17.6	17.6	17.6	3.6	62.7		14.9	74.0	
Actuated g/C Ratio		0.04	0.04	0.15	0.15	0.15	0.03	0.52		0.12	0.62	
Clearance Time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		70	62	247	220	221	54	3320		218	3100	
v/s Ratio Prot		c0.03	0.00	c0.13	0.10	0.04	0.02	c0.48		c0.11	0.50	
v/s Ratio Perm												
v/c Ratio		0.74	0.03	0.91	0.68	0.28	0.65	0.91		0.91	0.81	
Uniform Delay, d1		57.0	55.4	50.4	48.5	45.6	57.6	26.2		51.9	17.6	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		34.2	0.2	33.2	8.0	0.7	23.7	5.1		36.5	2.4	
Delay (s)		91.2	55.5	83.6	56.5	46.3	81.3	31.3		88.3	20.0	
Level of Service		F	E	F	E	D	F	C		F	C	
Approach Delay (s)		75.7			62.6			31.9			25.0	
Approach LOS		E			E			C			C	

Intersection Summary					
HCM Average Control Delay	32.7	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.90				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		20.0	
Intersection Capacity Utilization	82.1%	ICU Level of Service		E	
Analysis Period (min)	15				

c Critical Lane Group

Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

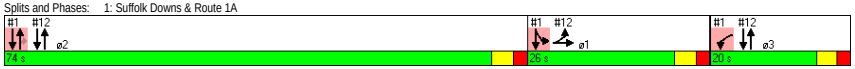
Synchro 7 Capacity Analysis
Option 4 - Flyover Solution

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	20	8	1171	68	8	2133
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	3	1		1	2	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		333			412
Travel Time (s)	28.4		7.6			9.4
Peak Hour Factor	0.68	0.68	0.94	0.94	0.99	0.99
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	29	12	1246	72	8	2155
Turn Type		Free		Perm	Prot	
Protected Phases	3		2		1	1 2
Permitted Phases		Free		2		
Detector Phase	3		2	2	1	1 2
Switch Phase						
Minimum Initial (s)	6.0		6.0	6.0	10.0	
Minimum Split (s)	11.0		11.0	11.0	15.0	
Total Split (s)	20.0	0.0	74.0	74.0	26.0	100.0
Total Split (%)	16.7%	0.0%	61.7%	61.7%	21.7%	83.3%
Yellow Time (s)	3.0		3.0	3.0	3.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead	Lead	Lag	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None		C-Min	C-Min	None	
v/c Ratio	0.05	0.01	0.43	0.08	0.01	0.79
Control Delay	46.5	0.0	15.9	3.6	43.2	10.0
Queue Delay	0.0	0.0	0.3	0.0	0.0	4.0
Total Delay	46.5	0.0	16.1	3.6	43.2	13.9
Queue Length 50th (ft)	7	0	204	0	3	751
Queue Length 95th (ft)	13	0	239	26	m3	788
Internal Link Dist (ft)	1168		253			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)	624	1583	2924	941	584	2722
Starvation Cap Reductn	0	0	848	0	0	480
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.01	0.60	0.08	0.01	0.96

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 39 (33%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	20	8	1171	68	8	2133
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.94	1.00	0.91	1.00	0.97	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	4990	1583	5085	1583	3335	3438
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	4990	1583	5085	1583	3335	3438
Peak-hour factor, PHF	0.68	0.68	0.94	0.94	0.99	0.99
Adj. Flow (vph)	29	12	1246	72	8	2155
RTOR Reduction (vph)	0	0	0	31	0	0
Lane Group Flow (vph)	29	12	1246	41	8	2155
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Turn Type		Free		Perm	Prot	
Protected Phases	3		2		1	1 2
Permitted Phases		Free		2		
Actuated Green, G (s)	15.0	120.0	69.0	69.0	21.0	95.0
Effective Green, g (s)	15.0	120.0	69.0	69.0	21.0	95.0
Actuated g/C Ratio	0.12	1.00	0.58	0.58	0.18	0.79
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	624	1583	2924	910	584	2722
v/s Ratio Prot	c0.01		0.25		0.00	c0.63
v/s Ratio Perm		0.01		0.03		
v/c Ratio	0.05	0.01	0.43	0.05	0.01	0.79
Uniform Delay, d1	46.2	0.0	14.4	11.1	40.9	7.0
Progression Factor	1.00	1.00	1.07	1.31	1.05	1.19
Incremental Delay, d2	0.0	0.0	0.4	0.1	0.0	0.8
Delay (s)	46.2	0.0	15.8	14.6	43.0	9.1
Level of Service	D	A	B	B	D	A
Approach Delay (s)	32.7		15.7			9.3
Approach LOS	C		B			A

Intersection Summary

HCM Average Control Delay	11.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	72.3%	ICU Level of Service	C
Analysis Period (min)	15		

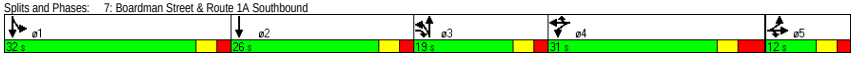
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	39	10	90	384	34	149	134	10	60	124	2052	14	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		100	200		200	200		200	475		0	
Storage Lanes	0		1	1		1	1		1	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		376			531			536			818		
Travel Time (s)		8.5			12.1			12.2			18.6		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.90	0.90	0.90	0.99	0.99	0.99	
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	5%	5%	5%	
Shared Lane Traffic (%)				46%									
Lane Group Flow (vph)	0	52	96	221	224	159	149	11	67	125	2087	0	
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases									Free				
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			6.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0		17.0			13.0
Total Split (s)	12.0	12.0	31.0	31.0	31.0	31.0	19.0	19.0	0.0	32.0	58.0	0.0	26.0
Total Split (%)	10.0%	10.0%	25.8%	25.8%	25.8%	25.8%	15.8%	15.8%	0.0%	26.7%	48.3%	0.0%	22%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag				Lag	Lag	Lag	Lead	Lead		Lead			Lag
Lead-Lag Optimize?													
Recall Mode	None	None		None	None	None	None	None		C-Max			None
v/c Ratio		0.54	0.35	0.79	0.79	0.40	0.79	0.06	0.04	0.28	0.89		
Control Delay		75.8	21.2	67.0	67.2	9.4	80.2	48.0	0.1	24.3	37.3		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay		75.8	21.2	67.0	67.2	9.4	80.2	48.0	0.1	24.3	37.3		
Queue Length 50th (ft)		40	30	171	173	0	113	8	0	70	625		
Queue Length 95th (ft)		#90	62	262	265	58	#215	26	0	m98	#698		
Internal Link Dist (ft)		296			451			456			738		
Turn Bay Length (ft)			100	200		200	200		200	475			
Base Capacity (vph)		99	282	324	327	432	199	209	1524	446	2351		
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio		0.53	0.34	0.68	0.69	0.37	0.75	0.05	0.04	0.28	0.89		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 1:SBTL, Start of Green, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	39	10	90	384	34	149	134	10	60	124	2052	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.91	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1693	1495	1618	1634	1524	1703	1792	1524	1719	4935	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1693	1495	1618	1634	1524	1703	1792	1524	1719	4935	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.90	0.90	0.90	0.99	0.99	0.99
Adj. Flow (vph)	41	11	96	409	36	159	149	11	67	125	2073	14
RTOR Reduction (vph)	0	0	21	0	0	131	0	0	0	0	1	0
Lane Group Flow (vph)	0	52	75	221	224	28	149	11	67	125	2086	0
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	5%	5%	5%
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases									Free			
Actuated Green, G (s)		6.8	20.1	20.8	20.8	20.8	13.3	13.3	120.0	31.1	57.1	
Effective Green, g (s)		6.8	20.1	20.8	20.8	20.8	13.3	13.3	120.0	31.1	57.1	
Actuated g/C Ratio		0.06	0.17	0.17	0.17	0.17	0.11	0.11	1.00	0.26	0.48	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		96	250	280	283	264	189	199	1524	446	2348	
v/s Ratio Prot		c0.03	0.05	0.14	c0.14	0.02	c0.09	0.01		0.07	c0.42	
v/s Ratio Perm									0.04			
v/c Ratio		0.54	0.30	0.79	0.79	0.10	0.79	0.06	0.04	0.28	0.89	
Uniform Delay, d1		55.1	43.8	47.5	47.5	41.8	52.0	47.7	0.0	35.5	28.6	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.61	1.14	
Incremental Delay, d2		6.1	0.7	13.7	14.0	0.2	19.2	0.1	0.1	1.0	3.1	
Delay (s)		61.2	44.5	61.2	61.5	41.9	71.2	47.8	0.1	22.8	35.6	
Level of Service		E	D	E	E	D	E	D	A	C	D	
Approach Delay (s)		50.3			56.3			49.1			34.9	
Approach LOS		D			E			D			C	

Intersection Summary

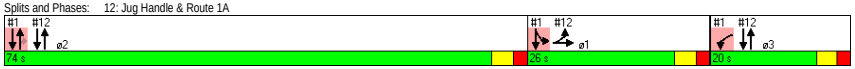
HCM Average Control Delay	40.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	79.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2	ø3
Lane Configurations														
Volume (vph)	54	8	7	0	0	0	0	1179	3	0	2140	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	16	16	16	12	12	12	12	12	12	12	12	12		
Right Turn on Red			Yes			Yes			Yes			Yes		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		158			294			412			281			
Travel Time (s)		3.6			6.7			9.4			6.4			
Peak Hour Factor	0.73	0.73	0.73	0.92	0.92	0.92	0.93	0.93	0.93	0.99	0.99	0.99		
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	6%	6%	6%	5%	5%	5%		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	95	0	0	0	0	0	1271	0	0	2162	0		
Turn Type	Split													
Protected Phases	1	1						2 3			2 3		2	3
Permitted Phases														
Detector Phase	1	1						2 3			2 3			
Switch Phase														
Minimum Initial (s)	10.0	10.0											6.0	6.0
Minimum Split (s)	15.0	15.0											11.0	11.0
Total Split (s)	26.0	26.0	0.0	0.0	0.0	0.0	0.0	94.0	0.0	0.0	94.0	0.0	74.0	20.0
Total Split (%)	21.7%	21.7%	0.0%	0.0%	0.0%	0.0%	0.0%	78.3%	0.0%	0.0%	78.3%	0.0%	62%	17%
Yellow Time (s)	3.0	3.0											3.0	3.0
All-Red Time (s)	2.0	2.0											2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0		
Lead/Lag	Lag	Lag											Lead	
Lead-Lag Optimize?	Yes	Yes											Yes	
Recall Mode	None	None											C-Min	None
v/c Ratio		0.27						0.35			0.85			
Control Delay		43.4						1.9			15.1			
Queue Delay		0.0						0.0			0.8			
Total Delay		43.4						1.9			15.9			
Queue Length 50th (ft)		62						19			533			
Queue Length 95th (ft)		90						33			655			
Internal Link Dist (ft)		78			214			332			201			
Turn Bay Length (ft)														
Base Capacity (vph)		354						3629			2550			
Starvation Cap Reductn		0						294			0			
Spillback Cap Reductn		0						0			150			
Storage Cap Reductn		0						0			0			
Reduced v/c Ratio		0.27						0.38			0.90			

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 39 (33%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	

Splits and Phases: 12: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	54	8	7	0	0	0	0	1179	3	0	2140	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	16	16	16	12	12	12	12	12	12	12	12	12
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.95	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		2003						4892			3438	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		2003						4892			3438	
Peak-hour factor, PHF	0.73	0.73	0.73	0.92	0.92	0.92	0.93	0.93	0.93	0.99	0.99	0.99
Adj. Flow (vph)	74	11	10	0	0	0	0	1268	3	0	2162	0
RTOR Reduction (vph)	0	3	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	92	0	0	0	0	0	1271	0	0	2162	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	6%	6%	6%	5%	5%	5%
Turn Type	Split											
Protected Phases	1	1						2 3			2 3	
Permitted Phases												
Actuated Green, G (s)		21.0						89.0			89.0	
Effective Green, g (s)		21.0						89.0			89.0	
Actuated g/C Ratio		0.18						0.74			0.74	
Clearance Time (s)		5.0										
Vehicle Extension (s)		3.0										
Lane Grp Cap (vph)		351						3628			2550	
v/s Ratio Prot		c0.05						0.26			c0.63	
v/s Ratio Perm												
v/c Ratio		0.26						0.35			0.85	
Uniform Delay, d1		42.8						5.4			10.8	
Progression Factor		1.00						0.31			1.00	
Incremental Delay, d2		0.4						0.1			2.8	
Delay (s)		43.2						1.7			13.6	
Level of Service		D						A			B	
Approach Delay (s)		43.2			0.0			1.7			13.6	
Approach LOS		D			A			A			B	

Intersection Summary					
HCM Average Control Delay		10.1	HCM Level of Service		B
HCM Volume to Capacity ratio		0.74			
Actuated Cycle Length (s)		120.0	Sum of lost time (s)		10.0
Intersection Capacity Utilization		75.8%	ICU Level of Service		D
Analysis Period (min)		15			
c Critical Lane Group					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	195	5	0	0	0	50	0	1036	50	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		300	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red	Yes		Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		105			600			1113			116	
Travel Time (s)		2.4			13.6			25.3			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	2%	2%
Shared Lane Traffic (%)	49%											
Lane Group Flow (vph)	108	109	0	0	0	54	0	1180	0	0	0	0
Turn Type	Perm					Free						
Protected Phases		4						2				
Permitted Phases	4					Free						
Detector Phase	4	4						2				
Switch Phase												
Minimum Initial (s)	6.0	6.0						10.0				
Minimum Split (s)	11.0	11.0						20.0				
Total Split (s)	32.0	32.0	0.0	0.0	0.0	0.0	0.0	88.0	0.0	0.0	0.0	0.0
Total Split (%)	26.7%	26.7%	0.0%	0.0%	0.0%	0.0%	0.0%	73.3%	0.0%	0.0%	0.0%	0.0%
Yellow Time (s)	3.0	3.0						3.0				
All-Red Time (s)	2.0	2.0						2.0				
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None						C-Min				
v/c Ratio	0.47	0.47				0.03		0.29				
Control Delay	18.1	19.2				0.0		2.5				
Queue Delay	0.0	0.0				0.0		0.0				
Total Delay	18.1	19.2				0.0		2.5				
Queue Length 50th (ft)	0	8				0		39				
Queue Length 95th (ft)	61	66				0		111				
Internal Link Dist (ft)		25			520			1033			36	
Turn Bay Length (ft)												
Base Capacity (vph)	462	479				1611		4129				
Starvation Cap Reductn	0	0				0		0				
Spillback Cap Reductn	0	0				0		0				
Storage Cap Reductn	0	0				0		0				
Reduced v/c Ratio	0.23	0.23				0.03		0.29				

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 75 (63%), Referenced to phase 2:NBT, Start of Green
Natural Cycle: 40
Control Type: Actuated-Coordinated

Splits and Phases: 20: Waldemar Avenue & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	195	5	0	0	0	50	0	1036	50	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0				4.0		5.0				
Lane Util. Factor	0.95	0.95				1.00		0.91				
Frt	1.00	1.00				0.86		0.99				
Flt Protected	0.95	1.00				1.00		1.00				
Satd. Flow (prot)	1681	1770				1611		4913				
Flt Permitted	0.95	1.00				1.00		1.00				
Satd. Flow (perm)	1681	1770				1611		4913				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	212	5	0	0	0	54	0	1126	54	0	0	0
RTOR Reduction (vph)	100	96	0	0	0	0	0	2	0	0	0	0
Lane Group Flow (vph)	8	13	0	0	0	54	0	1178	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	2%	2%
Turn Type	Perm					Free						
Protected Phases		4						2				
Permitted Phases	4					Free						
Actuated Green, G (s)	9.2	9.2				120.0		100.8				
Effective Green, g (s)	9.2	9.2				120.0		100.8				
Actuated g/C Ratio	0.08	0.08				1.00		0.84				
Clearance Time (s)	5.0	5.0						5.0				
Vehicle Extension (s)	3.0	3.0						3.0				
Lane Grp Cap (vph)	129	136				1611		4127				
v/s Ratio Prot								c0.24				
v/s Ratio Perm	0.00	0.01				0.03						
v/c Ratio	0.06	0.10				0.03		0.29				
Uniform Delay, d1	51.4	51.5				0.0		2.0				
Progression Factor	1.31	1.26				1.00		1.00				
Incremental Delay, d2	0.2	0.3				0.0		0.2				
Delay (s)	67.6	65.1				0.0		2.2				
Level of Service	E	E				A		A				
Approach Delay (s)		66.3			0.0			2.2			0.0	
Approach LOS		E			A			A			A	

Intersection Summary

HCM Average Control Delay	11.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	35.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	19	13	2007	200	30	1716
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	3	1		1	2	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		333			412
Travel Time (s)	28.4		7.6			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	21	14	2182	217	33	1865
Turn Type		Free		Perm	Prot	
Protected Phases	3		2		1	1 2
Permitted Phases		Free		2		
Detector Phase	3		2	2	1	1 2
Switch Phase						
Minimum Initial (s)	6.0		6.0	6.0	10.0	
Minimum Split (s)	11.0		11.0	11.0	15.0	
Total Split (s)	25.0	0.0	58.0	58.0	17.0	75.0
Total Split (%)	25.0%	0.0%	58.0%	58.0%	17.0%	75.0%
Yellow Time (s)	3.0		3.0	3.0	3.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead	Lead	Lag	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None		C-Min	C-Min	None	
v/c Ratio	0.02	0.01	0.81	0.23	0.08	0.77
Control Delay	32.3	0.0	20.3	1.7	40.5	12.2
Queue Delay	0.0	0.0	0.4	0.0	0.0	1.0
Total Delay	32.3	0.0	20.7	1.7	40.5	13.2
Queue Length 50th (ft)	3	0	421	10	10	471
Queue Length 95th (ft)	10	0	316	12	m14	594
Internal Link Dist (ft)	1168		253			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)	998	1583	2695	941	400	2407
Starvation Cap Reductn	0	0	159	0	0	277
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.01	0.86	0.23	0.08	0.88

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 90 (90%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	19	13	2007	200	30	1716
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.94	1.00	0.91	1.00	0.97	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	4990	1583	5085	1583	3335	3438
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	4990	1583	5085	1583	3335	3438
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	14	2182	217	33	1865
RTOR Reduction (vph)	0	0	0	102	0	0
Lane Group Flow (vph)	21	14	2182	115	33	1865
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Turn Type		Free		Perm	Prot	
Protected Phases	3		2		1	1 2
Permitted Phases		Free		2		
Actuated Green, G (s)	20.0	100.0	53.0	53.0	12.0	70.0
Effective Green, g (s)	20.0	100.0	53.0	53.0	12.0	70.0
Actuated g/C Ratio	0.20	1.00	0.53	0.53	0.12	0.70
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	998	1583	2695	839	400	2407
v/s Ratio Prot	c0.00		0.43		0.01	c0.54
v/s Ratio Perm		0.01		0.07		
v/c Ratio	0.02	0.01	0.81	0.14	0.08	0.77
Uniform Delay, d1	32.1	0.0	19.3	11.9	39.1	9.8
Progression Factor	1.00	1.00	0.91	0.70	1.02	1.02
Incremental Delay, d2	0.0	0.0	2.4	0.3	0.1	1.1
Delay (s)	32.1	0.0	20.0	8.6	40.0	11.2
Level of Service	C	A	C	A	D	B
Approach Delay (s)	19.3		19.0			11.7
Approach LOS	B		B			B

Intersection Summary

HCM Average Control Delay	15.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	60.8%	ICU Level of Service	B
Analysis Period (min)	15		

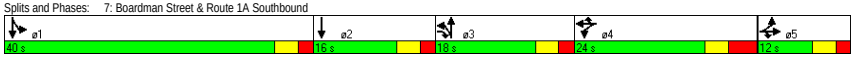
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	34	3	48	182	15	201	66	10	23	152	1591	11	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		100	200		200	200		200	475		0	
Storage Lanes	0		1	1		1	1		1	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		376			531			536			818		
Travel Time (s)		8.5			12.1			12.2			18.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	5%	5%	5%	
Shared Lane Traffic (%)				46%									
Lane Group Flow (vph)	0	40	52	107	107	218	72	11	25	165	1741	0	
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases									Free				
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			4.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0		17.0			21.0
Total Split (s)	12.0	12.0	30.0	24.0	24.0	24.0	18.0	18.0	0.0	40.0	56.0	0.0	16.0
Total Split (%)	10.9%	10.9%	27.3%	21.8%	21.8%	21.8%	16.4%	16.4%	0.0%	36.4%	50.9%	0.0%	15%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag				Lag	Lag	Lag	Lead	Lead		Lead			Lag
Lead-Lag Optimize?													Yes
Recall Mode	None	None		None	None	None	None	None		C-Max			None
v/c Ratio		0.39	0.19	0.58	0.57	0.59	0.47	0.07	0.02	0.22	0.61		
Control Delay		60.7	7.9	57.8	57.4	12.8	57.2	45.1	0.0	24.9	19.3		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay		60.7	7.9	57.8	57.4	12.8	57.2	45.1	0.0	24.9	19.3		
Queue Length 50th (ft)		28	0	76	76	0	49	7	0	78	312		
Queue Length 95th (ft)		64	22	131	131	67	94	25	0	145	423		
Internal Link Dist (ft)		296			451			456			738		
Turn Bay Length (ft)			100	200		200	200		200	475			
Base Capacity (vph)		107	314	250	252	420	201	212	1524	738	2837		
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio		0.37	0.17	0.43	0.42	0.52	0.36	0.05	0.02	0.22	0.61		

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 1:SBTL, Start of Green, Master Intersection
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	3	48	182	15	201	66	10	23	152	1591	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.91	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1681	1495	1618	1633	1524	1703	1792	1524	1719	4935	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1681	1495	1618	1633	1524	1703	1792	1524	1719	4935	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	3	52	198	16	218	72	11	25	165	1729	12
RTOR Reduction (vph)	0	0	45	0	0	193	0	0	0	0	0	0
Lane Group Flow (vph)	0	40	7	107	107	25	72	11	25	165	1741	0
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	5%	5%	5%
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases									Free			
Actuated Green, G (s)		5.6	14.2	12.6	12.6	12.6	8.6	8.6	110.0	45.2	61.2	
Effective Green, g (s)		5.6	14.2	12.6	12.6	12.6	8.6	8.6	110.0	45.2	61.2	
Actuated g/C Ratio		0.05	0.13	0.11	0.11	0.11	0.08	0.08	1.00	0.41	0.56	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		86	193	185	187	175	133	140	1524	706	2746	
v/s Ratio Prot		c0.02	0.00	c0.07	0.07	0.02	c0.04	0.01		0.10	c0.35	
v/s Ratio Perm									0.02			
v/c Ratio		0.47	0.03	0.58	0.57	0.14	0.54	0.08	0.02	0.23	0.63	
Uniform Delay, d1		50.7	41.9	46.2	46.1	43.8	48.8	47.0	0.0	21.1	16.7	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		3.9	0.1	4.3	4.2	0.4	4.4	0.2	0.0	0.8	0.5	
Delay (s)		54.7	42.0	50.5	50.3	44.2	53.2	47.3	0.0	21.9	17.2	
Level of Service		D	D	D	D	D	D	D	A	C	B	
Approach Delay (s)		47.5			47.3			40.3			17.6	
Approach LOS		D			D			D			B	

Intersection Summary

HCM Average Control Delay	24.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	62.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2	ø3
Lane Configurations														
Volume (vph)	100	7	8	0	0	0	0	2031	0	0	1738	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	16	16	16	12	12	12	12	12	12	12	12	12		
Right Turn on Red			Yes			Yes			Yes			Yes		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		158			294			412			281			
Travel Time (s)		3.6			6.7			9.4			6.4			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92		
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	6%	6%	6%	5%	5%	5%		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	126	0	0	0	0	0	2208	0	0	1889	0		
Turn Type	Split													
Protected Phases	1	1						2 3			2 3		2	3
Permitted Phases														
Detector Phase	1	1						2 3			2 3			
Switch Phase														
Minimum Initial (s)	10.0	10.0											6.0	6.0
Minimum Split (s)	15.0	15.0											11.0	11.0
Total Split (s)	17.0	17.0	0.0	0.0	0.0	0.0	0.0	83.0	0.0	0.0	83.0	0.0	58.0	25.0
Total Split (%)	17.0%	17.0%	0.0%	0.0%	0.0%	0.0%	0.0%	83.0%	0.0%	0.0%	83.0%	0.0%	58%	25%
Yellow Time (s)	3.0	3.0											3.0	3.0
All-Red Time (s)	2.0	2.0											2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0		
Lead/Lag	Lag	Lag											Lead	
Lead-Lag Optimize?	Yes	Yes											Yes	
Recall Mode	None	None											C-Min	None
v/c Ratio		0.52						0.58			0.70			
Control Delay		48.6						3.2			7.2			
Queue Delay		0.0						0.1			0.3			
Total Delay		48.6						3.3			7.5			
Queue Length 50th (ft)		75						48			245			
Queue Length 95th (ft)		134						78			311			
Internal Link Dist (ft)		78			214			332			201			
Turn Bay Length (ft)														
Base Capacity (vph)		243						3817			2682			
Starvation Cap Reductn		0						277			0			
Spillback Cap Reductn		0						0			255			
Storage Cap Reductn		0						0			0			
Reduced v/c Ratio		0.52						0.62			0.78			

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 90 (90%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	

Splits and Phases: 12: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	100	7	8	0	0	0	0	2031	0	0	1738	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	16	16	16	12	12	12	12	12	12	12	12	12
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.95	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		2004						4893			3438	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		2004						4893			3438	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	109	8	9	0	0	0	0	2208	0	0	1889	0
RTOR Reduction (vph)	0	3	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	123	0	0	0	0	0	2208	0	0	1889	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	6%	6%	6%	5%	5%	5%
Turn Type	Split											
Protected Phases	1	1						2 3			2 3	
Permitted Phases												
Actuated Green, G (s)		12.0						78.0			78.0	
Effective Green, g (s)		12.0						78.0			78.0	
Actuated g/C Ratio		0.12						0.78			0.78	
Clearance Time (s)		5.0										
Vehicle Extension (s)		3.0										
Lane Grp Cap (vph)		240						3817			2682	
v/s Ratio Prot		c0.06						0.45			c0.55	
v/s Ratio Perm												
v/c Ratio		0.51						0.58			0.70	
Uniform Delay, d1		41.3						4.4			5.4	
Progression Factor		1.00						0.64			1.00	
Incremental Delay, d2		1.9						0.1			0.9	
Delay (s)		43.1						2.9			6.2	
Level of Service		D						A			A	
Approach Delay (s)		43.1			0.0			2.9			6.2	
Approach LOS		D			A			A			A	

Intersection Summary					
HCM Average Control Delay		5.6	HCM Level of Service		A
HCM Volume to Capacity ratio		0.68			
Actuated Cycle Length (s)		100.0	Sum of lost time (s)		10.0
Intersection Capacity Utilization		64.7%	ICU Level of Service		C
Analysis Period (min)		15			
c Critical Lane Group					



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	240	5	0	0	0	149	0	1837	114	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		300	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red	Yes		Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		105			600			1113			116	
Travel Time (s)		2.4			13.6			25.3			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	2%	2%
Shared Lane Traffic (%)	49%											
Lane Group Flow (vph)	133	133	0	0	0	162	0	2121	0	0	0	0
Turn Type	Perm					Free						
Protected Phases		4						2				
Permitted Phases	4					Free						
Detector Phase	4	4						2				
Switch Phase												
Minimum Initial (s)	6.0	6.0						10.0				
Minimum Split (s)	11.0	11.0						20.0				
Total Split (s)	25.0	25.0	0.0	0.0	0.0	0.0	0.0	75.0	0.0	0.0	0.0	0.0
Total Split (%)	25.0%	25.0%	0.0%	0.0%	0.0%	0.0%	0.0%	75.0%	0.0%	0.0%	0.0%	0.0%
Yellow Time (s)	3.0	3.0						3.0				
All-Red Time (s)	2.0	2.0						2.0				
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None						C-Min				
v/c Ratio	0.58	0.55				0.10		0.56				
Control Delay	44.5	42.9				0.1		5.7				
Queue Delay	0.0	0.0				0.0		0.1				
Total Delay	44.5	42.9				0.1		5.8				
Queue Length 50th (ft)	73	73				0		152				
Queue Length 95th (ft)	126	125				0		265				
Internal Link Dist (ft)		25			520			1033			36	
Turn Bay Length (ft)												
Base Capacity (vph)	351	368				1611		3795				
Starvation Cap Reductn	0	0				0		0				
Spillback Cap Reductn	1	1				149		456				
Storage Cap Reductn	0	0				0		0				
Reduced v/c Ratio	0.38	0.36				0.11		0.64				

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 89 (89%), Referenced to phase 2:NBT, Start of Green	
Natural Cycle: 40	
Control Type: Actuated-Coordinated	

Splits and Phases: 20: Waldemar Avenue & Route 1A





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	240	5	0	0	0	149	0	1837	114	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0				4.0		5.0				
Lane Util. Factor	0.95	0.95				1.00		0.91				
Frt	1.00	1.00				0.86		0.99				
Flt Protected	0.95	1.00				1.00		1.00				
Satd. Flow (prot)	1681	1770				1611		4905				
Flt Permitted	0.95	1.00				1.00		1.00				
Satd. Flow (perm)	1681	1770				1611		4905				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	261	5	0	0	0	162	0	1997	124	0	0	0
RTOR Reduction (vph)	16	16	0	0	0	0	0	5	0	0	0	0
Lane Group Flow (vph)	117	117	0	0	0	162	0	2116	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	2%	2%
Turn Type	Perm					Free						
Protected Phases		4						2				
Permitted Phases	4					Free						
Actuated Green, G (s)	12.7	12.7				100.0		77.3				
Effective Green, g (s)	12.7	12.7				100.0		77.3				
Actuated g/C Ratio	0.13	0.13				1.00		0.77				
Clearance Time (s)	5.0	5.0						5.0				
Vehicle Extension (s)	3.0	3.0						3.0				
Lane Grp Cap (vph)	213	225				1611		3792				
v/s Ratio Prot								c0.43				
v/s Ratio Perm	c0.07	0.07				0.10						
v/c Ratio	0.55	0.52				0.10		0.56				
Uniform Delay, d1	41.0	40.8				0.0		4.5				
Progression Factor	1.00	1.00				1.00		1.00				
Incremental Delay, d2	3.1	2.2				0.1		0.6				
Delay (s)	44.0	43.0				0.1		5.1				
Level of Service	D	D				A		A				
Approach Delay (s)		43.5			0.1			5.1			0.0	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM Average Control Delay	8.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	53.1%	ICU Level of Service	A
Analysis Period (min)	15		

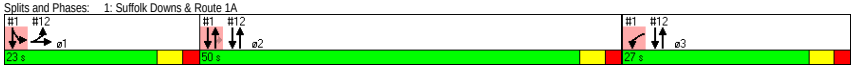
c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	41	59	1691	165	26	1567
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	3	1		1	2	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		333			412
Travel Time (s)	28.4		7.6			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	45	64	1838	179	28	1703
Turn Type		Free		Perm	Prot	
Protected Phases	3		2		1	1 2
Permitted Phases		Free		2		
Detector Phase	3		2	2	1	1 2
Switch Phase						
Minimum Initial (s)	6.0		6.0	6.0	10.0	
Minimum Split (s)	11.0		11.0	11.0	15.0	
Total Split (s)	27.0	0.0	50.0	50.0	23.0	73.0
Total Split (%)	27.0%	0.0%	50.0%	50.0%	23.0%	73.0%
Maximum Green (s)	22.0		45.0	45.0	18.0	
Yellow Time (s)	3.0		3.0	3.0	3.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	None		C-Min	C-Min	None	
v/c Ratio	0.04	0.04	0.80	0.22	0.05	0.71
Control Delay	30.9	0.1	28.5	3.7	37.8	10.0
Queue Delay	0.0	0.0	1.1	0.0	0.0	0.3
Total Delay	30.9	0.1	29.6	3.7	37.8	10.3
Queue Length 50th (ft)	8	0	393	12	9	226
Queue Length 95th (ft)	18	0	442	9	m13	270
Internal Link Dist (ft)	1168		253			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)	1098	1583	2288	811	612	2383
Starvation Cap Reductn	0	0	222	0	0	217
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.04	0.89	0.22	0.05	0.79

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 68 (68%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	41	59	1691	165	26	1567
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.94	1.00	0.91	1.00	0.97	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	4990	1583	5085	1583	3400	3505
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	4990	1583	5085	1583	3400	3505
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	45	64	1838	179	28	1703
RTOR Reduction (vph)	0	0	0	98	0	0
Lane Group Flow (vph)	45	64	1838	81	28	1703
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Turn Type		Free		Perm	Prot	
Protected Phases	3		2		1	1 2
Permitted Phases		Free		2		
Actuated Green, G (s)	22.0	100.0	45.0	45.0	18.0	68.0
Effective Green, g (s)	22.0	100.0	45.0	45.0	18.0	68.0
Actuated g/C Ratio	0.22	1.00	0.45	0.45	0.18	0.68
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1098	1583	2288	712	612	2383
v/s Ratio Prot	0.01		c0.36		0.01	c0.49
v/s Ratio Perm		c0.04		0.05		
v/c Ratio	0.04	0.04	0.80	0.11	0.05	0.71
Uniform Delay, d1	30.7	0.0	23.7	15.9	33.9	10.0
Progression Factor	1.00	1.00	1.07	1.18	1.10	0.84
Incremental Delay, d2	0.0	0.0	2.9	0.3	0.0	0.8
Delay (s)	30.7	0.0	28.2	19.1	37.5	9.1
Level of Service	C	A	C	B	D	A
Approach Delay (s)	12.7		27.4			9.6
Approach LOS	B		C			A

Intersection Summary

HCM Average Control Delay	19.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	56.6%	ICU Level of Service	B
Analysis Period (min)	15		

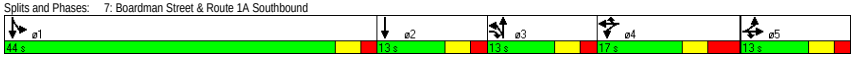
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	34	9	33	184	11	256	29	10	239	126	1474	25	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		100	200		200	200		200	475		0	
Storage Lanes	0		1	1		1	1		1	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		246			531			536			818		
Travel Time (s)		5.6			12.1			12.2			18.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	1%	1%	1%	3%	3%	3%	
Shared Lane Traffic (%)				47%									
Lane Group Flow (vph)	0	47	36	106	106	278	32	11	260	137	1629	0	
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases									Free				
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			4.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0		17.0			13.0
Total Split (s)	13.0	13.0	26.0	17.0	17.0	17.0	13.0	13.0	0.0	44.0	57.0	0.0	13.0
Total Split (%)	13.0%	13.0%	26.0%	17.0%	17.0%	17.0%	13.0%	13.0%	0.0%	44.0%	57.0%	0.0%	13%
Maximum Green (s)	8.0	8.0		10.0	10.0	10.0	8.0	8.0		39.0			8.0
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag				Lag	Lag	Lag	Lead	Lead		Lead			Lag
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes		Yes			Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
Recall Mode	None	None		None	None	None	None	None		C-Max			None
Walk Time (s)	7.0	7.0		5.0	5.0	5.0	7.0	7.0					5.0
Flash Dont Walk (s)	20.0	20.0		11.0	11.0	11.0	20.0	20.0					11.0
Pedestrian Calls (#/hr)	5	5		0	0	0	5	5					0
v/c Ratio		0.37	0.15	0.67	0.66	0.69	0.25	0.08	0.16	0.17	0.55		
Control Delay		52.3	12.1	64.4	63.6	15.2	48.7	44.3	0.2	10.2	7.6		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay		52.3	12.1	64.4	63.6	15.2	48.7	44.3	0.2	10.2	7.6		
Queue Length 50th (ft)		29	4	69	69	0	20	7	0	40	149		
Queue Length 95th (ft)		66	24	#144	#143	79	49	24	0	m63	191		
Internal Link Dist (ft)		166			451			456			738		
Turn Bay Length (ft)			100	200		200	200		200	475			
Base Capacity (vph)		139	269	168	170	409	143	150	1599	797	2942		
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio		0.34	0.13	0.63	0.62	0.68	0.22	0.07	0.16	0.17	0.55		

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 1:SBTL, Start of Green, Master Intersection
Natural Cycle: 70
Control Type: Actuated-Coordinated
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	9	33	184	11	256	29	10	239	126	1474	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.91	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1741	1538	1681	1694	1583	1787	1881	1599	1752	5023	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1741	1538	1681	1694	1583	1787	1881	1599	1752	5023	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	10	36	200	12	278	32	11	260	137	1602	27
RTOR Reduction (vph)	0	0	24	0	0	252	0	0	0	0	2	0
Lane Group Flow (vph)	0	47	12	106	106	26	32	11	260	137	1627	0
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	1%	1%	1%	3%	3%	3%
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases									Free			
Actuated Green, G (s)		6.2	12.1	9.5	9.5	9.5	5.9	5.9	100.0	43.4	56.4	
Effective Green, g (s)		6.2	12.1	9.5	9.5	9.5	5.9	5.9	100.0	43.4	56.4	
Actuated g/C Ratio		0.06	0.12	0.10	0.10	0.10	0.06	0.06	1.00	0.43	0.56	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		108	186	160	161	150	105	111	1599	760	2833	
v/s Ratio Prot		c0.03	0.01	c0.06	0.06	0.02	c0.02	0.01		0.08	c0.32	
v/s Ratio Perm									0.16			
v/c Ratio		0.44	0.07	0.66	0.66	0.18	0.30	0.10	0.16	0.18	0.57	
Uniform Delay, d1		45.2	38.9	43.7	43.7	41.6	45.1	44.5	0.0	17.4	14.1	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.51	0.49	
Incremental Delay, d2		2.8	0.2	9.9	9.3	0.6	1.6	0.4	0.2	0.4	0.2	
Delay (s)		48.0	39.1	53.6	53.0	42.2	46.7	44.9	0.2	9.3	7.0	
Level of Service		D	D	D	D	D	D	D	A	A	A	
Approach Delay (s)		44.1			47.0			6.8			7.2	
Approach LOS		D			D			A			A	

Intersection Summary

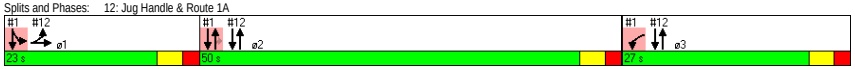
HCM Average Control Delay	15.7	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.55				
Actuated Cycle Length (s)	100.0	Sum of lost time (s)		22.0	
Intersection Capacity Utilization	53.6%	ICU Level of Service		A	
Analysis Period (min)	15				

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2	ø3
Lane Configurations														
Volume (vph)	49	8	7	0	0	0	0	1752	2	0	1586	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Right Turn on Red			Yes			Yes			Yes			Yes		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		158			294			412			281			
Travel Time (s)		3.6			6.7			9.4			6.4			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92		
Heavy Vehicles (%)	14%	14%	14%	0%	0%	0%	2%	2%	2%	3%	3%	3%		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	70	0	0	0	0	0	1906	0	0	1724	0		
Turn Type	Split													
Protected Phases	1	1						2 3			2 3		2	3
Permitted Phases														
Detector Phase	1	1						2 3			2 3			
Switch Phase														
Minimum Initial (s)	10.0	10.0											6.0	6.0
Minimum Split (s)	15.0	15.0											11.0	11.0
Total Split (s)	23.0	23.0	0.0	0.0	0.0	0.0	0.0	77.0	0.0	0.0	77.0	0.0	50.0	27.0
Total Split (%)	23.0%	23.0%	0.0%	0.0%	0.0%	0.0%	0.0%	77.0%	0.0%	0.0%	77.0%	0.0%	50%	27%
Maximum Green (s)	18.0	18.0											45.0	22.0
Yellow Time (s)	3.0	3.0											3.0	3.0
All-Red Time (s)	2.0	2.0											2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0		
Lead/Lag	Lead	Lead											Lag	
Lead-Lag Optimize?	Yes	Yes											Yes	
Vehicle Extension (s)	3.0	3.0											3.0	3.0
Recall Mode	None	None											C-Min	None
v/c Ratio		0.24						0.52			0.68			
Control Delay		34.6						0.7			9.5			
Queue Delay		0.0						0.3			0.0			
Total Delay		34.6						0.9			9.5			
Queue Length 50th (ft)		35						5			273			
Queue Length 95th (ft)		76						4			342			
Internal Link Dist (ft)		78			214			332			201			
Turn Bay Length (ft)														
Base Capacity (vph)		290						3661			2524			
Starvation Cap Reductn		0						875			0			
Spillback Cap Reductn		0						0			0			
Storage Cap Reductn		0						0			0			
Reduced v/c Ratio		0.24						0.68			0.68			

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 68 (68%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	

Splits and Phases: 12: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	49	8	7	0	0	0	0	1752	2	0	1586	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.95	
Frt		0.98						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1581						5084			3505	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1581						5084			3505	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	53	9	8	0	0	0	0	1904	2	0	1724	0
RTOR Reduction (vph)	0	5	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	65	0	0	0	0	0	1906	0	0	1724	0
Heavy Vehicles (%)	14%	14%	14%	0%	0%	0%	2%	2%	2%	3%	3%	3%
Turn Type	Split											
Protected Phases	1	1						2 3			2 3	
Permitted Phases												
Actuated Green, G (s)		18.0						72.0			72.0	
Effective Green, g (s)		18.0						72.0			72.0	
Actuated g/C Ratio		0.18						0.72			0.72	
Clearance Time (s)		5.0										
Vehicle Extension (s)		3.0										
Lane Grp Cap (vph)		285						3660			2524	
v/s Ratio Prot		c0.04						0.37			c0.49	
v/s Ratio Perm												
v/c Ratio		0.23						0.52			0.68	
Uniform Delay, d1		35.1						6.3			7.7	
Progression Factor		1.00						0.06			1.00	
Incremental Delay, d2		0.4						0.1			0.8	
Delay (s)		35.5						0.4			8.5	
Level of Service		D						A			A	
Approach Delay (s)		35.5			0.0			0.4			8.5	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM Average Control Delay	4.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	60.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	295	5	0	0	0	111	0	1467	114	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		300	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red	Yes		Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		105			600			1113			116	
Travel Time (s)		2.4			13.6			25.3			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)	49%											
Lane Group Flow (vph)	164	162	0	0	0	121	0	1719	0	0	0	0
Turn Type	Perm					Free						
Protected Phases		4						2				
Permitted Phases	4					Free						
Detector Phase	4	4						2				
Switch Phase												
Minimum Initial (s)	6.0	6.0						10.0				
Minimum Split (s)	11.0	11.0						20.0				
Total Split (s)	35.0	35.0	0.0	0.0	0.0	0.0	0.0	65.0	0.0	0.0	0.0	0.0
Total Split (%)	35.0%	35.0%	0.0%	0.0%	0.0%	0.0%	0.0%	65.0%	0.0%	0.0%	0.0%	0.0%
Maximum Green (s)	30.0	30.0						60.0				
Yellow Time (s)	3.0	3.0						3.0				
All-Red Time (s)	2.0	2.0						2.0				
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0						3.0				
Recall Mode	None	None						C-Min				
Walk Time (s)	7.0	7.0										
Flash Dont Walk (s)	13.0	13.0										
Pedestrian Calls (#/hr)	5	5										
v/c Ratio	0.65	0.61				0.08		0.45				
Control Delay	39.5	37.6				0.1		5.1				
Queue Delay	0.0	0.0				0.0		0.1				
Total Delay	39.5	37.6				0.1		5.2				
Queue Length 50th (ft)	76	75				0		115				
Queue Length 95th (ft)	m149	m146				0		188				
Internal Link Dist (ft)		25			520			1033			36	
Turn Bay Length (ft)												
Base Capacity (vph)	522	549				1611		3834				
Starvation Cap Reductn	0	0				0		0				
Spillback Cap Reductn	2	2				172		538				
Storage Cap Reductn	0	0				0		0				
Reduced v/c Ratio	0.32	0.30				0.08		0.52				

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 65 (65%), Referenced to phase 2:NBT, Start of Green
Natural Cycle: 40
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 20: Waldemar Avenue & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	295	5	0	0	0	111	0	1467	114	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0				4.0		5.0				
Lane Util. Factor	0.95	0.95				1.00		0.91				
Frt	1.00	1.00				0.86		0.99				
Flt Protected	0.95	1.00				1.00		1.00				
Satd. Flow (prot)	1681	1770				1611		5030				
Flt Permitted	0.95	1.00				1.00		1.00				
Satd. Flow (perm)	1681	1770				1611		5030				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	321	5	0	0	0	121	0	1595	124	0	0	0
RTOR Reduction (vph)	22	22	0	0	0	0	0	5	0	0	0	0
Lane Group Flow (vph)	142	140	0	0	0	121	0	1714	0	0	0	0
Turn Type	Perm					Free						
Protected Phases		4						2				
Permitted Phases	4					Free						
Actuated Green, G (s)	13.9	13.9				100.0		76.1				
Effective Green, g (s)	13.9	13.9				100.0		76.1				
Actuated g/C Ratio	0.14	0.14				1.00		0.76				
Clearance Time (s)	5.0	5.0						5.0				
Vehicle Extension (s)	3.0	3.0						3.0				
Lane Grp Cap (vph)	234	246				1611		3828				
v/s Ratio Prot								c0.34				
v/s Ratio Perm	c0.08	0.08				0.08						
v/c Ratio	0.61	0.57				0.08		0.45				
Uniform Delay, d1	40.5	40.3				0.0		4.3				
Progression Factor	0.90	0.90				1.00		1.00				
Incremental Delay, d2	3.5	2.5				0.1		0.4				
Delay (s)	39.9	38.7				0.1		4.7				
Level of Service	D	D				A		A				
Approach Delay (s)		39.3			0.1			4.7			0.0	
Approach LOS		D			A			A			A	

Intersection Summary

HCM Average Control Delay	9.7	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.47				
Actuated Cycle Length (s)	100.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	47.5%	ICU Level of Service		A	
Analysis Period (min)	15				

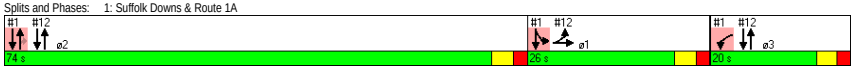
c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	212	162	1201	292	128	2187
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	3	1		1	2	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		333			412
Travel Time (s)	28.4		7.6			9.4
Peak Hour Factor	0.68	0.68	0.94	0.94	0.99	0.99
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	312	238	1278	311	129	2209
Turn Type		Free		Perm	Prot	
Protected Phases	3		2		1	1 2
Permitted Phases		Free		2		
Detector Phase	3		2	2	1	1 2
Switch Phase						
Minimum Initial (s)	6.0		6.0	6.0	10.0	
Minimum Split (s)	11.0		11.0	11.0	15.0	
Total Split (s)	20.0	0.0	74.0	74.0	26.0	100.0
Total Split (%)	16.7%	0.0%	61.7%	61.7%	21.7%	83.3%
Yellow Time (s)	3.0		3.0	3.0	3.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead	Lead	Lag	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None		C-Min	C-Min	None	
v/c Ratio	0.50	0.15	0.44	0.30	0.22	0.81
Control Delay	52.1	0.2	15.0	3.1	45.2	9.2
Queue Delay	0.0	0.0	0.2	0.3	0.0	14.9
Total Delay	52.1	0.2	15.2	3.4	45.2	24.1
Queue Length 50th (ft)	81	0	208	10	52	805
Queue Length 95th (ft)	83	0	253	5	m56	760
Internal Link Dist (ft)	1168		253			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)	624	1583	2924	1042	584	2722
Starvation Cap Reductn	0	0	754	290	0	554
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.50	0.15	0.59	0.41	0.22	1.02

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 39 (33%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	212	162	1201	292	128	2187
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.94	1.00	0.91	1.00	0.97	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	4990	1583	5085	1583	3335	3438
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	4990	1583	5085	1583	3335	3438
Peak-hour factor, PHF	0.68	0.68	0.94	0.94	0.99	0.99
Adj. Flow (vph)	312	238	1278	311	129	2209
RTOR Reduction (vph)	0	0	0	132	0	0
Lane Group Flow (vph)	312	238	1278	179	129	2209
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Turn Type		Free		Perm	Prot	
Protected Phases	3		2		1	1 2
Permitted Phases		Free		2		
Actuated Green, G (s)	15.0	120.0	69.0	69.0	21.0	95.0
Effective Green, g (s)	15.0	120.0	69.0	69.0	21.0	95.0
Actuated g/C Ratio	0.12	1.00	0.58	0.58	0.18	0.79
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	624	1583	2924	910	584	2722
v/s Ratio Prot	c0.06		0.25		0.04	c0.64
v/s Ratio Perm		0.15		0.11		
v/c Ratio	0.50	0.15	0.44	0.20	0.22	0.81
Uniform Delay, d1	49.0	0.0	14.5	12.2	42.5	7.3
Progression Factor	1.00	1.00	1.00	1.83	1.05	1.05
Incremental Delay, d2	0.6	0.2	0.5	0.5	0.1	0.8
Delay (s)	49.6	0.2	14.9	22.8	44.6	8.4
Level of Service	D	A	B	C	D	A
Approach Delay (s)	28.2		16.4			10.4
Approach LOS	C		B			B

Intersection Summary

HCM Average Control Delay	14.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		

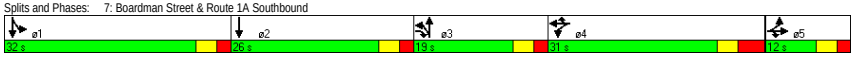
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	40	10	92	394	35	153	137	51	62	127	2261	14	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		100	200		200	200		200	475		0	
Storage Lanes	0		1	1		1	1		1	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		376			531			536			818		
Travel Time (s)		8.5			12.1			12.2			18.6		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.90	0.90	0.90	0.99	0.99	0.99	
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	5%	5%	5%	
Shared Lane Traffic (%)				46%									
Lane Group Flow (vph)	0	54	98	226	230	163	152	57	69	128	2298	0	
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases									Free				
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			6.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0		17.0			13.0
Total Split (s)	12.0	12.0	31.0	31.0	31.0	31.0	19.0	19.0	0.0	32.0	58.0	0.0	26.0
Total Split (%)	10.0%	10.0%	25.8%	25.8%	25.8%	25.8%	15.8%	15.8%	0.0%	26.7%	48.3%	0.0%	22%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag				Lag	Lag	Lag	Lead	Lead		Lead			Lag
Lead-Lag Optimize?													
Recall Mode	None	None		None	None	None	None	None		C-Max			None
v/c Ratio		0.56	0.36	0.79	0.80	0.41	0.80	0.29	0.05	0.29	0.98		
Control Delay		77.3	22.0	67.2	67.7	9.3	81.6	52.6	0.0	29.6	47.0		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay		77.3	22.0	67.2	67.7	9.3	81.6	52.6	0.0	29.6	47.0		
Queue Length 50th (ft)		41	32	174	177	0	116	41	0	75	~680		
Queue Length 95th (ft)		#95	64	#269	#274	58	#222	84	0	m106	#799		
Internal Link Dist (ft)		296			451			456			738		
Turn Bay Length (ft)			100	200		200	200		200	475			
Base Capacity (vph)		99	281	324	327	435	199	209	1524	441	2336		
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio		0.55	0.35	0.70	0.70	0.37	0.76	0.27	0.05	0.29	0.98		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 1:SBTL, Start of Green, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	10	92	394	35	153	137	51	62	127	2261	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.91	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1692	1495	1618	1634	1524	1703	1792	1524	1719	4935	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1692	1495	1618	1634	1524	1703	1792	1524	1719	4935	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.90	0.90	0.90	0.99	0.99	0.99
Adj. Flow (vph)	43	11	98	419	37	163	152	57	69	128	2284	14
RTOR Reduction (vph)	0	0	19	0	0	134	0	0	0	0	1	0
Lane Group Flow (vph)	0	54	79	226	230	29	152	57	69	128	2297	0
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	5%	5%	5%
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases									Free			
Actuated Green, G (s)		6.8	20.1	21.1	21.1	21.1	13.3	13.3	120.0	30.8	56.8	
Effective Green, g (s)		6.8	20.1	21.1	21.1	21.1	13.3	13.3	120.0	30.8	56.8	
Actuated g/C Ratio		0.06	0.17	0.18	0.18	0.18	0.11	0.11	1.00	0.26	0.47	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		96	250	284	287	268	189	199	1524	441	2336	
v/s Ratio Prot		c0.03	0.05	0.14	c0.14	0.02	c0.09	0.03		0.07	c0.47	
v/s Ratio Perm									0.05			
v/c Ratio		0.56	0.32	0.80	0.80	0.11	0.80	0.29	0.05	0.29	0.98	
Uniform Delay, d1		55.2	43.9	47.4	47.4	41.5	52.1	49.0	0.0	35.8	31.1	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.75	1.12	
Incremental Delay, d2		7.3	0.7	14.2	14.8	0.2	21.4	0.8	0.1	1.1	11.3	
Delay (s)		62.5	44.6	61.6	62.2	41.7	73.5	49.8	0.1	27.9	46.2	
Level of Service		E	D	E	E	D	E	D	A	C	D	
Approach Delay (s)		51.0			56.6			50.4			45.2	
Approach LOS		D			E			D			D	

Intersection Summary

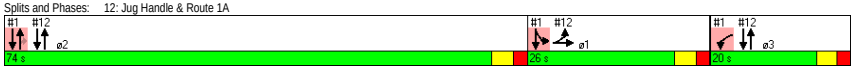
HCM Average Control Delay	47.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	84.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2	ø3
Lane Configurations														
Volume (vph)	58	8	1	0	0	0	0	1359	3	0	2314	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	16	16	16	12	12	12	12	12	12	12	12	12		
Right Turn on Red			Yes			Yes			Yes			Yes		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		158			294			412			281			
Travel Time (s)		3.6			6.7			9.4			6.4			
Peak Hour Factor	0.73	0.73	0.73	0.92	0.92	0.92	0.93	0.93	0.93	0.99	0.99	0.99		
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	6%	6%	6%	5%	5%	5%		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	91	0	0	0	0	0	1464	0	0	2337	0		
Turn Type	Split													
Protected Phases	1	1						2 3			2 3		2	3
Permitted Phases														
Detector Phase	1	1						2 3			2 3			
Switch Phase														
Minimum Initial (s)	10.0	10.0											6.0	6.0
Minimum Split (s)	15.0	15.0											11.0	11.0
Total Split (s)	26.0	26.0	0.0	0.0	0.0	0.0	0.0	94.0	0.0	0.0	94.0	0.0	74.0	20.0
Total Split (%)	21.7%	21.7%	0.0%	0.0%	0.0%	0.0%	0.0%	78.3%	0.0%	0.0%	78.3%	0.0%	62%	17%
Yellow Time (s)	3.0	3.0											3.0	3.0
All-Red Time (s)	2.0	2.0											2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0		
Lead/Lag	Lag	Lag											Lead	
Lead-Lag Optimize?	Yes	Yes											Yes	
Recall Mode	None	None											C-Min	None
v/c Ratio		0.26						0.40			0.92			
Control Delay		45.0						2.9			19.9			
Queue Delay		0.0						0.0			2.8			
Total Delay		45.0						2.9			22.7			
Queue Length 50th (ft)		62						44			668			
Queue Length 95th (ft)		89						49			835			
Internal Link Dist (ft)		78			214			332			201			
Turn Bay Length (ft)														
Base Capacity (vph)		354						3629			2550			
Starvation Cap Reductn		0						117			0			
Spillback Cap Reductn		0						0			136			
Storage Cap Reductn		0						0			0			
Reduced v/c Ratio		0.26						0.42			0.97			

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 39 (33%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	

Splits and Phases: 12: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	58	8	1	0	0	0	0	1359	3	0	2314	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	16	16	16	12	12	12	12	12	12	12	12	12
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.95	
Frt		1.00						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		2020						4892			3438	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		2020						4892			3438	
Peak-hour factor, PHF	0.73	0.73	0.73	0.92	0.92	0.92	0.93	0.93	0.93	0.99	0.99	0.99
Adj. Flow (vph)	79	11	1	0	0	0	0	1461	3	0	2337	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	91	0	0	0	0	0	1464	0	0	2337	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	6%	6%	6%	5%	5%	5%
Turn Type	Split											
Protected Phases	1	1						2 3			2 3	
Permitted Phases												
Actuated Green, G (s)		21.0						89.0			89.0	
Effective Green, g (s)		21.0						89.0			89.0	
Actuated g/C Ratio		0.18						0.74			0.74	
Clearance Time (s)		5.0										
Vehicle Extension (s)		3.0										
Lane Grp Cap (vph)		354						3628			2550	
v/s Ratio Prot		c0.05						0.30			c0.68	
v/s Ratio Perm												
v/c Ratio		0.26						0.40			0.92	
Uniform Delay, d1		42.8						5.7			12.5	
Progression Factor		1.00						0.45			1.00	
Incremental Delay, d2		0.4						0.1			5.7	
Delay (s)		43.1						2.6			18.3	
Level of Service		D						A			B	
Approach Delay (s)		43.1			0.0			2.6			18.3	
Approach LOS		D			A			A			B	

Intersection Summary					
HCM Average Control Delay	13.0	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.79				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	80.6%	ICU Level of Service		D	
Analysis Period (min)	15				
c Critical Lane Group					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	200	5	0	0	0	51	0	1247	51	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		300	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red	Yes		Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		105			600			1113			116	
Travel Time (s)		2.4			13.6			25.3			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	2%	2%
Shared Lane Traffic (%)	49%											
Lane Group Flow (vph)	111	111	0	0	0	55	0	1410	0	0	0	0
Turn Type	Perm					Free						
Protected Phases		4						2				
Permitted Phases	4					Free						
Detector Phase	4	4						2				
Switch Phase												
Minimum Initial (s)	6.0	6.0						10.0				
Minimum Split (s)	11.0	11.0						20.0				
Total Split (s)	35.0	35.0	0.0	0.0	0.0	0.0	0.0	85.0	0.0	0.0	0.0	0.0
Total Split (%)	29.2%	29.2%	0.0%	0.0%	0.0%	0.0%	0.0%	70.8%	0.0%	0.0%	0.0%	0.0%
Yellow Time (s)	3.0	3.0						3.0				
All-Red Time (s)	2.0	2.0						2.0				
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None						C-Min				
v/c Ratio	0.54	0.52				0.03		0.35				
Control Delay	26.5	25.6				0.0		3.0				
Queue Delay	0.0	0.0				0.0		0.0				
Total Delay	26.5	25.6				0.0		3.0				
Queue Length 50th (ft)	37	37				0		63				
Queue Length 95th (ft)	74	74				0		140				
Internal Link Dist (ft)		25			520			1033			36	
Turn Bay Length (ft)												
Base Capacity (vph)	471	493				1611		4082				
Starvation Cap Reductn	0	0				0		0				
Spillback Cap Reductn	0	0				0		0				
Storage Cap Reductn	0	0				0		0				
Reduced v/c Ratio	0.24	0.23				0.03		0.35				

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 75 (63%), Referenced to phase 2:NBT, Start of Green
Natural Cycle: 40
Control Type: Actuated-Coordinated

Splits and Phases: 20: Waldemar Avenue & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	200	5	0	0	0	51	0	1247	51	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0				4.0		5.0				
Lane Util. Factor	0.95	0.95				1.00		0.91				
Frt	1.00	1.00				0.86		0.99				
Flt Protected	0.95	1.00				1.00		1.00				
Satd. Flow (prot)	1681	1770				1611		4917				
Flt Permitted	0.95	1.00				1.00		1.00				
Satd. Flow (perm)	1681	1770				1611		4917				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	217	5	0	0	0	55	0	1355	55	0	0	0
RTOR Reduction (vph)	61	61	0	0	0	0	0	2	0	0	0	0
Lane Group Flow (vph)	50	50	0	0	0	55	0	1408	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	2%	2%
Turn Type	Perm					Free						
Protected Phases		4						2				
Permitted Phases	4					Free						
Actuated Green, G (s)	10.4	10.4				120.0		99.6				
Effective Green, g (s)	10.4	10.4				120.0		99.6				
Actuated g/C Ratio	0.09	0.09				1.00		0.83				
Clearance Time (s)	5.0	5.0						5.0				
Vehicle Extension (s)	3.0	3.0						3.0				
Lane Grp Cap (vph)	146	153				1611		4081				
v/s Ratio Prot								c0.29				
v/s Ratio Perm	c0.03	0.03				0.03						
v/c Ratio	0.34	0.33				0.03		0.35				
Uniform Delay, d1	51.6	51.5				0.0		2.4				
Progression Factor	0.79	0.79				1.00		1.00				
Incremental Delay, d2	1.3	1.2				0.0		0.2				
Delay (s)	42.1	41.9				0.0		2.7				
Level of Service	D	D				A		A				
Approach Delay (s)		42.0			0.0			2.7			0.0	
Approach LOS		D			A			A			A	

Intersection Summary

HCM Average Control Delay	7.8	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.34				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	39.2%	ICU Level of Service		A	
Analysis Period (min)	15				

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	530	151	2300	867	194	2028
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	3	1		1	2	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		333			412
Travel Time (s)	28.4		7.6			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	576	164	2500	942	211	2204
Turn Type		Free		Perm	Prot	
Protected Phases	3		2		1	1 2
Permitted Phases		Free		2		
Detector Phase	3		2	2	1	1 2
Switch Phase						
Minimum Initial (s)	6.0		6.0	6.0	10.0	
Minimum Split (s)	11.0		11.0	11.0	15.0	
Total Split (s)	25.0	0.0	58.0	58.0	17.0	75.0
Total Split (%)	25.0%	0.0%	58.0%	58.0%	17.0%	75.0%
Yellow Time (s)	3.0		3.0	3.0	3.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead	Lead	Lag	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None		C-Min	C-Min	None	
v/c Ratio	0.58	0.10	0.93	0.80	0.53	0.92
Control Delay	38.8	0.1	23.4	6.4	42.4	15.1
Queue Delay	0.0	0.0	28.6	0.9	0.0	35.6
Total Delay	38.8	0.1	52.1	7.3	42.4	50.7
Queue Length 50th (ft)	118	0	430	21	72	708
Queue Length 95th (ft)	156	0	#530	140	m80	876
Internal Link Dist (ft)	1168		253			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)	998	1583	2695	1178	400	2407
Starvation Cap Reductn	0	0	339	72	0	360
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.58	0.10	1.06	0.85	0.53	1.08

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 90 (90%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	530	151	2300	867	194	2028
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.94	1.00	0.91	1.00	0.97	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	4990	1583	5085	1583	3335	3438
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	4990	1583	5085	1583	3335	3438
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	576	164	2500	942	211	2204
RTOR Reduction (vph)	0	0	0	339	0	0
Lane Group Flow (vph)	576	164	2500	603	211	2204
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Turn Type		Free		Perm	Prot	
Protected Phases	3		2		1	1 2
Permitted Phases		Free		2		
Actuated Green, G (s)	20.0	100.0	53.0	53.0	12.0	70.0
Effective Green, g (s)	20.0	100.0	53.0	53.0	12.0	70.0
Actuated g/C Ratio	0.20	1.00	0.53	0.53	0.12	0.70
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	998	1583	2695	839	400	2407
v/s Ratio Prot	c0.12		0.49		0.06	c0.64
v/s Ratio Perm		0.10		0.38		
v/c Ratio	0.58	0.10	0.93	0.72	0.53	0.92
Uniform Delay, d1	36.2	0.0	21.7	17.8	41.3	12.5
Progression Factor	1.00	1.00	0.83	0.58	0.97	0.88
Incremental Delay, d2	0.8	0.1	4.9	3.5	0.5	2.8
Delay (s)	37.0	0.1	22.8	13.8	40.4	13.8
Level of Service	D	A	C	B	D	B
Approach Delay (s)	28.8		20.4			16.1
Approach LOS	C		C			B

Intersection Summary

HCM Average Control Delay	19.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	75.4%	ICU Level of Service	D
Analysis Period (min)	15		

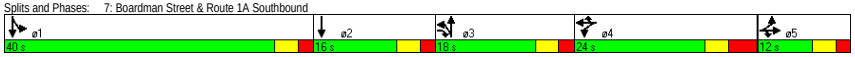
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	36	3	51	240	16	249	70	10	79	194	2375	12	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		100	200		200	200		200	475		0	
Storage Lanes	0		1	1		1	1		1	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		376			531			536			818		
Travel Time (s)		8.5			12.1			12.2			18.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	5%	5%	5%	
Shared Lane Traffic (%)				47%									
Lane Group Flow (vph)	0	42	55	138	140	271	76	11	86	211	2595	0	
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases									Free				
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			4.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0		17.0			21.0
Total Split (s)	12.0	12.0	30.0	24.0	24.0	24.0	18.0	18.0	0.0	40.0	56.0	0.0	16.0
Total Split (%)	10.9%	10.9%	27.3%	21.8%	21.8%	21.8%	16.4%	16.4%	0.0%	36.4%	50.9%	0.0%	15%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag				Lag	Lag	Lag	Lead	Lead		Lead			Lag
Lead-Lag Optimize?													Yes
Recall Mode	None	None		None	None	None	None	None		C-Max			None
v/c Ratio		0.40	0.22	0.66	0.67	0.63	0.49	0.07	0.06	0.30	0.94		
Control Delay		61.5	13.7	60.7	60.8	12.1	57.8	45.0	0.1	26.8	33.9		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay		61.5	13.7	60.7	60.8	12.1	57.8	45.0	0.1	26.8	33.9		
Queue Length 50th (ft)		29	10	97	98	0	52	7	0	108	~732		
Queue Length 95th (ft)		66	33	165	167	75	98	25	0	183	#880		
Internal Link Dist (ft)		296			451			456			738		
Turn Bay Length (ft)			100	200		200	200		200	475			
Base Capacity (vph)		107	298	250	252	465	201	212	1524	711	2761		
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio		0.39	0.18	0.55	0.56	0.58	0.38	0.05	0.06	0.30	0.94		

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 1:SBTL, Start of Green, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	3	51	240	16	249	70	10	79	194	2375	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.91	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1681	1495	1618	1631	1524	1703	1792	1524	1719	4936	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1681	1495	1618	1631	1524	1703	1792	1524	1719	4936	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	3	55	261	17	271	76	11	86	211	2582	13
RTOR Reduction (vph)	0	0	28	0	0	236	0	0	0	0	0	0
Lane Group Flow (vph)	0	42	27	138	140	35	76	11	86	211	2595	0
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	5%	5%	5%
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases									Free			
Actuated Green, G (s)		5.6	14.3	14.2	14.2	14.2	8.7	8.7	110.0	43.5	59.5	
Effective Green, g (s)		5.6	14.3	14.2	14.2	14.2	8.7	8.7	110.0	43.5	59.5	
Actuated g/C Ratio		0.05	0.13	0.13	0.13	0.13	0.08	0.08	1.00	0.40	0.54	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		86	194	209	211	197	135	142	1524	680	2670	
v/s Ratio Prot		c0.02	0.02	0.09	c0.09	0.02	c0.04	0.01		0.12	c0.53	
v/s Ratio Perm									0.06			
v/c Ratio		0.49	0.14	0.66	0.66	0.18	0.56	0.08	0.06	0.31	0.97	
Uniform Delay, d1		50.8	42.4	45.6	45.6	42.7	48.8	46.9	0.0	22.9	24.4	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		4.3	0.3	7.6	7.6	0.4	5.3	0.2	0.1	1.2	11.6	
Delay (s)		55.1	42.7	53.2	53.2	43.1	54.1	47.2	0.1	24.1	36.0	
Level of Service		E	D	D	D	D	D	D	A	C	D	
Approach Delay (s)		48.1			48.2			26.8			35.1	
Approach LOS		D			D			C			D	

Intersection Summary

HCM Average Control Delay	37.0	HCM Level of Service		D	
HCM Volume to Capacity ratio	0.85				
Actuated Cycle Length (s)	110.0	Sum of lost time (s)		22.0	
Intersection Capacity Utilization	79.1%	ICU Level of Service		D	
Analysis Period (min)	15				

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2	ø3
Lane Configurations														
Volume (vph)	105	7	8	0	0	0	0	2442	0	0	2213	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	16	16	16	12	12	12	12	12	12	12	12	12		
Right Turn on Red			Yes			Yes			Yes			Yes		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		158			294			412			281			
Travel Time (s)		3.6			6.7			9.4			6.4			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92		
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	6%	6%	6%	5%	5%	5%		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	131	0	0	0	0	0	2654	0	0	2405	0		
Turn Type	Split													
Protected Phases	1	1						2 3			2 3		2	3
Permitted Phases														
Detector Phase	1	1						2 3			2 3			
Switch Phase														
Minimum Initial (s)	10.0	10.0											6.0	6.0
Minimum Split (s)	15.0	15.0											11.0	11.0
Total Split (s)	17.0	17.0	0.0	0.0	0.0	0.0	0.0	83.0	0.0	0.0	83.0	0.0	58.0	25.0
Total Split (%)	17.0%	17.0%	0.0%	0.0%	0.0%	0.0%	0.0%	83.0%	0.0%	0.0%	83.0%	0.0%	58%	25%
Yellow Time (s)	3.0	3.0											3.0	3.0
All-Red Time (s)	2.0	2.0											2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0		
Lead/Lag	Lag	Lag											Lead	
Lead-Lag Optimize?	Yes	Yes											Yes	
Recall Mode	None	None											C-Min	None
v/c Ratio		0.54						0.70			0.90			
Control Delay		49.4						6.4			14.1			
Queue Delay		0.0						0.1			4.9			
Total Delay		49.4						6.6			19.0			
Queue Length 50th (ft)		78						119			470			
Queue Length 95th (ft)		139						169			625			
Internal Link Dist (ft)		78			214			332			201			
Turn Bay Length (ft)														
Base Capacity (vph)		243						3817			2682			
Starvation Cap Reductn		0						261			0			
Spillback Cap Reductn		0						0			232			
Storage Cap Reductn		0						0			0			
Reduced v/c Ratio		0.54						0.75			0.98			

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 90 (90%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	

Splits and Phases: 12: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	105	7	8	0	0	0	0	2442	0	0	2213	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	16	16	16	12	12	12	12	12	12	12	12	12
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.95	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		2004						4893			3438	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		2004						4893			3438	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	114	8	9	0	0	0	0	2654	0	0	2405	0
RTOR Reduction (vph)	0	3	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	128	0	0	0	0	0	2654	0	0	2405	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	6%	6%	6%	5%	5%	5%
Turn Type	Split											
Protected Phases	1	1						2 3			2 3	
Permitted Phases												
Actuated Green, G (s)		12.0						78.0			78.0	
Effective Green, g (s)		12.0						78.0			78.0	
Actuated g/C Ratio		0.12						0.78			0.78	
Clearance Time (s)		5.0										
Vehicle Extension (s)		3.0										
Lane Grp Cap (vph)		240						3817			2682	
v/s Ratio Prot		c0.06						0.54			c0.70	
v/s Ratio Perm												
v/c Ratio		0.53						0.70			0.90	
Uniform Delay, d1		41.4						5.3			8.1	
Progression Factor		1.00						1.09			1.00	
Incremental Delay, d2		2.3						0.3			4.4	
Delay (s)		43.7						6.0			12.4	
Level of Service		D						A			B	
Approach Delay (s)		43.7			0.0			6.0			12.4	
Approach LOS		D			A			A			B	

Intersection Summary					
HCM Average Control Delay	10.0	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.85				
Actuated Cycle Length (s)	100.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	77.8%	ICU Level of Service		D	
Analysis Period (min)	15				
c Critical Lane Group					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	290	5	0	0	0	157	0	2721	120	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		300	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red	Yes		Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		105			600			1113			116	
Travel Time (s)		2.4			13.6			25.3			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	2%	2%
Shared Lane Traffic (%)	49%											
Lane Group Flow (vph)	161	159	0	0	0	171	0	3088	0	0	0	0
Turn Type	Perm					Free						
Protected Phases		4						2				
Permitted Phases	4					Free						
Detector Phase	4	4						2				
Switch Phase												
Minimum Initial (s)	6.0	6.0						10.0				
Minimum Split (s)	11.0	11.0						20.0				
Total Split (s)	25.0	25.0	0.0	0.0	0.0	0.0	0.0	75.0	0.0	0.0	0.0	0.0
Total Split (%)	25.0%	25.0%	0.0%	0.0%	0.0%	0.0%	0.0%	75.0%	0.0%	0.0%	0.0%	0.0%
Yellow Time (s)	3.0	3.0						3.0				
All-Red Time (s)	2.0	2.0						2.0				
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None						C-Min				
v/c Ratio	0.65	0.61				0.11		0.83				
Control Delay	51.6	48.9				0.1		11.7				
Queue Delay	0.0	0.0				0.0		2.4				
Total Delay	51.6	48.9				0.1		14.1				
Queue Length 50th (ft)	102	100				0		393				
Queue Length 95th (ft)	163	160				0		595				
Internal Link Dist (ft)		25			520			1033			36	
Turn Bay Length (ft)												
Base Capacity (vph)	338	356				1611		3710				
Starvation Cap Reductn	0	0				0		0				
Spillback Cap Reductn	0	0				157		480				
Storage Cap Reductn	0	0				0		0				
Reduced v/c Ratio	0.48	0.45				0.12		0.96				

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 89 (89%), Referenced to phase 2:NBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 20: Waldemar Avenue & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	290	5	0	0	0	157	0	2721	120	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0				4.0		5.0				
Lane Util. Factor	0.95	0.95				1.00		0.91				
Frt	1.00	1.00				0.86		0.99				
Flt Protected	0.95	1.00				1.00		1.00				
Satd. Flow (prot)	1681	1770				1611		4915				
Flt Permitted	0.95	1.00				1.00		1.00				
Satd. Flow (perm)	1681	1770				1611		4915				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	315	5	0	0	0	171	0	2958	130	0	0	0
RTOR Reduction (vph)	2	2	0	0	0	0	0	4	0	0	0	0
Lane Group Flow (vph)	159	157	0	0	0	171	0	3084	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	2%	2%
Turn Type	Perm					Free						
Protected Phases		4						2				
Permitted Phases	4					Free						
Actuated Green, G (s)	14.6	14.6				100.0		75.4				
Effective Green, g (s)	14.6	14.6				100.0		75.4				
Actuated g/C Ratio	0.15	0.15				1.00		0.75				
Clearance Time (s)	5.0	5.0						5.0				
Vehicle Extension (s)	3.0	3.0						3.0				
Lane Grp Cap (vph)	245	258				1611		3706				
v/s Ratio Prot								c0.63				
v/s Ratio Perm	c0.09	0.09				0.11						
v/c Ratio	0.65	0.61				0.11		0.83				
Uniform Delay, d1	40.3	40.0				0.0		8.1				
Progression Factor	1.00	1.00				1.00		1.00				
Incremental Delay, d2	6.0	4.0				0.1		2.3				
Delay (s)	46.3	44.1				0.1		10.5				
Level of Service	D	D				A		B				
Approach Delay (s)		45.2			0.1			10.5			0.0	
Approach LOS		D			A			B			A	

Intersection Summary

HCM Average Control Delay	13.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	71.7%	ICU Level of Service	C
Analysis Period (min)	15		

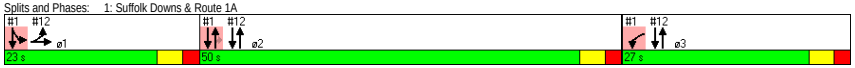
c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	526	193	1958	873	208	1850
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	3	1		1	2	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		333			412
Travel Time (s)	28.4		7.6			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	572	210	2128	949	226	2011
Turn Type		Free		Perm	Prot	
Protected Phases	3		2		1	1 2
Permitted Phases		Free		2		
Detector Phase	3		2	2	1	1 2
Switch Phase						
Minimum Initial (s)	6.0		6.0	6.0	10.0	
Minimum Split (s)	11.0		11.0	11.0	15.0	
Total Split (s)	27.0	0.0	50.0	50.0	23.0	73.0
Total Split (%)	27.0%	0.0%	50.0%	50.0%	23.0%	73.0%
Yellow Time (s)	3.0		3.0	3.0	3.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None		C-Min	C-Min	None	
v/c Ratio	0.52	0.13	0.93	0.87	0.37	0.84
Control Delay	36.4	0.2	29.2	11.1	38.4	14.3
Queue Delay	0.0	0.0	21.6	1.8	0.0	5.2
Total Delay	36.4	0.2	50.8	12.9	38.4	19.6
Queue Length 50th (ft)	114	0	473	19	77	323
Queue Length 95th (ft)	151	0	#500	#136	m87	408
Internal Link Dist (ft)	1168		253			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)	1098	1583	2288	1095	612	2383
Starvation Cap Reductn	0	0	248	55	0	320
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.13	1.04	0.91	0.37	0.97

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 68 (68%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	526	193	1958	873	208	1850
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.94	1.00	0.91	1.00	0.97	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	4990	1583	5085	1583	3400	3505
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	4990	1583	5085	1583	3400	3505
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	572	210	2128	949	226	2011
RTOR Reduction (vph)	0	0	0	382	0	0
Lane Group Flow (vph)	572	210	2128	567	226	2011
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Turn Type		Free		Perm	Prot	
Protected Phases	3		2		1	1 2
Permitted Phases		Free		2		
Actuated Green, G (s)	22.0	100.0	45.0	45.0	18.0	68.0
Effective Green, g (s)	22.0	100.0	45.0	45.0	18.0	68.0
Actuated g/C Ratio	0.22	1.00	0.45	0.45	0.18	0.68
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1098	1583	2288	712	612	2383
v/s Ratio Prot	c0.11		c0.42		0.07	c0.57
v/s Ratio Perm		0.13		0.36		
v/c Ratio	0.52	0.13	0.93	0.80	0.37	0.84
Uniform Delay, d1	34.4	0.0	26.0	23.6	36.0	12.0
Progression Factor	1.00	1.00	0.85	0.45	1.04	1.00
Incremental Delay, d2	0.4	0.2	6.6	7.0	0.2	1.3
Delay (s)	34.8	0.2	28.6	17.6	37.5	13.3
Level of Service	C	A	C	B	D	B
Approach Delay (s)	25.5		25.2			15.8
Approach LOS	C		C			B

Intersection Summary

HCM Average Control Delay	21.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	70.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	36	10	35	242	12	316	31	10	323	173	2197	27	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		100	200		200	200		200	475		0	
Storage Lanes	0		1	1		1	1		1	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		246			531			536			818		
Travel Time (s)		5.6			12.1			12.2			18.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	1%	1%	1%	3%	3%	3%	
Shared Lane Traffic (%)				48%									
Lane Group Flow (vph)	0	50	38	137	139	343	34	11	351	188	2417	0	
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases									Free				
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			4.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0		17.0			13.0
Total Split (s)	14.0	14.0	26.0	20.0	20.0	20.0	12.0	12.0	0.0	41.0	54.0	0.0	13.0
Total Split (%)	14.0%	14.0%	26.0%	20.0%	20.0%	20.0%	12.0%	12.0%	0.0%	41.0%	54.0%	0.0%	13%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag				Lag	Lag	Lag	Lead	Lead		Lead			Lag
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes		Yes			Yes
Recall Mode	None	None		None	None	None	None	None		C-Max			None
v/c Ratio		0.36	0.16	0.68	0.69	0.70	0.29	0.09	0.22	0.25	0.86		
Control Delay		51.0	15.0	59.5	59.9	12.9	50.7	45.2	0.3	20.4	24.6		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay		51.0	15.0	59.5	59.9	12.9	50.7	45.2	0.3	20.4	24.6		
Queue Length 50th (ft)		31	8	88	89	0	21	7	0	85	553		
Queue Length 95th (ft)		68	27	#166	#168	84	53	25	0	m101	#691		
Internal Link Dist (ft)		166			451			456			738		
Turn Bay Length (ft)			100	200		200	200		200	475			
Base Capacity (vph)		157	261	219	220	504	125	132	1599	753	2813		
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio		0.32	0.15	0.63	0.63	0.68	0.27	0.08	0.22	0.25	0.86		

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 1:SBTL, Start of Green, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	10	35	242	12	316	31	10	323	173	2197	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.91	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1742	1538	1681	1693	1583	1787	1881	1599	1752	5027	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1742	1538	1681	1693	1583	1787	1881	1599	1752	5027	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	11	38	263	13	343	34	11	351	188	2388	29
RTOR Reduction (vph)	0	0	16	0	0	302	0	0	0	0	1	0
Lane Group Flow (vph)	0	50	22	137	139	41	34	11	351	188	2416	0
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	1%	1%	1%	3%	3%	3%
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases									Free			
Actuated Green, G (s)		6.6	12.1	12.0	12.0	12.0	5.5	5.5	100.0	40.9	53.9	
Effective Green, g (s)		6.6	12.1	12.0	12.0	12.0	5.5	5.5	100.0	40.9	53.9	
Actuated g/C Ratio		0.07	0.12	0.12	0.12	0.12	0.06	0.06	1.00	0.41	0.54	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		115	186	202	203	190	98	103	1599	717	2710	
v/s Ratio Prot		c0.03	0.01	0.08	c0.08	0.03	0.02	0.01		0.11	c0.48	
v/s Ratio Perm									c0.22			
v/c Ratio		0.43	0.12	0.68	0.68	0.22	0.35	0.11	0.22	0.26	0.89	
Uniform Delay, d1		44.9	39.2	42.2	42.2	39.8	45.5	44.9	0.0	19.6	20.5	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.92	1.02	
Incremental Delay, d2		2.6	0.3	8.7	9.2	0.6	2.1	0.5	0.3	0.6	2.6	
Delay (s)		47.5	39.5	50.9	51.4	40.3	47.7	45.4	0.3	18.6	23.5	
Level of Service		D	D	D	D	D	D	D	A	B	C	
Approach Delay (s)		44.1			45.1			5.6			23.1	
Approach LOS		D			D			A			C	

Intersection Summary

HCM Average Control Delay	25.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		

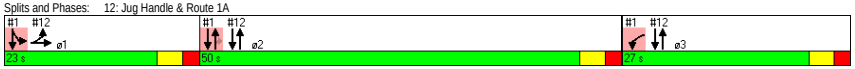
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2	ø3
Lane Configurations														
Volume (vph)	52	8	7	0	0	0	0	2137	2	0	2050	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Right Turn on Red			Yes			Yes			Yes			Yes		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		158			294			412			281			
Travel Time (s)		3.6			6.7			9.4			6.4			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92		
Heavy Vehicles (%)	14%	14%	14%	0%	0%	0%	2%	2%	2%	3%	3%	3%		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	74	0	0	0	0	0	2325	0	0	2228	0		
Turn Type	Split													
Protected Phases	1	1						2 3			2 3		2	3
Permitted Phases														
Detector Phase	1	1						2 3			2 3			
Switch Phase														
Minimum Initial (s)	10.0	10.0											6.0	6.0
Minimum Split (s)	15.0	15.0											11.0	11.0
Total Split (s)	23.0	23.0	0.0	0.0	0.0	0.0	0.0	77.0	0.0	0.0	77.0	0.0	50.0	27.0
Total Split (%)	23.0%	23.0%	0.0%	0.0%	0.0%	0.0%	0.0%	77.0%	0.0%	0.0%	77.0%	0.0%	50%	27%
Yellow Time (s)	3.0	3.0											3.0	3.0
All-Red Time (s)	2.0	2.0											2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0		
Lead/Lag	Lead	Lead											Lag	
Lead-Lag Optimize?	Yes	Yes											Yes	
Recall Mode	None	None											C-Min	None
v/c Ratio		0.26						0.64			0.88			
Control Delay		35.6						1.9			16.4			
Queue Delay		0.0						0.6			0.3			
Total Delay		35.6						2.5			16.7			
Queue Length 50th (ft)		38						16			492			
Queue Length 95th (ft)		80						m21			634			
Internal Link Dist (ft)		78			214			332			201			
Turn Bay Length (ft)														
Base Capacity (vph)		289						3661			2524			
Starvation Cap Reductn		0						827			0			
Spillback Cap Reductn		0						0			45			
Storage Cap Reductn		0						0			0			
Reduced v/c Ratio		0.26						0.82			0.90			

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 68 (68%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 12: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	52	8	7	0	0	0	0	2137	2	0	2050	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.95	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1581						5085			3505	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1581						5085			3505	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	57	9	8	0	0	0	0	2323	2	0	2228	0
RTOR Reduction (vph)	0	4	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	70	0	0	0	0	0	2325	0	0	2228	0
Heavy Vehicles (%)	14%	14%	14%	0%	0%	0%	2%	2%	2%	3%	3%	3%
Turn Type	Split											
Protected Phases	1	1						2 3			2 3	
Permitted Phases												
Actuated Green, G (s)		18.0						72.0			72.0	
Effective Green, g (s)		18.0						72.0			72.0	
Actuated g/C Ratio		0.18						0.72			0.72	
Clearance Time (s)		5.0										
Vehicle Extension (s)		3.0										
Lane Grp Cap (vph)		285						3661			2524	
v/s Ratio Prot		c0.04						0.46			c0.64	
v/s Ratio Perm												
v/c Ratio		0.25						0.64			0.88	
Uniform Delay, d1		35.2						7.2			10.8	
Progression Factor		1.00						0.20			1.00	
Incremental Delay, d2		0.5						0.2			4.0	
Delay (s)		35.6						1.6			14.8	
Level of Service		D						A			B	
Approach Delay (s)		35.6			0.0			1.6			14.8	
Approach LOS		D			A			A			B	

Intersection Summary

HCM Average Control Delay	8.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	390	5	0	0	0	117	0	2326	120	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		300	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red	Yes		Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		105			600			1113			116	
Travel Time (s)		2.4			13.6			25.3			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)	49%											
Lane Group Flow (vph)	216	213	0	0	0	127	0	2658	0	0	0	0
Turn Type	Perm					Free						
Protected Phases		4						2				
Permitted Phases	4					Free						
Detector Phase	4	4						2				
Switch Phase												
Minimum Initial (s)	6.0	6.0						10.0				
Minimum Split (s)	11.0	11.0						20.0				
Total Split (s)	35.0	35.0	0.0	0.0	0.0	0.0	0.0	65.0	0.0	0.0	0.0	0.0
Total Split (%)	35.0%	35.0%	0.0%	0.0%	0.0%	0.0%	0.0%	65.0%	0.0%	0.0%	0.0%	0.0%
Yellow Time (s)	3.0	3.0						3.0				
All-Red Time (s)	2.0	2.0						2.0				
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None						C-Min				
v/c Ratio	0.69	0.65				0.08		0.74				
Control Delay	47.5	45.0				0.1		11.0				
Queue Delay	0.0	0.0				0.0		0.9				
Total Delay	47.5	45.0				0.1		11.9				
Queue Length 50th (ft)	138	134				0		312				
Queue Length 95th (ft)	m208	m203				0		500				
Internal Link Dist (ft)		25			520			1033			36	
Turn Bay Length (ft)												
Base Capacity (vph)	506	533				1611		3616				
Starvation Cap Reductn	0	0				0		0				
Spillback Cap Reductn	0	0				192		604				
Storage Cap Reductn	0	0				0		0				
Reduced v/c Ratio	0.43	0.40				0.09		0.88				

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 65 (65%), Referenced to phase 2:NBT, Start of Green
Natural Cycle: 50
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 20: Waldemar Avenue & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	390	5	0	0	0	117	0	2326	120	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0				4.0		5.0				
Lane Util. Factor	0.95	0.95				1.00		0.91				
Frt	1.00	1.00				0.86		0.99				
Flt Protected	0.95	1.00				1.00		1.00				
Satd. Flow (prot)	1681	1770				1611		5048				
Flt Permitted	0.95	1.00				1.00		1.00				
Satd. Flow (perm)	1681	1770				1611		5048				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	424	5	0	0	0	127	0	2528	130	0	0	0
RTOR Reduction (vph)	2	2	0	0	0	0	0	4	0	0	0	0
Lane Group Flow (vph)	214	211	0	0	0	127	0	2654	0	0	0	0
Turn Type	Perm					Free						
Protected Phases		4						2				
Permitted Phases	4					Free						
Actuated Green, G (s)	18.5	18.5				100.0		71.5				
Effective Green, g (s)	18.5	18.5				100.0		71.5				
Actuated g/C Ratio	0.18	0.18				1.00		0.72				
Clearance Time (s)	5.0	5.0						5.0				
Vehicle Extension (s)	3.0	3.0						3.0				
Lane Grp Cap (vph)	311	327				1611		3609				
v/s Ratio Prot								c0.53				
v/s Ratio Perm	c0.13	0.12				0.08						
v/c Ratio	0.69	0.64				0.08		0.74				
Uniform Delay, d1	38.0	37.7				0.0		8.6				
Progression Factor	1.03	1.03				1.00		1.00				
Incremental Delay, d2	5.1	3.6				0.1		1.4				
Delay (s)	44.4	42.4				0.1		9.9				
Level of Service	D	D				A		A				
Approach Delay (s)		43.4			0.1			9.9			0.0	
Approach LOS		D			A			A			A	

Intersection Summary

HCM Average Control Delay	14.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	66.9%	ICU Level of Service	C
Analysis Period (min)	15		

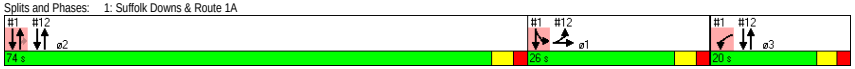
c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	223	170	1262	307	135	2299
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	3	1		1	2	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		333			412
Travel Time (s)	28.4		7.6			9.4
Peak Hour Factor	0.68	0.68	0.94	0.94	0.99	0.99
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	328	250	1343	327	136	2322
Turn Type		Free		Perm	Prot	
Protected Phases	3		2		1	1 2
Permitted Phases		Free		2		
Detector Phase	3		2	2	1	1 2
Switch Phase						
Minimum Initial (s)	6.0		6.0	6.0	10.0	
Minimum Split (s)	11.0		11.0	11.0	15.0	
Total Split (s)	20.0	0.0	74.0	74.0	26.0	100.0
Total Split (%)	16.7%	0.0%	61.7%	61.7%	21.7%	83.3%
Yellow Time (s)	3.0		3.0	3.0	3.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead	Lead	Lag	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None		C-Min	C-Min	None	
v/c Ratio	0.53	0.16	0.46	0.31	0.23	0.85
Control Delay	52.6	0.2	15.2	2.9	44.4	10.1
Queue Delay	0.0	0.0	0.2	0.3	0.0	34.2
Total Delay	52.6	0.2	15.4	3.2	44.4	44.3
Queue Length 50th (ft)	85	0	226	17	55	930
Queue Length 95th (ft)	87	0	272	7	m56	m1012
Internal Link Dist (ft)	1168		253			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)	624	1583	2924	1049	584	2722
Starvation Cap Reductn	0	0	706	281	0	554
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.53	0.16	0.61	0.43	0.23	1.07

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 39 (33%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	223	170	1262	307	135	2299
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.94	1.00	0.91	1.00	0.97	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	4990	1583	5085	1583	3335	3438
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	4990	1583	5085	1583	3335	3438
Peak-hour factor, PHF	0.68	0.68	0.94	0.94	0.99	0.99
Adj. Flow (vph)	328	250	1343	327	136	2322
RTOR Reduction (vph)	0	0	0	139	0	0
Lane Group Flow (vph)	328	250	1343	188	136	2322
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Turn Type		Free		Perm	Prot	
Protected Phases	3		2		1	1 2
Permitted Phases		Free		2		
Actuated Green, G (s)	15.0	120.0	69.0	69.0	21.0	95.0
Effective Green, g (s)	15.0	120.0	69.0	69.0	21.0	95.0
Actuated g/C Ratio	0.12	1.00	0.58	0.58	0.18	0.79
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	624	1583	2924	910	584	2722
v/s Ratio Prot	c0.07		0.26		0.04	c0.68
v/s Ratio Perm		0.16		0.12		
v/c Ratio	0.53	0.16	0.46	0.21	0.23	0.85
Uniform Delay, d1	49.2	0.0	14.7	12.3	42.6	8.0
Progression Factor	1.00	1.00	0.99	1.66	1.03	1.05
Incremental Delay, d2	0.8	0.2	0.5	0.5	0.1	0.9
Delay (s)	50.0	0.2	15.1	20.9	43.8	9.2
Level of Service	D	A	B	C	D	A
Approach Delay (s)	28.4		16.2			11.2
Approach LOS	C		B			B

Intersection Summary

HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	76.9%	ICU Level of Service	D
Analysis Period (min)	15		

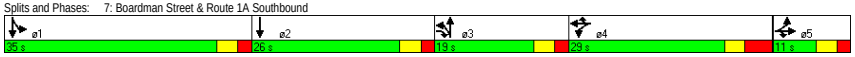
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	42	11	97	414	37	161	144	54	65	133	2377	15	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		100	200		200	200		200	475		0	
Storage Lanes	0		1	1		1	1		1	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		376			531			536			818		
Travel Time (s)		8.5			12.1			12.2			18.6		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.90	0.90	0.90	0.99	0.99	0.99	
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	5%	5%	5%	
Shared Lane Traffic (%)				46%									
Lane Group Flow (vph)	0	57	103	238	241	171	160	60	72	134	2416	0	
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases									Free				
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			6.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0		17.0			13.0
Total Split (s)	11.0	11.0	30.0	29.0	29.0	29.0	19.0	19.0	0.0	35.0	61.0	0.0	26.0
Total Split (%)	9.2%	9.2%	25.0%	24.2%	24.2%	24.2%	15.8%	15.8%	0.0%	29.2%	50.8%	0.0%	22%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag				Lag	Lag	Lag	Lead	Lead		Lead			Lag
Lead-Lag Optimize?													
Recall Mode	None	None		None	None	None	None	None		C-Max			None
v/c Ratio		0.67	0.40	0.86	0.86	0.42	0.83	0.30	0.05	0.29	1.01		
Control Delay		91.6	26.4	75.4	75.4	9.7	85.5	52.9	0.1	29.6	50.3		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay		91.6	26.4	75.4	75.4	9.7	85.5	52.9	0.1	29.6	50.3		
Queue Length 50th (ft)		44	39	187	190	0	123	43	0	76	~726		
Queue Length 95th (ft)		#114	75	#323	#327	60	#238	87	0	m103	#832		
Internal Link Dist (ft)		296			451			456			738		
Turn Bay Length (ft)			100	200		200	200		200	475			
Base Capacity (vph)		85	261	297	300	419	199	209	1524	457	2381		
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio		0.67	0.39	0.80	0.80	0.41	0.80	0.29	0.05	0.29	1.01		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 1:SBTL, Start of Green, Master Intersection
Natural Cycle: 110
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	42	11	97	414	37	161	144	54	65	133	2377	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.91	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1692	1495	1618	1634	1524	1703	1792	1524	1719	4935	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1692	1495	1618	1634	1524	1703	1792	1524	1719	4935	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.90	0.90	0.90	0.99	0.99	0.99
Adj. Flow (vph)	45	12	103	440	39	171	160	60	72	134	2401	15
RTOR Reduction (vph)	0	0	12	0	0	142	0	0	0	0	1	0
Lane Group Flow (vph)	0	57	91	238	241	29	160	60	72	134	2415	0
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	5%	5%	5%
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases									Free			
Actuated Green, G (s)		6.0	19.5	20.6	20.6	20.6	13.5	13.5	120.0	31.9	57.9	
Effective Green, g (s)		6.0	19.5	20.6	20.6	20.6	13.5	13.5	120.0	31.9	57.9	
Actuated g/C Ratio		0.05	0.16	0.17	0.17	0.17	0.11	0.11	1.00	0.27	0.48	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		85	243	278	281	262	192	202	1524	457	2381	
v/s Ratio Prot		c0.03	0.06	0.15	c0.15	0.02	c0.09	0.03		0.08	c0.49	
v/s Ratio Perm									0.05			
v/c Ratio		0.67	0.38	0.86	0.86	0.11	0.83	0.30	0.05	0.29	1.01	
Uniform Delay, d1		56.0	44.8	48.3	48.3	42.0	52.1	48.9	0.0	35.1	31.1	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.78	1.03	
Incremental Delay, d2		18.8	1.0	21.9	21.9	0.2	25.5	0.8	0.1	1.0	17.9	
Delay (s)		74.8	45.8	70.1	70.1	42.2	77.6	49.7	0.1	28.5	49.9	
Level of Service		E	D	E	E	D	E	D	A	C	D	
Approach Delay (s)		56.1			62.8			52.8			48.7	
Approach LOS		E			E			D			D	

Intersection Summary

HCM Average Control Delay	51.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	87.5%	ICU Level of Service	E
Analysis Period (min)	15		

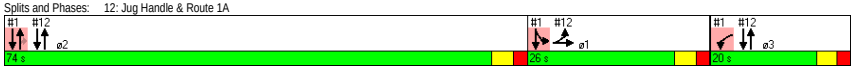
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2	ø3
Lane Configurations														
Volume (vph)	61	8	1	0	0	0	0	1428	3	0	2432	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	16	16	16	12	12	12	12	12	12	12	12	12		
Right Turn on Red			Yes			Yes			Yes			Yes		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		158			294			412			281			
Travel Time (s)		3.6			6.7			9.4			6.4			
Peak Hour Factor	0.73	0.73	0.73	0.92	0.92	0.92	0.93	0.93	0.93	0.99	0.99	0.99		
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	6%	6%	6%	5%	5%	5%		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	96	0	0	0	0	0	1538	0	0	2457	0		
Turn Type	Split													
Protected Phases	1	1						2 3			2 3		2	3
Permitted Phases														
Detector Phase	1	1						2 3			2 3			
Switch Phase														
Minimum Initial (s)	10.0	10.0											6.0	6.0
Minimum Split (s)	15.0	15.0											11.0	11.0
Total Split (s)	26.0	26.0	0.0	0.0	0.0	0.0	0.0	94.0	0.0	0.0	94.0	0.0	74.0	20.0
Total Split (%)	21.7%	21.7%	0.0%	0.0%	0.0%	0.0%	0.0%	78.3%	0.0%	0.0%	78.3%	0.0%	62%	17%
Yellow Time (s)	3.0	3.0											3.0	3.0
All-Red Time (s)	2.0	2.0											2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0		
Lead/Lag	Lag	Lag											Lead	
Lead-Lag Optimize?	Yes	Yes											Yes	
Recall Mode	None	None											C-Min	None
v/c Ratio		0.27						0.42			0.96			
Control Delay		45.3						3.0			25.9			
Queue Delay		0.0						0.0			11.3			
Total Delay		45.3						3.0			37.2			
Queue Length 50th (ft)		65						46			788			
Queue Length 95th (ft)		93						50			#1135			
Internal Link Dist (ft)		78			214			332			201			
Turn Bay Length (ft)														
Base Capacity (vph)		354						3629			2550			
Starvation Cap Reductn		0						32			0			
Spillback Cap Reductn		0						0			142			
Storage Cap Reductn		0						0			0			
Reduced v/c Ratio		0.27						0.43			1.02			

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 39 (33%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 12: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	61	8	1	0	0	0	0	1428	3	0	2432	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	16	16	16	12	12	12	12	12	12	12	12	12
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.95	
Frt		1.00						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		2020						4892			3438	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		2020						4892			3438	
Peak-hour factor, PHF	0.73	0.73	0.73	0.92	0.92	0.92	0.93	0.93	0.93	0.99	0.99	0.99
Adj. Flow (vph)	84	11	1	0	0	0	0	1535	3	0	2457	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	96	0	0	0	0	0	1538	0	0	2457	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	6%	6%	6%	5%	5%	5%
Turn Type	Split											
Protected Phases	1	1						2 3			2 3	
Permitted Phases												
Actuated Green, G (s)		21.0						89.0			89.0	
Effective Green, g (s)		21.0						89.0			89.0	
Actuated g/C Ratio		0.18						0.74			0.74	
Clearance Time (s)		5.0										
Vehicle Extension (s)		3.0										
Lane Grp Cap (vph)		354						3628			2550	
v/s Ratio Prot		c0.05						0.31			c0.71	
v/s Ratio Perm												
v/c Ratio		0.27						0.42			0.96	
Uniform Delay, d1		42.9						5.8			14.0	
Progression Factor		1.00						0.46			1.00	
Incremental Delay, d2		0.4						0.1			10.6	
Delay (s)		43.3						2.7			24.6	
Level of Service		D						A			C	
Approach Delay (s)		43.3			0.0			2.7			24.6	
Approach LOS		D			A			A			C	

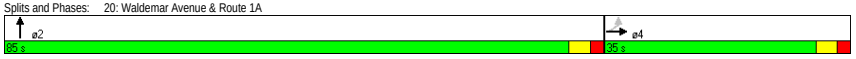
Intersection Summary					
HCM Average Control Delay	16.8	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.83				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	83.9%	ICU Level of Service		E	
Analysis Period (min)	15				
c Critical Lane Group					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	210	5	0	0	0	54	0	1311	54	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		300	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red	Yes		Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		105			600			1113			116	
Travel Time (s)		2.4			13.6			25.3			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	2%	2%
Shared Lane Traffic (%)	49%											
Lane Group Flow (vph)	116	117	0	0	0	59	0	1484	0	0	0	0
Turn Type	Perm					Free						
Protected Phases		4						2				
Permitted Phases	4					Free						
Detector Phase	4	4						2				
Switch Phase												
Minimum Initial (s)	6.0	6.0						10.0				
Minimum Split (s)	11.0	11.0						20.0				
Total Split (s)	35.0	35.0	0.0	0.0	0.0	0.0	0.0	85.0	0.0	0.0	0.0	0.0
Total Split (%)	29.2%	29.2%	0.0%	0.0%	0.0%	0.0%	0.0%	70.8%	0.0%	0.0%	0.0%	0.0%
Yellow Time (s)	3.0	3.0						3.0				
All-Red Time (s)	2.0	2.0						2.0				
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None						C-Min				
v/c Ratio	0.56	0.54				0.04		0.37				
Control Delay	31.4	30.4				0.0		3.3				
Queue Delay	0.0	0.0				0.0		0.0				
Total Delay	31.4	30.4				0.0		3.3				
Queue Length 50th (ft)	49	50				0		73				
Queue Length 95th (ft)	m85	m86				0		150				
Internal Link Dist (ft)		25			520			1033			36	
Turn Bay Length (ft)												
Base Capacity (vph)	464	486				1611		4058				
Starvation Cap Reductn	0	0				0		0				
Spillback Cap Reductn	0	0				0		0				
Storage Cap Reductn	0	0				0		0				
Reduced v/c Ratio	0.25	0.24				0.04		0.37				

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 75 (63%), Referenced to phase 2:NBT, Start of Green
Natural Cycle: 40
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 20: Waldemar Avenue & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	210	5	0	0	0	54	0	1311	54	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0				4.0		5.0				
Lane Util. Factor	0.95	0.95				1.00		0.91				
Frt	1.00	1.00				0.86		0.99				
Flt Protected	0.95	1.00				1.00		1.00				
Satd. Flow (prot)	1681	1770				1611		4916				
Flt Permitted	0.95	1.00				1.00		1.00				
Satd. Flow (perm)	1681	1770				1611		4916				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	228	5	0	0	0	59	0	1425	59	0	0	0
RTOR Reduction (vph)	53	53	0	0	0	0	0	2	0	0	0	0
Lane Group Flow (vph)	63	64	0	0	0	59	0	1482	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	2%	2%
Turn Type	Perm					Free						
Protected Phases		4						2				
Permitted Phases	4					Free						
Actuated Green, G (s)	11.0	11.0				120.0		99.0				
Effective Green, g (s)	11.0	11.0				120.0		99.0				
Actuated g/C Ratio	0.09	0.09				1.00		0.82				
Clearance Time (s)	5.0	5.0						5.0				
Vehicle Extension (s)	3.0	3.0						3.0				
Lane Grp Cap (vph)	154	162				1611		4056				
v/s Ratio Prot								c0.30				
v/s Ratio Perm	c0.04	0.04				0.04						
v/c Ratio	0.41	0.40				0.04		0.37				
Uniform Delay, d1	51.4	51.4				0.0		2.6				
Progression Factor	0.83	0.82				1.00		1.00				
Incremental Delay, d2	1.6	1.5				0.0		0.3				
Delay (s)	44.2	43.8				0.0		2.9				
Level of Service	D	D				A		A				
Approach Delay (s)		44.0			0.0			2.9			0.0	
Approach LOS		D			A			A			A	

Intersection Summary

HCM Average Control Delay	8.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	40.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	552	151	2396	899	183	2132
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	3	1		1	2	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		333			412
Travel Time (s)	28.4		7.6			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	600	164	2604	977	199	2317
Turn Type		Free		Perm	Prot	
Protected Phases	3		2		1	1 2
Permitted Phases		Free		2		
Detector Phase	3		2	2	1	1 2
Switch Phase						
Minimum Initial (s)	6.0		6.0	6.0	10.0	
Minimum Split (s)	11.0		11.0	11.0	15.0	
Total Split (s)	25.0	0.0	58.0	58.0	17.0	75.0
Total Split (%)	25.0%	0.0%	58.0%	58.0%	17.0%	75.0%
Yellow Time (s)	3.0		3.0	3.0	3.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead	Lead	Lag	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None		C-Min	C-Min	None	
v/c Ratio	0.60	0.10	0.97	0.83	0.50	0.96
Control Delay	39.3	0.1	27.4	7.6	41.0	18.2
Queue Delay	0.0	0.0	44.4	1.2	0.0	54.6
Total Delay	39.3	0.1	71.9	8.8	41.0	72.8
Queue Length 50th (ft)	124	0	452	26	68	818
Queue Length 95th (ft)	162	0	#701	m141	m72	m#932
Internal Link Dist (ft)	1168		253			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)	998	1583	2695	1181	400	2407
Starvation Cap Reductn	0	0	335	70	0	350
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.10	1.10	0.88	0.50	1.13

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 90 (90%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	552	151	2396	899	183	2132
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.94	1.00	0.91	1.00	0.97	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	4990	1583	5085	1583	3335	3438
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	4990	1583	5085	1583	3335	3438
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	600	164	2604	977	199	2317
RTOR Reduction (vph)	0	0	0	342	0	0
Lane Group Flow (vph)	600	164	2604	635	199	2317
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Turn Type		Free		Perm	Prot	
Protected Phases	3		2		1	1 2
Permitted Phases		Free		2		
Actuated Green, G (s)	20.0	100.0	53.0	53.0	12.0	70.0
Effective Green, g (s)	20.0	100.0	53.0	53.0	12.0	70.0
Actuated g/C Ratio	0.20	1.00	0.53	0.53	0.12	0.70
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	998	1583	2695	839	400	2407
v/s Ratio Prot	c0.12		0.51		0.06	c0.67
v/s Ratio Perm		0.10		0.40		
v/c Ratio	0.60	0.10	0.97	0.76	0.50	0.96
Uniform Delay, d1	36.4	0.0	22.6	18.4	41.2	13.8
Progression Factor	1.00	1.00	0.83	0.61	0.95	0.86
Incremental Delay, d2	1.0	0.1	7.8	4.0	0.4	5.0
Delay (s)	37.4	0.1	26.6	15.2	39.4	16.8
Level of Service	D	A	C	B	D	B
Approach Delay (s)	29.4		23.5			18.6
Approach LOS	C		C			B

Intersection Summary

HCM Average Control Delay	22.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	77.8%	ICU Level of Service	D
Analysis Period (min)	15		

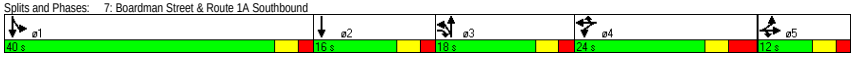
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	38	3	54	252	17	261	74	10	83	203	2471	12	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		100	200		200	200		200	475		0	
Storage Lanes	0		1	1		1	1		1	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		376			531			536			818		
Travel Time (s)		8.5			12.1			12.2			18.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	5%	5%	5%	
Shared Lane Traffic (%)				47%									
Lane Group Flow (vph)	0	44	59	145	147	284	80	11	90	221	2699	0	
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases									Free				
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			4.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0		17.0			21.0
Total Split (s)	12.0	12.0	30.0	24.0	24.0	24.0	18.0	18.0	0.0	40.0	56.0	0.0	16.0
Total Split (%)	10.9%	10.9%	27.3%	21.8%	21.8%	21.8%	16.4%	16.4%	0.0%	36.4%	50.9%	0.0%	15%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag				Lag	Lag	Lag	Lead	Lead		Lead			Lag
Lead-Lag Optimize?													Yes
Recall Mode	None	None		None	None	None	None	None		C-Max			None
v/c Ratio		0.42	0.23	0.68	0.69	0.64	0.51	0.07	0.06	0.31	0.98		
Control Delay		62.4	15.7	61.8	61.9	12.0	58.2	44.8	0.1	27.3	41.2		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay		62.4	15.7	61.8	61.9	12.0	58.2	44.8	0.1	27.3	41.2		
Queue Length 50th (ft)		30	13	102	104	0	55	7	0	115	~798		
Queue Length 95th (ft)		68	37	172	174	78	102	25	0	192	#936		
Internal Link Dist (ft)		296			451			456			738		
Turn Bay Length (ft)			100	200		200	200		200	475			
Base Capacity (vph)		107	295	250	252	476	201	212	1524	704	2741		
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio		0.41	0.20	0.58	0.58	0.60	0.40	0.05	0.06	0.31	0.98		

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 1:SBTL, Start of Green, Master Intersection
Natural Cycle: 100
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	3	54	252	17	261	74	10	83	203	2471	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.91	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1681	1495	1618	1631	1524	1703	1792	1524	1719	4936	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1681	1495	1618	1631	1524	1703	1792	1524	1719	4936	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	41	3	59	274	18	284	80	11	90	221	2686	13
RTOR Reduction (vph)	0	0	24	0	0	247	0	0	0	0	0	0
Lane Group Flow (vph)	0	44	35	145	147	37	80	11	90	221	2699	0
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	5%	5%	5%
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases									Free			
Actuated Green, G (s)		5.6	14.5	14.4	14.4	14.4	8.9	8.9	110.0	43.1	59.1	
Effective Green, g (s)		5.6	14.5	14.4	14.4	14.4	8.9	8.9	110.0	43.1	59.1	
Actuated g/C Ratio		0.05	0.13	0.13	0.13	0.13	0.08	0.08	1.00	0.39	0.54	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		86	197	212	214	200	138	145	1524	674	2652	
v/s Ratio Prot		c0.03	0.02	0.09	c0.09	0.02	c0.05	0.01		0.13	c0.55	
v/s Ratio Perm									0.06			
v/c Ratio		0.51	0.18	0.68	0.69	0.19	0.58	0.08	0.06	0.33	1.02	
Uniform Delay, d1		50.9	42.4	45.6	45.6	42.6	48.7	46.7	0.0	23.3	25.4	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		5.1	0.4	8.8	8.8	0.5	5.8	0.2	0.1	1.3	22.0	
Delay (s)		55.9	42.9	54.4	54.5	43.0	54.5	47.0	0.1	24.6	47.5	
Level of Service		E	D	D	D	D	D	D	A	C	D	
Approach Delay (s)		48.4			48.8			27.0			45.7	
Approach LOS		D			D			C			D	

Intersection Summary

HCM Average Control Delay	45.4	HCM Level of Service		D	
HCM Volume to Capacity ratio	0.89				
Actuated Cycle Length (s)	110.0	Sum of lost time (s)		22.0	
Intersection Capacity Utilization	81.3%	ICU Level of Service		D	
Analysis Period (min)	15				

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2	ø3
Lane Configurations														
Volume (vph)	122	8	9	0	0	0	0	2547	0	0	2306	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	16	16	16	12	12	12	12	12	12	12	12	12		
Right Turn on Red			Yes			Yes			Yes			Yes		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		158			294			412			281			
Travel Time (s)		3.6			6.7			9.4			6.4			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92		
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	6%	6%	6%	5%	5%	5%		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	152	0	0	0	0	0	2768	0	0	2507	0		
Turn Type	Split													
Protected Phases	1	1						2 3			2 3		2	3
Permitted Phases														
Detector Phase	1	1						2 3			2 3			
Switch Phase														
Minimum Initial (s)	10.0	10.0											6.0	6.0
Minimum Split (s)	15.0	15.0											11.0	11.0
Total Split (s)	17.0	17.0	0.0	0.0	0.0	0.0	0.0	83.0	0.0	0.0	83.0	0.0	58.0	25.0
Total Split (%)	17.0%	17.0%	0.0%	0.0%	0.0%	0.0%	0.0%	83.0%	0.0%	0.0%	83.0%	0.0%	58%	25%
Yellow Time (s)	3.0	3.0											3.0	3.0
All-Red Time (s)	2.0	2.0											2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0		
Lead/Lag	Lag	Lag											Lead	
Lead-Lag Optimize?	Yes	Yes											Yes	
Recall Mode	None	None											C-Min	None
v/c Ratio		0.63						0.73			0.93			
Control Delay		53.3						7.7			17.6			
Queue Delay		0.0						0.2			15.5			
Total Delay		53.3						7.8			33.1			
Queue Length 50th (ft)		92						149			543			
Queue Length 95th (ft)		#162						m176			#765			
Internal Link Dist (ft)		78			214			332			201			
Turn Bay Length (ft)														
Base Capacity (vph)		243						3817			2682			
Starvation Cap Reductn		0						261			0			
Spillback Cap Reductn		0						0			243			
Storage Cap Reductn		0						0			0			
Reduced v/c Ratio		0.63						0.78			1.03			

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 90 (90%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 12: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	122	8	9	0	0	0	0	2547	0	0	2306	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	16	16	16	12	12	12	12	12	12	12	12	12
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.95	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		2005						4893			3438	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		2005						4893			3438	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	133	9	10	0	0	0	0	2768	0	0	2507	0
RTOR Reduction (vph)	0	3	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	149	0	0	0	0	0	2768	0	0	2507	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	6%	6%	6%	5%	5%	5%
Turn Type	Split											
Protected Phases	1	1						2 3			2 3	
Permitted Phases												
Actuated Green, G (s)		12.0						78.0			78.0	
Effective Green, g (s)		12.0						78.0			78.0	
Actuated g/C Ratio		0.12						0.78			0.78	
Clearance Time (s)		5.0										
Vehicle Extension (s)		3.0										
Lane Grp Cap (vph)		241						3817			2682	
v/s Ratio Prot		c0.07						0.57			c0.73	
v/s Ratio Perm												
v/c Ratio		0.62						0.73			0.93	
Uniform Delay, d1		41.8						5.6			8.9	
Progression Factor		1.00						1.25			1.00	
Incremental Delay, d2		4.7						0.3			6.9	
Delay (s)		46.5						7.2			15.8	
Level of Service		D						A			B	
Approach Delay (s)		46.5			0.0			7.2			15.8	
Approach LOS		D			A			A			B	

Intersection Summary					
HCM Average Control Delay	12.3	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.89				
Actuated Cycle Length (s)	100.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	80.4%	ICU Level of Service		D	
Analysis Period (min)	15				
c Critical Lane Group					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	304	5	0	0	0	165	0	2827	126	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		300	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red	Yes		Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		105			600			1113			116	
Travel Time (s)		2.4			13.6			25.3			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	2%	2%
Shared Lane Traffic (%)	49%											
Lane Group Flow (vph)	168	167	0	0	0	179	0	3210	0	0	0	0
Turn Type	Perm					Free						
Protected Phases		4						2				
Permitted Phases	4					Free						
Detector Phase	4	4						2				
Switch Phase												
Minimum Initial (s)	6.0	6.0						10.0				
Minimum Split (s)	11.0	11.0						20.0				
Total Split (s)	25.0	25.0	0.0	0.0	0.0	0.0	0.0	75.0	0.0	0.0	0.0	0.0
Total Split (%)	25.0%	25.0%	0.0%	0.0%	0.0%	0.0%	0.0%	75.0%	0.0%	0.0%	0.0%	0.0%
Yellow Time (s)	3.0	3.0						3.0				
All-Red Time (s)	2.0	2.0						2.0				
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None						C-Min				
v/c Ratio	0.66	0.63				0.11		0.87				
Control Delay	52.0	49.4				0.1		13.4				
Queue Delay	0.0	0.0				0.0		11.8				
Total Delay	52.0	49.4				0.2		25.2				
Queue Length 50th (ft)	106	105				0		447				
Queue Length 95th (ft)	169	168				0		665				
Internal Link Dist (ft)		25			520			1033			36	
Turn Bay Length (ft)												
Base Capacity (vph)	338	356				1611		3695				
Starvation Cap Reductn	0	0				0		0				
Spillback Cap Reductn	0	0				174		532				
Storage Cap Reductn	0	0				0		0				
Reduced v/c Ratio	0.50	0.47				0.12		1.01				

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 89 (89%), Referenced to phase 2:NBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 20: Waldemar Avenue & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	304	5	0	0	0	165	0	2827	126	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0				4.0		5.0				
Lane Util. Factor	0.95	0.95				1.00		0.91				
Frt	1.00	1.00				0.86		0.99				
Flt Protected	0.95	1.00				1.00		1.00				
Satd. Flow (prot)	1681	1770				1611		4914				
Flt Permitted	0.95	1.00				1.00		1.00				
Satd. Flow (perm)	1681	1770				1611		4914				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	330	5	0	0	0	179	0	3073	137	0	0	0
RTOR Reduction (vph)	2	2	0	0	0	0	0	4	0	0	0	0
Lane Group Flow (vph)	166	165	0	0	0	179	0	3206	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	2%	2%
Turn Type	Perm					Free						
Protected Phases		4						2				
Permitted Phases	4					Free						
Actuated Green, G (s)	14.9	14.9				100.0		75.1				
Effective Green, g (s)	14.9	14.9				100.0		75.1				
Actuated g/C Ratio	0.15	0.15				1.00		0.75				
Clearance Time (s)	5.0	5.0						5.0				
Vehicle Extension (s)	3.0	3.0						3.0				
Lane Grp Cap (vph)	250	264				1611		3690				
v/s Ratio Prot								c0.65				
v/s Ratio Perm	c0.10	0.09				0.11						
v/c Ratio	0.67	0.63				0.11		0.87				
Uniform Delay, d1	40.2	39.9				0.0		8.9				
Progression Factor	1.00	1.00				1.00		1.00				
Incremental Delay, d2	6.5	4.6				0.1		3.1				
Delay (s)	46.7	44.5				0.1		12.0				
Level of Service	D	D				A		B				
Approach Delay (s)		45.6			0.1			12.0			0.0	
Approach LOS		D			A			B			A	

Intersection Summary

HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		

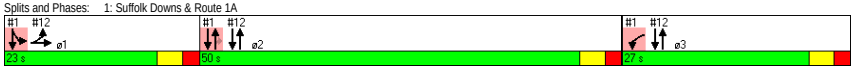
c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	548	196	2039	901	208	1945
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	3	1		1	2	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		333			412
Travel Time (s)	28.4		7.6			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	596	213	2216	979	226	2114
Turn Type		Free		Perm	Prot	
Protected Phases	3		2		1	1 2
Permitted Phases		Free		2		
Detector Phase	3		2	2	1	1 2
Switch Phase						
Minimum Initial (s)	6.0		6.0	6.0	10.0	
Minimum Split (s)	11.0		11.0	11.0	15.0	
Total Split (s)	27.0	0.0	50.0	50.0	23.0	73.0
Total Split (%)	27.0%	0.0%	50.0%	50.0%	23.0%	73.0%
Maximum Green (s)	22.0		45.0	45.0	18.0	
Yellow Time (s)	3.0		3.0	3.0	3.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	None		C-Min	C-Min	None	
v/c Ratio	0.54	0.13	0.97	0.89	0.37	0.89
Control Delay	36.7	0.2	33.8	13.2	37.6	15.9
Queue Delay	0.0	0.0	35.9	2.9	0.0	15.0
Total Delay	36.7	0.2	69.8	16.1	37.6	30.9
Queue Length 50th (ft)	119	0	504	21	77	358
Queue Length 95th (ft)	157	0	#613	#229	m83	m423
Internal Link Dist (ft)	1168		253			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)	1098	1583	2288	1095	612	2383
Starvation Cap Reductn	0	0	245	56	0	313
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.54	0.13	1.08	0.94	0.37	1.02

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 68 (68%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	548	196	2039	901	208	1945
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.94	1.00	0.91	1.00	0.97	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	4990	1583	5085	1583	3400	3505
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	4990	1583	5085	1583	3400	3505
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	596	213	2216	979	226	2114
RTOR Reduction (vph)	0	0	0	382	0	0
Lane Group Flow (vph)	596	213	2216	597	226	2114
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Turn Type		Free		Perm	Prot	
Protected Phases	3		2		1	1 2
Permitted Phases		Free		2		
Actuated Green, G (s)	22.0	100.0	45.0	45.0	18.0	68.0
Effective Green, g (s)	22.0	100.0	45.0	45.0	18.0	68.0
Actuated g/C Ratio	0.22	1.00	0.45	0.45	0.18	0.68
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1098	1583	2288	712	612	2383
v/s Ratio Prot	c0.12		c0.44		0.07	c0.60
v/s Ratio Perm		0.13		0.38		
v/c Ratio	0.54	0.13	0.97	0.84	0.37	0.89
Uniform Delay, d1	34.5	0.0	26.8	24.3	36.0	12.9
Progression Factor	1.00	1.00	0.85	0.47	1.02	1.00
Incremental Delay, d2	0.6	0.2	10.3	8.6	0.1	1.8
Delay (s)	35.1	0.2	33.0	20.0	36.8	14.7
Level of Service	D	A	C	B	D	B
Approach Delay (s)	25.9		29.0			16.9
Approach LOS	C		C			B

Intersection Summary

HCM Average Control Delay	24.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	72.5%	ICU Level of Service	C
Analysis Period (min)	15		

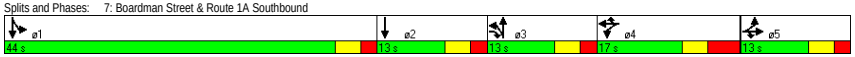
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	38	10	37	255	12	332	32	10	339	182	2284	28	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		100	200		200	200		200	475		0	
Storage Lanes	0		1	1		1	1		1	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		246			531			536			818		
Travel Time (s)		5.6			12.1			12.2			18.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	1%	1%	1%	3%	3%	3%	
Shared Lane Traffic (%)				48%									
Lane Group Flow (vph)	0	52	40	144	146	361	35	11	368	198	2513	0	
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases									Free				
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			4.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0		17.0			13.0
Total Split (s)	13.0	13.0	26.0	17.0	17.0	17.0	13.0	13.0	0.0	44.0	57.0	0.0	13.0
Total Split (%)	13.0%	13.0%	26.0%	17.0%	17.0%	17.0%	13.0%	13.0%	0.0%	44.0%	57.0%	0.0%	13%
Maximum Green (s)	8.0	8.0		10.0	10.0	10.0	8.0	8.0		39.0			8.0
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag				Lag	Lag	Lag	Lead	Lead		Lead			Lag
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes		Yes			Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
Recall Mode	None	None		None	None	None	None	None		C-Max			None
Walk Time (s)	7.0	7.0		5.0	5.0	5.0	7.0	7.0					5.0
Flash Dont Walk (s)	20.0	20.0		11.0	11.0	11.0	20.0	20.0					11.0
Pedestrian Calls (#/hr)	5	5		0	0	0	5	5					0
v/c Ratio		0.40	0.17	0.86	0.86	0.75	0.27	0.08	0.23	0.25	0.86		
Control Delay		53.5	21.8	85.8	86.7	15.4	49.2	44.2	0.3	18.0	21.0		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay		53.5	21.8	85.8	86.7	15.4	49.2	44.2	0.3	18.0	21.0		
Queue Length 50th (ft)		32	14	96	97	0	21	7	0	81	531		
Queue Length 95th (ft)		71	35	#213	#216	#111	53	24	0	m96	#673		
Internal Link Dist (ft)		166			451			456			738		
Turn Bay Length (ft)			100	200		200	200		200	475			
Base Capacity (vph)		139	251	168	169	483	143	150	1599	786	2908		
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio		0.37	0.16	0.86	0.86	0.75	0.24	0.07	0.23	0.25	0.86		

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 1:SBTL, Start of Green, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	10	37	255	12	332	32	10	339	182	2284	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.91	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1741	1538	1681	1693	1583	1787	1881	1599	1752	5027	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1741	1538	1681	1693	1583	1787	1881	1599	1752	5027	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	41	11	40	277	13	361	35	11	368	198	2483	30
RTOR Reduction (vph)	0	0	5	0	0	325	0	0	0	0	1	0
Lane Group Flow (vph)	0	52	35	144	146	36	35	11	368	198	2512	0
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	1%	1%	1%	3%	3%	3%
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases									Free			
Actuated Green, G (s)		6.2	12.1	10.0	10.0	10.0	5.9	5.9	100.0	42.9	55.9	
Effective Green, g (s)		6.2	12.1	10.0	10.0	10.0	5.9	5.9	100.0	42.9	55.9	
Actuated g/C Ratio		0.06	0.12	0.10	0.10	0.10	0.06	0.06	1.00	0.43	0.56	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		108	186	168	169	158	105	111	1599	752	2810	
v/s Ratio Prot		c0.03	0.02	0.09	c0.09	0.02	0.02	0.01		0.11	c0.50	
v/s Ratio Perm									c0.23			
v/c Ratio		0.48	0.19	0.86	0.86	0.23	0.33	0.10	0.23	0.26	0.89	
Uniform Delay, d1		45.3	39.5	44.3	44.3	41.4	45.2	44.5	0.0	18.4	19.4	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.89	0.92	
Incremental Delay, d2		3.4	0.5	32.5	33.8	0.7	1.9	0.4	0.3	0.5	2.4	
Delay (s)		48.7	40.0	76.8	78.1	42.2	47.0	44.9	0.3	16.8	20.2	
Level of Service		D	D	E	E	D	D	D	A	B	C	
Approach Delay (s)		44.9			57.9			5.5			19.9	
Approach LOS		D			E			A			B	

Intersection Summary

HCM Average Control Delay	25.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		

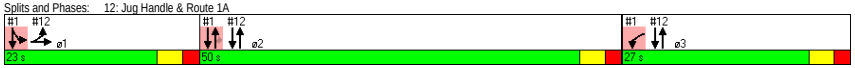
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2	ø3
Lane Configurations														
Volume (vph)	59	9	8	0	0	0	0	2239	2	0	2142	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Right Turn on Red			Yes			Yes			Yes			Yes		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		158			294			412			281			
Travel Time (s)		3.6			6.7			9.4			6.4			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92		
Heavy Vehicles (%)	14%	14%	14%	0%	0%	0%	2%	2%	2%	3%	3%	3%		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	83	0	0	0	0	0	2436	0	0	2328	0		
Turn Type	Split													
Protected Phases	1	1						2 3			2 3		2	3
Permitted Phases														
Detector Phase	1	1						2 3			2 3			
Switch Phase														
Minimum Initial (s)	10.0	10.0											6.0	6.0
Minimum Split (s)	15.0	15.0											11.0	11.0
Total Split (s)	23.0	23.0	0.0	0.0	0.0	0.0	0.0	77.0	0.0	0.0	77.0	0.0	50.0	27.0
Total Split (%)	23.0%	23.0%	0.0%	0.0%	0.0%	0.0%	0.0%	77.0%	0.0%	0.0%	77.0%	0.0%	50%	27%
Maximum Green (s)	18.0	18.0											45.0	22.0
Yellow Time (s)	3.0	3.0											3.0	3.0
All-Red Time (s)	2.0	2.0											2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0		
Lead/Lag	Lead	Lead											Lag	
Lead-Lag Optimize?	Yes	Yes											Yes	
Vehicle Extension (s)	3.0	3.0											3.0	3.0
Recall Mode	None	None											C-Min	None
v/c Ratio		0.29						0.67			0.92			
Control Delay		36.4						2.4			19.6			
Queue Delay		0.0						0.8			1.3			
Total Delay		36.4						3.3			20.9			
Queue Length 50th (ft)		43						21			558			
Queue Length 95th (ft)		88						m26			#727			
Internal Link Dist (ft)		78			214			332			201			
Turn Bay Length (ft)														
Base Capacity (vph)		289						3661			2524			
Starvation Cap Reductn		0						825			0			
Spillback Cap Reductn		0						0			77			
Storage Cap Reductn		0						0			0			
Reduced v/c Ratio		0.29						0.86			0.95			

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 68 (68%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 12: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	59	9	8	0	0	0	0	2239	2	0	2142	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.95	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1581						5085			3505	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1581						5085			3505	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	64	10	9	0	0	0	0	2434	2	0	2328	0
RTOR Reduction (vph)	0	4	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	79	0	0	0	0	0	2436	0	0	2328	0
Heavy Vehicles (%)	14%	14%	14%	0%	0%	0%	2%	2%	2%	3%	3%	3%
Turn Type	Split											
Protected Phases	1	1						2 3			2 3	
Permitted Phases												
Actuated Green, G (s)		18.0						72.0			72.0	
Effective Green, g (s)		18.0						72.0			72.0	
Actuated g/C Ratio		0.18						0.72			0.72	
Clearance Time (s)		5.0										
Vehicle Extension (s)		3.0										
Lane Grp Cap (vph)		285						3661			2524	
v/s Ratio Prot		c0.05						0.48			c0.66	
v/s Ratio Perm												
v/c Ratio		0.28						0.67			0.92	
Uniform Delay, d1		35.4						7.5			11.7	
Progression Factor		1.00						0.26			1.00	
Incremental Delay, d2		0.5						0.2			6.3	
Delay (s)		35.9						2.2			17.9	
Level of Service		D						A			B	
Approach Delay (s)		35.9			0.0			2.2			17.9	
Approach LOS		D			A			A			B	

Intersection Summary

HCM Average Control Delay	10.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	75.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	375	5	0	0	0	123	0	2444	126	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		300	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red	Yes		Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		105			600			1113			116	
Travel Time (s)		2.4			13.6			25.3			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)	49%											
Lane Group Flow (vph)	208	205	0	0	0	134	0	2794	0	0	0	0
Turn Type	Perm					Free						
Protected Phases		4						2				
Permitted Phases	4					Free						
Detector Phase	4	4						2				
Switch Phase												
Minimum Initial (s)	6.0	6.0						10.0				
Minimum Split (s)	11.0	11.0						20.0				
Total Split (s)	35.0	35.0	0.0	0.0	0.0	0.0	0.0	65.0	0.0	0.0	0.0	0.0
Total Split (%)	35.0%	35.0%	0.0%	0.0%	0.0%	0.0%	0.0%	65.0%	0.0%	0.0%	0.0%	0.0%
Maximum Green (s)	30.0	30.0						60.0				
Yellow Time (s)	3.0	3.0						3.0				
All-Red Time (s)	2.0	2.0						2.0				
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0						3.0				
Recall Mode	None	None						C-Min				
Walk Time (s)	7.0	7.0										
Flash Dont Walk (s)	13.0	13.0										
Pedestrian Calls (#/hr)	5	5										
v/c Ratio	0.68	0.64				0.08		0.77				
Control Delay	45.9	43.7				0.1		11.6				
Queue Delay	0.0	0.0				0.0		2.3				
Total Delay	45.9	43.7				0.1		13.9				
Queue Length 50th (ft)	134	131				0		342				
Queue Length 95th (ft)	m182	m178				0		548				
Internal Link Dist (ft)		25			520			1033			36	
Turn Bay Length (ft)												
Base Capacity (vph)	506	532				1611		3637				
Starvation Cap Reductn	0	0				0		0				
Spillback Cap Reductn	0	0				216		678				
Storage Cap Reductn	0	0				0		0				
Reduced v/c Ratio	0.41	0.39				0.10		0.94				

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 65 (65%), Referenced to phase 2:NBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 20: Waldemar Avenue & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	375	5	0	0	0	123	0	2444	126	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0				4.0		5.0				
Lane Util. Factor	0.95	0.95				1.00		0.91				
Frt	1.00	1.00				0.86		0.99				
Flt Protected	0.95	1.00				1.00		1.00				
Satd. Flow (prot)	1681	1770				1611		5048				
Flt Permitted	0.95	1.00				1.00		1.00				
Satd. Flow (perm)	1681	1770				1611		5048				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	408	5	0	0	0	134	0	2657	137	0	0	0
RTOR Reduction (vph)	2	2	0	0	0	0	0	4	0	0	0	0
Lane Group Flow (vph)	206	203	0	0	0	134	0	2790	0	0	0	0
Turn Type	Perm					Free						
Protected Phases		4						2				
Permitted Phases	4					Free						
Actuated Green, G (s)	18.1	18.1				100.0		71.9				
Effective Green, g (s)	18.1	18.1				100.0		71.9				
Actuated g/C Ratio	0.18	0.18				1.00		0.72				
Clearance Time (s)	5.0	5.0						5.0				
Vehicle Extension (s)	3.0	3.0						3.0				
Lane Grp Cap (vph)	304	320				1611		3630				
v/s Ratio Prot								c0.55				
v/s Ratio Perm	c0.12	0.11				0.08						
v/c Ratio	0.68	0.64				0.08		0.77				
Uniform Delay, d1	38.2	37.9				0.0		8.8				
Progression Factor	1.01	1.01				1.00		1.00				
Incremental Delay, d2	4.2	2.9				0.1		1.6				
Delay (s)	43.0	41.3				0.1		10.4				
Level of Service	D	D				A		B				
Approach Delay (s)		42.2			0.1			10.4			0.0	
Approach LOS		D			A			B			A	

Intersection Summary

HCM Average Control Delay	14.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	68.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

Synchro 7 Capacity Analysis
Option 8 - Northbound Flyover Constructed within Existing NB Travel Way

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	54	8	7	0	0	0	0	1179	3	0	2140	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		160			283			370			273	
Travel Time (s)		3.6			6.4			8.4			6.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	76	0	0	0	0	0	1285	0	0	2326	0
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Detector Phase	4	4						2			6	
Switch Phase												
Minimum Initial (s)	6.0	6.0						10.0			10.0	
Minimum Split (s)	20.0	20.0						20.0			20.0	
Total Split (s)	25.0	25.0	0.0	0.0	0.0	0.0	0.0	85.0	0.0	0.0	85.0	0.0
Total Split (%)	22.7%	22.7%	0.0%	0.0%	0.0%	0.0%	0.0%	77.3%	0.0%	0.0%	77.3%	0.0%
Yellow Time (s)	3.0	3.0						3.0			3.0	
All-Red Time (s)	2.0	2.0						2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None						C-Max			C-Max	
v/c Ratio		0.47						0.30			0.77	
Control Delay		53.0						0.7			7.7	
Queue Delay		0.0						0.1			0.0	
Total Delay		53.0						0.8			7.7	
Queue Length 50th (ft)		48						0			343	
Queue Length 95th (ft)		93						0			553	
Internal Link Dist (ft)		80			203			290			193	
Turn Bay Length (ft)												
Base Capacity (vph)		326						4317			3004	
Starvation Cap Reductn		0						1231			0	
Spillback Cap Reductn		0						0			0	
Storage Cap Reductn		0						0			0	
Reduced v/c Ratio		0.23						0.42			0.77	

Intersection Summary	
Area Type:	Other
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	

Splits and Phases: 2: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	54	8	7	0	0	0	0	1179	3	0	2140	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.95	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1768						5084			3539	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1768						5084			3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	59	9	8	0	0	0	0	1282	3	0	2326	0
RTOR Reduction (vph)	0	5	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	71	0	0	0	0	0	1285	0	0	2326	0
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Actuated Green, G (s)		8.6						91.4			91.4	
Effective Green, g (s)		8.6						91.4			91.4	
Actuated g/C Ratio		0.08						0.83			0.83	
Clearance Time (s)		5.0						5.0			5.0	
Vehicle Extension (s)		3.0						3.0			3.0	
Lane Grp Cap (vph)		138						4224			2941	
v/s Ratio Prot								0.25			c0.66	
v/s Ratio Perm		0.04										
v/c Ratio		0.52						0.30			0.79	
Uniform Delay, d1		48.7						2.1			4.6	
Progression Factor		1.00						0.23			1.00	
Incremental Delay, d2		3.3						0.2			2.3	
Delay (s)		52.0						0.7			6.8	
Level of Service		D						A			A	
Approach Delay (s)		52.0			0.0			0.7			6.8	
Approach LOS		D			A			A			A	

Intersection Summary					
HCM Average Control Delay	5.6	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.77				
Actuated Cycle Length (s)	110.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	72.5%	ICU Level of Service		C	
Analysis Period (min)	15				
c Critical Lane Group					

Lane Group	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations										
Volume (vph)	20	8	0	220	68	8	0	2133	959	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red		Yes			Yes			No		
Link Speed (mph)	30			30			30		30	
Link Distance (ft)	585			447			370		424	
Travel Time (s)	13.3			10.2			8.4		9.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)										
Lane Group Flow (vph)	22	9	0	239	74	9	0	2318	1042	0
Turn Type		pt+ov			Perm	Prot		custom		
Protected Phases	8	8 1		2!		1		6	2!	
Permitted Phases					2					
Detector Phase	8	8 1		2	2	1		6	2	
Switch Phase										
Minimum Initial (s)	6.0			10.0	10.0	6.0		10.0	10.0	
Minimum Split (s)	20.0			15.0	15.0	11.0		15.0	15.0	
Total Split (s)	20.0	35.0	0.0	75.0	75.0	15.0	0.0	90.0	75.0	0.0
Total Split (%)	18.2%	31.8%	0.0%	68.2%	68.2%	13.6%	0.0%	81.8%	68.2%	0.0%
Yellow Time (s)	3.0			3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0			2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag				Lag	Lag	Lead			Lag	
Lead-Lag Optimize?				Yes	Yes	Yes			Yes	
Recall Mode	None			C-Max	C-Max	None		C-Max	C-Max	
v/c Ratio	0.11	0.05		0.15	0.05	0.05		0.68	0.32	
Control Delay	50.1	21.1		2.8	1.0	45.8		2.3	3.5	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.1	0.0	
Total Delay	50.1	21.1		2.8	1.0	45.8		2.4	3.5	
Queue Length 50th (ft)	7	0		19	0	3		148	49	
Queue Length 95th (ft)	20	15		67	11	m4		176	154	
Internal Link Dist (ft)	505			367			290		344	
Turn Bay Length (ft)										
Base Capacity (vph)	468	281		1618	1385	312		3387	3235	
Starvation Cap Reductn	0	0		0	0	0		187	0	
Spillback Cap Reductn	0	0		0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0		0	0	
Reduced v/c Ratio	0.05	0.03		0.15	0.05	0.03		0.72	0.32	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:NENB and 6:SBR, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.
! Phase conflict between lane groups.

Splits and Phases: 6: Tomasello Way & Route 1A



Movement	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations										
Volume (vph)	20	8	0	220	68	8	0	2133	959	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	0.97	1.00		1.00	1.00	0.97		*1.00	*1.00	
Frt	1.00	0.85		1.00	0.85	1.00		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	0.95		1.00	1.00	
Satd. Flow (prot)	3433	1583		1863	1583	3433		3725	3725	
Flt Permitted	0.95	1.00		1.00	1.00	0.95		1.00	1.00	
Satd. Flow (perm)	3433	1583		1863	1583	3433		3725	3725	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	9	0	239	74	9	0	2318	1042	0
RTOR Reduction (vph)	0	8	0	0	14	0	0	0	0	0
Lane Group Flow (vph)	22	1	0	239	60	9	0	2318	1042	0
Turn Type		pt+ov			Perm	Prot		custom		
Protected Phases	8	8 1		2!		1		6	2!	
Permitted Phases					2					
Actuated Green, G (s)	4.0	11.5		88.5	88.5	2.5		96.0	88.5	
Effective Green, g (s)	4.0	11.5		88.5	88.5	2.5		96.0	88.5	
Actuated g/C Ratio	0.04	0.10		0.80	0.80	0.02		0.87	0.80	
Clearance Time (s)	5.0			5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0			3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	125	165		1499	1274	78		3251	2997	
v/s Ratio Prot	c0.01	0.00		0.13		0.00		c0.62	0.28	
v/s Ratio Perm					0.04					
v/c Ratio	0.18	0.01		0.16	0.05	0.12		0.71	0.35	
Uniform Delay, d1	51.4	44.1		2.4	2.2	52.7		2.4	2.9	
Progression Factor	1.00	1.00		1.00	1.00	0.92		0.63	1.14	
Incremental Delay, d2	0.7	0.0		0.2	0.1	0.4		0.8	0.3	
Delay (s)	52.1	44.1		2.6	2.3	49.0		2.3	3.7	
Level of Service	D	D		A	A	D		A	A	
Approach Delay (s)	49.8			2.5			2.5		3.7	
Approach LOS	D			A			A		A	

Intersection Summary

HCM Average Control Delay	3.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	78.8%	ICU Level of Service	D
Analysis Period (min)	15		

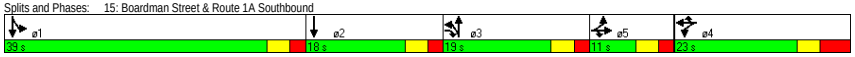
! Phase conflict between lane groups.
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	39	10	90	384	34	149	134	100	60	124	2052	14	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		0	200		200	100		200	250		0	
Storage Lanes	0		1	1		1	1		1	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		731			531			536			945		
Travel Time (s)		16.6			12.1			12.2			21.5		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99	
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%	
Shared Lane Traffic (%)				46%									
Lane Group Flow (vph)	0	52	96	221	224	159	146	109	65	125	2087	0	
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases									Free				
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			10.0
Minimum Split (s)	14.0	14.0		14.0	14.0	14.0	14.0	14.0		18.0			18.0
Total Split (s)	11.0	11.0	30.0	23.0	23.0	23.0	19.0	19.0	0.0	39.0	57.0	0.0	18.0
Total Split (%)	10.0%	10.0%	27.3%	20.9%	20.9%	20.9%	17.3%	17.3%	0.0%	35.5%	51.8%	0.0%	16%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag	Lag	Lag					Lead	Lead		Lead			Lag
Lead-Lag Optimize?	Yes	Yes					Yes	Yes					
Recall Mode	None	None		None	None	None	None	None		None			C-Min
v/c Ratio		0.54	0.30	0.91	0.91	0.45	0.78	0.27	0.04	0.22	0.86		
Control Delay		71.1	35.3	84.9	85.0	10.9	75.3	45.6	0.1	23.6	31.9		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay		71.1	35.3	84.9	85.0	10.9	75.3	45.6	0.1	23.6	31.9		
Queue Length 50th (ft)		37	52	163	165	0	101	36	0	69	534		
Queue Length 95th (ft)		#88	100	#312	#316	59	#199	64	0	m92	595		
Internal Link Dist (ft)		651			451			456			865		
Turn Bay Length (ft)				200		200	100		200	250			
Base Capacity (vph)		97	303	247	250	360	198	425	1509	558	2423		
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio		0.54	0.32	0.89	0.90	0.44	0.74	0.26	0.04	0.22	0.86		

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 15: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	39	10	90	384	34	149	134	100	60	124	2052	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1759	1417	1698	1718	1538	1556	3343	1509	1752	5027	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1759	1417	1698	1718	1538	1556	3343	1509	1752	5027	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	41	11	96	409	36	159	146	109	65	125	2073	14
RTOR Reduction (vph)	0	0	6	0	0	136	0	0	0	0	1	0
Lane Group Flow (vph)	0	52	90	221	224	23	146	109	65	125	2086	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases									Free			
Actuated Green, G (s)		6.1	24.2	15.8	15.8	15.8	13.1	13.1	110.0	35.0	53.0	
Effective Green, g (s)		6.1	24.2	15.8	15.8	15.8	13.1	13.1	110.0	35.0	53.0	
Actuated g/C Ratio		0.06	0.22	0.14	0.14	0.14	0.12	0.12	1.00	0.32	0.48	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		98	312	244	247	221	185	398	1509	557	2422	
v/s Ratio Prot		c0.03	0.06	0.13	c0.13	0.01	c0.09	0.03		0.07	c0.42	
v/s Ratio Perm									0.04			
v/c Ratio		0.53	0.29	0.91	0.91	0.10	0.79	0.27	0.04	0.22	0.86	
Uniform Delay, d1		50.6	35.7	46.4	46.4	40.9	47.1	44.1	0.0	27.5	25.2	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.81	1.11	
Incremental Delay, d2		5.4	0.5	33.3	33.2	0.2	19.7	0.4	0.1	0.1	2.5	
Delay (s)		56.0	36.2	79.7	79.6	41.1	66.8	44.5	0.1	22.3	30.5	
Level of Service		E	D	E	E	D	E	D	A	C	C	
Approach Delay (s)		43.2			69.5			45.6			30.0	
Approach LOS		D			E			D			C	

Intersection Summary

HCM Average Control Delay	39.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	79.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	100	7	8	0	0	0	0	2031	0	0	1738	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		160			283			370			273	
Travel Time (s)		3.6			6.4			8.4			6.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	126	0	0	0	0	0	2208	0	0	1889	0
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Detector Phase	4	4						2			6	
Switch Phase												
Minimum Initial (s)	6.0	6.0						10.0			10.0	
Minimum Split (s)	20.0	20.0						20.0			20.0	
Total Split (s)	20.0	20.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	100.0	0.0
Total Split (%)	16.7%	16.7%	0.0%	0.0%	0.0%	0.0%	0.0%	83.3%	0.0%	0.0%	83.3%	0.0%
Yellow Time (s)	3.0	3.0						3.0			3.0	
All-Red Time (s)	2.0	2.0						2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None						C-Max			C-Max	
v/c Ratio		0.66						0.54			0.66	
Control Delay		66.9						5.3			6.2	
Queue Delay		0.0						0.3			0.0	
Total Delay		66.9						5.6			6.2	
Queue Length 50th (ft)		92						272			261	
Queue Length 95th (ft)		156						351			340	
Internal Link Dist (ft)		80			203			290			193	
Turn Bay Length (ft)												
Base Capacity (vph)		224						4123			2870	
Starvation Cap Reductn		0						1021			0	
Spillback Cap Reductn		0						0			0	
Storage Cap Reductn		0						0			0	
Reduced v/c Ratio		0.56						0.71			0.66	

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	

Splits and Phases: 2: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	100	7	8	0	0	0	0	2031	0	0	1738	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.95	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1768						5085			3539	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1768						5085			3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	109	8	9	0	0	0	0	2208	0	0	1889	0
RTOR Reduction (vph)	0	3	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	123	0	0	0	0	0	2208	0	0	1889	0
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Actuated Green, G (s)		12.7						97.3			97.3	
Effective Green, g (s)		12.7						97.3			97.3	
Actuated g/C Ratio		0.11						0.81			0.81	
Clearance Time (s)		5.0						5.0			5.0	
Vehicle Extension (s)		3.0						3.0			3.0	
Lane Grp Cap (vph)		187						4123			2870	
v/s Ratio Prot								0.43			c0.53	
v/s Ratio Perm		0.07										
v/c Ratio		0.66						0.54			0.66	
Uniform Delay, d1		51.6						3.8			4.6	
Progression Factor		1.00						1.20			1.00	
Incremental Delay, d2		8.1						0.4			1.2	
Delay (s)		59.7						5.0			5.8	
Level of Service		E						A			A	
Approach Delay (s)		59.7			0.0			5.0			5.8	
Approach LOS		E			A			A			A	

Intersection Summary					
HCM Average Control Delay	7.0	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.66				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	62.8%	ICU Level of Service		B	
Analysis Period (min)	15				
c Critical Lane Group					

Lane Group	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations										
Volume (vph)	19	13	0	334	200	30	0	1716	1673	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red		Yes			Yes			No		
Link Speed (mph)	30			30			30		30	
Link Distance (ft)	585			447			370		424	
Travel Time (s)	13.3			10.2			8.4		9.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)										
Lane Group Flow (vph)	21	14	0	363	217	33	0	1865	1818	0
Turn Type		pt+ov			Perm	Prot		custom		
Protected Phases	8	8 1		2!		1		6	2!	
Permitted Phases					2					
Detector Phase	8	8 1		2	2	1		6	2	
Switch Phase										
Minimum Initial (s)	6.0			10.0	10.0	6.0		10.0	10.0	
Minimum Split (s)	20.0			15.0	15.0	11.0		15.0	15.0	
Total Split (s)	30.0	48.0	0.0	72.0	72.0	18.0	0.0	90.0	72.0	0.0
Total Split (%)	25.0%	40.0%	0.0%	60.0%	60.0%	15.0%	0.0%	75.0%	60.0%	0.0%
Yellow Time (s)	3.0			3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0			2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag				Lag	Lag	Lead			Lag	
Lead-Lag Optimize?				Yes	Yes	Yes			Yes	
Recall Mode	None			C-Max	C-Max	None		C-Max	C-Max	
v/c Ratio	0.11	0.07		0.23	0.16	0.17		0.55	0.57	
Control Delay	54.9	34.0		3.6	0.8	49.1		2.2	5.4	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.3	0.0	
Total Delay	54.9	34.0		3.6	0.8	49.1		2.5	5.4	
Queue Length 50th (ft)	8	6		68	0	12		132	190	
Queue Length 95th (ft)	21	25		111	18	m19		181	283	
Internal Link Dist (ft)	505			367			290		344	
Turn Bay Length (ft)										
Base Capacity (vph)	715	336		1592	1384	372		3410	3182	
Starvation Cap Reductn	0	0		0	0	0		813	0	
Spillback Cap Reductn	0	0		77	0	0		0	154	
Storage Cap Reductn	0	0		0	0	0		0	0	
Reduced v/c Ratio	0.03	0.04		0.24	0.16	0.09		0.72	0.60	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NENB and 6:SBR, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.
! Phase conflict between lane groups.

Splits and Phases: 6: Tomasello Way & Route 1A



Movement	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations										
Volume (vph)	19	13	0	334	200	30	0	1716	1673	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	0.97	1.00		1.00	1.00	0.97		*1.00	*1.00	
Frt	1.00	0.85		1.00	0.85	1.00		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	0.95		1.00	1.00	
Satd. Flow (prot)	3433	1583		1863	1583	3433		3725	3725	
Flt Permitted	0.95	1.00		1.00	1.00	0.95		1.00	1.00	
Satd. Flow (perm)	3433	1583		1863	1583	3433		3725	3725	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	14	0	363	217	33	0	1865	1818	0
RTOR Reduction (vph)	0	4	0	0	42	0	0	0	0	0
Lane Group Flow (vph)	21	10	0	363	175	33	0	1865	1818	0
Turn Type		pt+ov			Perm	Prot		custom		
Protected Phases	8	8 1		2!		1		6	2!	
Permitted Phases					2					
Actuated Green, G (s)	4.1	13.4		96.6	96.6	4.3		105.9	96.6	
Effective Green, g (s)	4.1	13.4		96.6	96.6	4.3		105.9	96.6	
Actuated g/C Ratio	0.03	0.11		0.80	0.80	0.04		0.88	0.80	
Clearance Time (s)	5.0			5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0			3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	117	177		1500	1274	123		3287	2999	
v/s Ratio Prot	c0.01	0.01		0.19		0.01		c0.50	c0.49	
v/s Ratio Perm					0.11					
v/c Ratio	0.18	0.05		0.24	0.14	0.27		0.57	0.61	
Uniform Delay, d1	56.3	47.6		2.8	2.6	56.3		1.7	4.5	
Progression Factor	1.00	1.00		1.00	1.00	0.89		0.99	0.94	
Incremental Delay, d2	0.7	0.1		0.4	0.2	0.9		0.5	0.9	
Delay (s)	57.1	47.8		3.2	2.8	50.8		2.2	5.1	
Level of Service	E	D		A	A	D		A	A	
Approach Delay (s)	53.3			3.1			3.0		5.1	
Approach LOS	D			A			A		A	

Intersection Summary

HCM Average Control Delay	4.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		

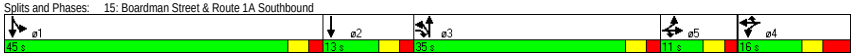
! Phase conflict between lane groups.
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	34	3	48	182	15	201	66	367	23	152	1591	11	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		0	200		200	100		200	250		0	
Storage Lanes	0		1	1		1	1		1	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		731			531			536			945		
Travel Time (s)		16.6			12.1			12.2			21.5		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99	
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%	
Shared Lane Traffic (%)				46%									
Lane Group Flow (vph)	0	39	51	105	105	214	72	399	25	154	1618	0	
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases									Free				
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			10.0
Minimum Split (s)	14.0	14.0		14.0	14.0	14.0	14.0	14.0		18.0			18.0
Total Split (s)	11.0	11.0	46.0	16.0	16.0	16.0	35.0	35.0	0.0	45.0	58.0	0.0	13.0
Total Split (%)	9.2%	9.2%	38.3%	13.3%	13.3%	13.3%	29.2%	29.2%	0.0%	37.5%	48.3%	0.0%	11%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag	Lag	Lag					Lead	Lead		Lead			Lag
Lead-Lag Optimize?	Yes	Yes					Yes	Yes					
Recall Mode	None	None		None	None	None	None	None		None			C-Min
v/c Ratio		0.34	0.13	0.65	0.64	0.63	0.27	0.71	0.02	0.26	0.64		
Control Delay		60.8	25.2	71.2	70.5	15.8	44.7	53.8	0.0	32.5	22.1		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay		60.8	25.2	71.2	70.5	15.8	44.7	53.8	0.0	32.5	22.1		
Queue Length 50th (ft)		29	23	82	82	0	49	154	0	101	364		
Queue Length 95th (ft)		66	50	#192	#191	78	89	197	0	173	446		
Internal Link Dist (ft)		651			451			456			865		
Turn Bay Length (ft)				200		200	100		200	250			
Base Capacity (vph)		116	410	162	164	340	389	836	1509	607	2521		
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio		0.34	0.12	0.65	0.64	0.63	0.19	0.48	0.02	0.25	0.64		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green, Master Intersection
Natural Cycle: 80
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 15: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	3	48	182	15	201	66	367	23	152	1591	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1736	1417	1698	1717	1538	1556	3343	1509	1752	5027	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1736	1417	1698	1717	1538	1556	3343	1509	1752	5027	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	36	3	51	194	16	214	72	399	25	154	1607	11
RTOR Reduction (vph)	0	0	8	0	0	193	0	0	0	0	1	0
Lane Group Flow (vph)	0	39	43	105	105	21	72	399	25	154	1617	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases									Free			
Actuated Green, G (s)		6.8	32.1	11.5	11.5	11.5	20.3	20.3	120.0	40.8	59.4	
Effective Green, g (s)		6.8	32.1	11.5	11.5	11.5	20.3	20.3	120.0	40.8	59.4	
Actuated g/C Ratio		0.06	0.27	0.10	0.10	0.10	0.17	0.17	1.00	0.34	0.49	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		98	379	163	165	147	263	566	1509	596	2488	
v/s Ratio Prot		c0.02	0.03	c0.06	0.06	0.01	0.05	c0.12		0.09	c0.32	
v/s Ratio Perm									0.02			
v/c Ratio		0.40	0.11	0.64	0.64	0.14	0.27	0.70	0.02	0.26	0.65	
Uniform Delay, d1		54.6	33.2	52.3	52.2	49.7	43.4	47.0	0.0	28.7	22.6	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.09	0.89	
Incremental Delay, d2		2.6	0.1	8.4	7.8	0.4	0.6	4.0	0.0	0.2	0.5	
Delay (s)		57.3	33.3	60.7	60.0	50.2	44.0	51.0	0.0	31.4	20.6	
Level of Service		E	C	E	E	D	D	D	A	C	C	
Approach Delay (s)		43.7			55.2			47.4			21.6	
Approach LOS		D			E			D			C	

Intersection Summary

HCM Average Control Delay	32.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	62.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	49	8	7	0	0	0	0	1752	2	0	1586	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		160			283			370			273	
Travel Time (s)		3.6			6.4			8.4			6.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	70	0	0	0	0	0	1906	0	0	1724	0
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Detector Phase	4	4						2			6	
Switch Phase												
Minimum Initial (s)	6.0	6.0						10.0			10.0	
Minimum Split (s)	20.0	20.0						20.0			20.0	
Total Split (s)	25.0	25.0	0.0	0.0	0.0	0.0	0.0	95.0	0.0	0.0	95.0	0.0
Total Split (%)	20.8%	20.8%	0.0%	0.0%	0.0%	0.0%	0.0%	79.2%	0.0%	0.0%	79.2%	0.0%
Yellow Time (s)	3.0	3.0						3.0			3.0	
All-Red Time (s)	2.0	2.0						2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None						C-Max			C-Max	
v/c Ratio		0.47						0.44			0.57	
Control Delay		58.2						6.1			4.0	
Queue Delay		0.0						0.2			0.0	
Total Delay		58.2						6.2			4.0	
Queue Length 50th (ft)		49						249			170	
Queue Length 95th (ft)		95						340			262	
Internal Link Dist (ft)		80			203			290			193	
Turn Bay Length (ft)												
Base Capacity (vph)		299						4381			3049	
Starvation Cap Reductn		0						1174			0	
Spillback Cap Reductn		0						0			18	
Storage Cap Reductn		0						0			0	
Reduced v/c Ratio		0.23						0.59			0.57	

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	

Splits and Phases: 2: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	49	8	7	0	0	0	0	1752	2	0	1586	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.95	
Frt		0.98						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1767						5084			3539	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1767						5084			3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	53	9	8	0	0	0	0	1904	2	0	1724	0
RTOR Reduction (vph)	0	5	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	65	0	0	0	0	0	1906	0	0	1724	0
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Actuated Green, G (s)		8.6						101.4			101.4	
Effective Green, g (s)		8.6						101.4			101.4	
Actuated g/C Ratio		0.07						0.85			0.85	
Clearance Time (s)		5.0						5.0			5.0	
Vehicle Extension (s)		3.0						3.0			3.0	
Lane Grp Cap (vph)		127						4296			2990	
v/s Ratio Prot								0.37			c0.49	
v/s Ratio Perm		0.04										
v/c Ratio		0.51						0.44			0.58	
Uniform Delay, d1		53.7						2.3			2.8	
Progression Factor		1.00						2.26			1.00	
Incremental Delay, d2		3.5						0.3			0.8	
Delay (s)		57.2						5.5			3.6	
Level of Service		E						A			A	
Approach Delay (s)		57.2			0.0			5.5			3.6	
Approach LOS		E			A			A			A	

Intersection Summary					
HCM Average Control Delay	5.6	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.57				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	57.2%	ICU Level of Service		B	
Analysis Period (min)	15				
c Critical Lane Group					

Lane Group	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations										
Volume (vph)	41	59	0	351	165	26	0	1567	1340	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red		Yes			Yes			No		
Link Speed (mph)	30			30			30		30	
Link Distance (ft)	585			447			370		424	
Travel Time (s)	13.3			10.2			8.4		9.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)										
Lane Group Flow (vph)	45	64	0	382	179	28	0	1703	1457	0
Turn Type		pt+ov			Perm	Prot		custom		
Protected Phases	8	8 1		2!		1		6	2!	
Permitted Phases					2					
Detector Phase	8	8 1		2	2	1		6	2	
Switch Phase										
Minimum Initial (s)	6.0			10.0	10.0	6.0		10.0	10.0	
Minimum Split (s)	20.0			15.0	15.0	11.0		15.0	15.0	
Total Split (s)	35.0	60.0	0.0	60.0	60.0	25.0	0.0	85.0	60.0	0.0
Total Split (%)	29.2%	50.0%	0.0%	50.0%	50.0%	20.8%	0.0%	70.8%	50.0%	0.0%
Yellow Time (s)	3.0			3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0			2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag				Lag	Lag	Lead			Lag	
Lead-Lag Optimize?				Yes	Yes	Yes			Yes	
Recall Mode	None			C-Max	C-Max	None		C-Max	C-Max	
v/c Ratio	0.17	0.25		0.26	0.14	0.15		0.53	0.50	
Control Delay	51.7	41.3		5.5	1.0	50.8		3.4	6.8	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.3	0.0	
Total Delay	51.7	41.3		5.5	1.0	50.8		3.7	6.8	
Queue Length 50th (ft)	17	40		83	0	10		146	172	
Queue Length 95th (ft)	35	78		142	20	m19		223	278	
Internal Link Dist (ft)	505			367			290		344	
Turn Bay Length (ft)										
Base Capacity (vph)	858	455		1465	1283	572		3220	2929	
Starvation Cap Reductn	0	0		0	0	0		756	0	
Spillback Cap Reductn	0	0		66	0	0		0	132	
Storage Cap Reductn	0	0		0	0	0		0	0	
Reduced v/c Ratio	0.05	0.14		0.27	0.14	0.05		0.69	0.52	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NENB and 6:SBR, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.
! Phase conflict between lane groups.

Splits and Phases: 6: Tomasello Way & Route 1A



Movement	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations										
Volume (vph)	41	59	0	351	165	26	0	1567	1340	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	0.97	1.00		1.00	1.00	0.97		*1.00	*1.00	
Frt	1.00	0.85		1.00	0.85	1.00		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	0.95		1.00	1.00	
Satd. Flow (prot)	3433	1583		1863	1583	3433		3725	3725	
Flt Permitted	0.95	1.00		1.00	1.00	0.95		1.00	1.00	
Satd. Flow (perm)	3433	1583		1863	1583	3433		3725	3725	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	45	64	0	382	179	28	0	1703	1457	0
RTOR Reduction (vph)	0	3	0	0	43	0	0	0	0	0
Lane Group Flow (vph)	45	61	0	382	136	28	0	1703	1457	0
Turn Type		pt+ov			Perm	Prot		custom		
Protected Phases	8	8 1		2!		1		6	2!	
Permitted Phases					2					
Actuated Green, G (s)	8.3	18.7		91.3	91.3	5.4		101.7	91.3	
Effective Green, g (s)	8.3	18.7		91.3	91.3	5.4		101.7	91.3	
Actuated g/C Ratio	0.07	0.16		0.76	0.76	0.05		0.85	0.76	
Clearance Time (s)	5.0			5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0			3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	237	247		1417	1204	154		3157	2834	
v/s Ratio Prot	0.01	c0.04		0.21		0.01		c0.46	0.39	
v/s Ratio Perm					0.09					
v/c Ratio	0.19	0.25		0.27	0.11	0.18		0.54	0.51	
Uniform Delay, d1	52.7	44.5		4.3	3.8	55.2		2.6	5.6	
Progression Factor	1.00	1.00		1.00	1.00	0.92		0.99	0.97	
Incremental Delay, d2	0.4	0.5		0.5	0.2	0.5		0.6	0.7	
Delay (s)	53.1	45.0		4.8	3.9	51.1		3.1	6.2	
Level of Service	D	D		A	A	D		A	A	
Approach Delay (s)	48.3			4.5			3.9		6.2	
Approach LOS	D			A			A		A	

Intersection Summary

HCM Average Control Delay	6.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	74.2%	ICU Level of Service	D
Analysis Period (min)	15		

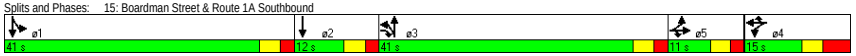
! Phase conflict between lane groups.
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	34	9	33	184	11	256	29	226	239	126	1474	25	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		0	200		200	100		200	250		0	
Storage Lanes	0		1	1		1	1		1	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		731			531			536			945		
Travel Time (s)		16.6			12.1			12.2			21.5		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99	
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%	
Shared Lane Traffic (%)				47%									
Lane Group Flow (vph)	0	46	35	104	104	272	32	246	260	127	1514	0	
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases									Free				
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			10.0
Minimum Split (s)	14.0	14.0		14.0	14.0	14.0	14.0	14.0		18.0			18.0
Total Split (s)	11.0	11.0	52.0	15.0	15.0	15.0	41.0	41.0	0.0	41.0	53.0	0.0	12.0
Total Split (%)	9.2%	9.2%	43.3%	12.5%	12.5%	12.5%	34.2%	34.2%	0.0%	34.2%	44.2%	0.0%	10%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag	Lag	Lag					Lead	Lead		Lead			Lag
Lead-Lag Optimize?	Yes	Yes					Yes	Yes					
Recall Mode	None	None		None	None	None	None	None		None			C-Min
v/c Ratio		0.29	0.10	0.58	0.57	0.67	0.17	0.61	0.17	0.22	0.58		
Control Delay		52.7	25.1	64.6	64.2	15.0	48.1	56.6	0.2	34.0	19.9		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay		52.7	25.1	64.6	64.2	15.0	48.1	56.6	0.2	34.0	19.9		
Queue Length 50th (ft)		35	17	80	80	0	23	96	0	72	288		
Queue Length 95th (ft)		64	35	#202	#202	#113	52	134	0	151	373		
Internal Link Dist (ft)		651			451			456			865		
Turn Bay Length (ft)				200		200	100		200	250			
Base Capacity (vph)		161	457	180	182	406	467	1003	1509	588	2576		
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio		0.29	0.08	0.58	0.57	0.67	0.07	0.25	0.17	0.22	0.59		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green, Master Intersection
Natural Cycle: 80
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 15: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	9	33	184	11	256	29	226	239	126	1474	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1760	1417	1698	1713	1538	1556	3343	1509	1752	5015	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1760	1417	1698	1713	1538	1556	3343	1509	1752	5015	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	36	10	35	196	12	272	32	246	260	127	1489	25
RTOR Reduction (vph)	0	0	6	0	0	243	0	0	0	0	1	0
Lane Group Flow (vph)	0	46	29	104	104	29	32	246	260	127	1513	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases									Free			
Actuated Green, G (s)		9.8	29.2	12.7	12.7	12.7	14.4	14.4	120.0	39.8	61.1	
Effective Green, g (s)		9.8	29.2	12.7	12.7	12.7	14.4	14.4	120.0	39.8	61.1	
Actuated g/C Ratio		0.08	0.24	0.11	0.11	0.11	0.12	0.12	1.00	0.33	0.51	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		144	345	180	181	163	187	401	1509	581	2553	
v/s Ratio Prot		c0.03	0.02	c0.06	0.06	0.02	0.02	c0.07		0.07	c0.30	
v/s Ratio Perm									0.17			
v/c Ratio		0.32	0.08	0.58	0.57	0.18	0.17	0.61	0.17	0.22	0.59	
Uniform Delay, d1		52.0	35.1	51.1	51.1	48.9	47.4	50.2	0.0	28.9	20.7	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.15	0.86	
Incremental Delay, d2		1.3	0.1	4.4	4.4	0.5	0.4	2.8	0.2	0.2	0.3	
Delay (s)		53.2	35.2	55.5	55.4	49.4	47.9	52.9	0.2	33.3	18.1	
Level of Service		D	D	E	E	D	D	D	A	C	B	
Approach Delay (s)		45.4			52.0			27.2			19.3	
Approach LOS		D			D			C			B	

Intersection Summary

HCM Average Control Delay	27.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	60.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	57	8	7	0	0	0	0	1396	3	0	2443	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		160			283			370			273	
Travel Time (s)		3.6			6.4			8.4			6.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	79	0	0	0	0	0	1520	0	0	2655	0
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Detector Phase	4	4						2			6	
Switch Phase												
Minimum Initial (s)	6.0	6.0						10.0			10.0	
Minimum Split (s)	20.0	20.0						20.0			20.0	
Total Split (s)	25.0	25.0	0.0	0.0	0.0	0.0	0.0	85.0	0.0	0.0	85.0	0.0
Total Split (%)	22.7%	22.7%	0.0%	0.0%	0.0%	0.0%	0.0%	77.3%	0.0%	0.0%	77.3%	0.0%
Yellow Time (s)	3.0	3.0						3.0			3.0	
All-Red Time (s)	2.0	2.0						2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None						C-Max			C-Max	
v/c Ratio		0.48						0.35			0.89	
Control Delay		53.4						0.4			12.6	
Queue Delay		0.0						0.0			0.0	
Total Delay		53.4						0.4			12.6	
Queue Length 50th (ft)		50						1			546	
Queue Length 95th (ft)		97						6			#1116	
Internal Link Dist (ft)		80			203			290			193	
Turn Bay Length (ft)												
Base Capacity (vph)		325						4310			3000	
Starvation Cap Reductn		0						570			0	
Spillback Cap Reductn		0						0			0	
Storage Cap Reductn		0						0			0	
Reduced v/c Ratio		0.24						0.41			0.89	

Intersection Summary	
Area Type:	Other
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 2: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	57	8	7	0	0	0	0	1396	3	0	2443	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.95	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1768						5084			3539	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1768						5084			3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	62	9	8	0	0	0	0	1517	3	0	2655	0
RTOR Reduction (vph)	0	5	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	74	0	0	0	0	0	1520	0	0	2655	0
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Actuated Green, G (s)		8.8						91.2			91.2	
Effective Green, g (s)		8.8						91.2			91.2	
Actuated g/C Ratio		0.08						0.83			0.83	
Clearance Time (s)		5.0						5.0			5.0	
Vehicle Extension (s)		3.0						3.0			3.0	
Lane Grp Cap (vph)		141						4215			2934	
v/s Ratio Prot								0.30			c0.75	
v/s Ratio Perm		0.04										
v/c Ratio		0.53						0.36			0.90	
Uniform Delay, d1		48.6						2.3			6.4	
Progression Factor		1.00						0.06			1.00	
Incremental Delay, d2		3.5						0.2			5.2	
Delay (s)		52.1						0.4			11.6	
Level of Service		D						A			B	
Approach Delay (s)		52.1			0.0			0.4			11.6	
Approach LOS		D			A			A			B	

Intersection Summary					
HCM Average Control Delay	8.4	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.87				
Actuated Cycle Length (s)	110.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	80.9%	ICU Level of Service		D	
Analysis Period (min)	15				
c Critical Lane Group					

Lane Group	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations										
Volume (vph)	141	38	0	232	251	58	0	2392	1137	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red		Yes			Yes			No		
Link Speed (mph)	30			30			30		30	
Link Distance (ft)	585			447			370		424	
Travel Time (s)	13.3			10.2			8.4		9.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)										
Lane Group Flow (vph)	153	41	0	252	273	63	0	2600	1236	0
Turn Type		pt+ov			Perm	Prot		custom		
Protected Phases	8	8 1		2!		1		6	2!	
Permitted Phases					2					
Detector Phase	8	8 1		2	2	1		6	2	
Switch Phase										
Minimum Initial (s)	6.0			10.0	10.0	6.0		10.0	10.0	
Minimum Split (s)	20.0			15.0	15.0	11.0		15.0	15.0	
Total Split (s)	20.0	35.0	0.0	75.0	75.0	15.0	0.0	90.0	75.0	0.0
Total Split (%)	18.2%	31.8%	0.0%	68.2%	68.2%	13.6%	0.0%	81.8%	68.2%	0.0%
Yellow Time (s)	3.0			3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0			2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag				Lag	Lag	Lead			Lag	
Lead-Lag Optimize?				Yes	Yes	Yes			Yes	
Recall Mode	None			C-Max	C-Max	None		C-Max	C-Max	
v/c Ratio	0.48	0.11		0.19	0.22	0.27		0.86	0.46	
Control Delay	52.0	10.8		6.2	1.2	50.9		5.4	6.3	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.6	0.0	
Total Delay	52.0	10.8		6.2	1.2	50.9		6.1	6.3	
Queue Length 50th (ft)	53	0		54	0	24		166	115	
Queue Length 95th (ft)	84	28		97	26	m27		226	186	
Internal Link Dist (ft)	505			367			290		344	
Turn Bay Length (ft)										
Base Capacity (vph)	468	381		1346	1219	312		3040	2691	
Starvation Cap Reductn	0	0		0	0	0		159	0	
Spillback Cap Reductn	0	0		0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0		0	0	
Reduced v/c Ratio	0.33	0.11		0.19	0.22	0.20		0.90	0.46	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:NENB and 6:SBR, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.
! Phase conflict between lane groups.

Splits and Phases: 6: Tomasello Way & Route 1A



Movement	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations										
Volume (vph)	141	38	0	232	251	58	0	2392	1137	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	0.97	1.00		1.00	1.00	0.97		*1.00	*1.00	
Frt	1.00	0.85		1.00	0.85	1.00		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	0.95		1.00	1.00	
Satd. Flow (prot)	3433	1583		1863	1583	3433		3725	3725	
Flt Permitted	0.95	1.00		1.00	1.00	0.95		1.00	1.00	
Satd. Flow (perm)	3433	1583		1863	1583	3433		3725	3725	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	153	41	0	252	273	63	0	2600	1236	0
RTOR Reduction (vph)	0	33	0	0	78	0	0	0	0	0
Lane Group Flow (vph)	153	8	0	252	195	63	0	2600	1236	0
Turn Type		pt+ov			Perm	Prot		custom		
Protected Phases	8	8 1		2!		1		6	2!	
Permitted Phases					2					
Actuated Green, G (s)	10.2	21.5		78.5	78.5	6.3		89.8	78.5	
Effective Green, g (s)	10.2	21.5		78.5	78.5	6.3		89.8	78.5	
Actuated g/C Ratio	0.09	0.20		0.71	0.71	0.06		0.82	0.71	
Clearance Time (s)	5.0			5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0			3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	318	309		1330	1130	197		3041	2658	
v/s Ratio Prot	c0.04	0.01		0.14		0.02		c0.70	0.33	
v/s Ratio Perm					0.12					
v/c Ratio	0.48	0.03		0.19	0.17	0.32		0.85	0.47	
Uniform Delay, d1	47.4	35.8		5.2	5.1	49.8		6.1	6.8	
Progression Factor	1.00	1.00		1.00	1.00	1.03		0.54	0.80	
Incremental Delay, d2	1.1	0.0		0.3	0.3	0.4		1.5	0.6	
Delay (s)	48.5	35.8		5.5	5.5	51.6		4.8	6.0	
Level of Service	D	D		A	A	D		A	A	
Approach Delay (s)	45.8			5.5			5.9		6.0	
Approach LOS	D			A			A		A	

Intersection Summary

HCM Average Control Delay	7.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	87.8%	ICU Level of Service	E
Analysis Period (min)	15		

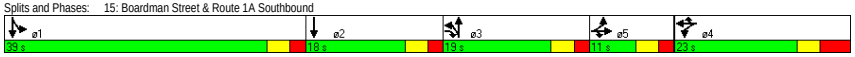
! Phase conflict between lane groups.
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	41	11	95	404	34	149	141	293	63	130	2427	15	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		0	200		200	100		200	250		0	
Storage Lanes	0		1	1		1	1		1	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		731			531			536			945		
Travel Time (s)		16.6			12.1			12.2			21.5		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99	
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%	
Shared Lane Traffic (%)				46%									
Lane Group Flow (vph)	0	56	101	232	234	159	153	318	68	131	2467	0	
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases									Free				
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			10.0
Minimum Split (s)	14.0	14.0		14.0	14.0	14.0	14.0	14.0		18.0			18.0
Total Split (s)	11.0	11.0	30.0	23.0	23.0	23.0	19.0	19.0	0.0	39.0	57.0	0.0	18.0
Total Split (%)	10.0%	10.0%	27.3%	20.9%	20.9%	20.9%	17.3%	17.3%	0.0%	35.5%	51.8%	0.0%	16%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag	Lag	Lag					Lead	Lead		Lead			Lag
Lead-Lag Optimize?	Yes	Yes					Yes	Yes					
Recall Mode	None	None		None	None	None	None	None		None			C-Min
v/c Ratio		0.58	0.32	0.93	0.93	0.44	0.80	0.77	0.05	0.24	1.03		
Control Delay		75.1	36.9	89.2	88.2	10.8	76.3	60.3	0.1	25.7	58.2		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay		75.1	36.9	89.2	88.2	10.8	76.3	60.3	0.1	25.7	58.2		
Queue Length 50th (ft)		39	56	172	174	0	106	115	0	68	~701		
Queue Length 95th (ft)		#96	107	#332	#333	59	#211	#173	0	m82	#812		
Internal Link Dist (ft)		651			451			456			865		
Turn Bay Length (ft)				200		200	100		200	250			
Base Capacity (vph)		96	313	249	252	362	198	425	1509	547	2393		
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio		0.58	0.32	0.93	0.93	0.44	0.77	0.75	0.05	0.24	1.03		

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 15: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	11	95	404	34	149	141	293	63	130	2427	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1759	1417	1698	1717	1538	1556	3343	1509	1752	5028	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1759	1417	1698	1717	1538	1556	3343	1509	1752	5028	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	44	12	101	430	36	159	153	318	68	131	2452	15
RTOR Reduction (vph)	0	0	4	0	0	136	0	0	0	0	1	0
Lane Group Flow (vph)	0	56	97	232	234	23	153	318	68	131	2466	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases									Free			
Actuated Green, G (s)		6.0	24.5	16.1	16.1	16.1	13.5	13.5	110.0	34.3	52.4	
Effective Green, g (s)		6.0	24.5	16.1	16.1	16.1	13.5	13.5	110.0	34.3	52.4	
Actuated g/C Ratio		0.05	0.22	0.15	0.15	0.15	0.12	0.12	1.00	0.31	0.48	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		96	316	249	251	225	191	410	1509	546	2395	
v/s Ratio Prot		c0.03	0.07	c0.14	0.14	0.02	c0.10	0.10		0.07	c0.49	
v/s Ratio Perm									0.05			
v/c Ratio		0.58	0.31	0.93	0.93	0.10	0.80	0.78	0.05	0.24	1.03	
Uniform Delay, d1		50.8	35.7	46.4	46.4	40.7	46.9	46.8	0.0	28.2	28.8	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.87	1.26	
Incremental Delay, d2		8.7	0.6	38.7	38.6	0.2	20.9	8.9	0.1	0.1	21.9	
Delay (s)		59.5	36.2	85.2	85.1	40.9	67.9	55.7	0.1	24.7	58.2	
Level of Service		E	D	F	F	D	E	E	A	C	E	
Approach Delay (s)		44.5			73.9			52.1			56.5	
Approach LOS		D			E			D			E	

Intersection Summary

HCM Average Control Delay	58.2	HCM Level of Service	E
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	88.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	105	7	8	0	0	0	0	2442	0	0	2213	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		160			283			370			273	
Travel Time (s)		3.6			6.4			8.4			6.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	131	0	0	0	0	0	2654	0	0	2405	0
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Detector Phase	4	4						2			6	
Switch Phase												
Minimum Initial (s)	6.0	6.0						10.0			10.0	
Minimum Split (s)	20.0	20.0						20.0			20.0	
Total Split (s)	20.0	20.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	100.0	0.0
Total Split (%)	16.7%	16.7%	0.0%	0.0%	0.0%	0.0%	0.0%	83.3%	0.0%	0.0%	83.3%	0.0%
Yellow Time (s)	3.0	3.0						3.0			3.0	
All-Red Time (s)	2.0	2.0						2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None						C-Max			C-Max	
v/c Ratio		0.68						0.64			0.84	
Control Delay		68.0						1.2			10.9	
Queue Delay		0.0						0.3			0.2	
Total Delay		68.0						1.5			11.1	
Queue Length 50th (ft)		96						14			492	
Queue Length 95th (ft)		162						m12			646	
Internal Link Dist (ft)		80			203			290			193	
Turn Bay Length (ft)												
Base Capacity (vph)		224						4116			2865	
Starvation Cap Reductn		0						743			0	
Spillback Cap Reductn		0						0			64	
Storage Cap Reductn		0						0			0	
Reduced v/c Ratio		0.58						0.79			0.86	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 33 (28%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	105	7	8	0	0	0	0	2442	0	0	2213	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.95	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1769						5085			3539	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1769						5085			3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	114	8	9	0	0	0	0	2654	0	0	2405	0
RTOR Reduction (vph)	0	3	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	128	0	0	0	0	0	2654	0	0	2405	0
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Actuated Green, G (s)		12.9						97.1			97.1	
Effective Green, g (s)		12.9						97.1			97.1	
Actuated g/C Ratio		0.11						0.81			0.81	
Clearance Time (s)		5.0						5.0			5.0	
Vehicle Extension (s)		3.0						3.0			3.0	
Lane Grp Cap (vph)		190						4115			2864	
v/s Ratio Prot								0.52			c0.68	
v/s Ratio Perm		0.07										
v/c Ratio		0.68						0.64			0.84	
Uniform Delay, d1		51.5						4.6			6.8	
Progression Factor		1.00						0.15			1.00	
Incremental Delay, d2		9.1						0.4			3.2	
Delay (s)		60.7						1.1			10.0	
Level of Service		E						A			A	
Approach Delay (s)		60.7			0.0			1.1			10.0	
Approach LOS		E			A			A			A	

Intersection Summary

HCM Average Control Delay	6.7	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.82				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	76.2%	ICU Level of Service		D	
Analysis Period (min)	15				

c Critical Lane Group

Lane Group	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations										
Volume (vph)	530	151	0	392	867	200	0	2028	1888	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red		Yes			Yes			No		
Link Speed (mph)	30			30			30		30	
Link Distance (ft)	585			447			370		424	
Travel Time (s)	13.3			10.2			8.4		9.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)										
Lane Group Flow (vph)	576	164	0	426	942	217	0	2204	2052	0
Turn Type		pt+ov			Perm	Prot		custom		
Protected Phases	8	8 1		2!		1		6	2!	
Permitted Phases					2					
Detector Phase	8	8 1		2	2	1		6	2	
Switch Phase										
Minimum Initial (s)	6.0			10.0	10.0	6.0		10.0	10.0	
Minimum Split (s)	20.0			15.0	15.0	11.0		15.0	15.0	
Total Split (s)	30.0	48.0	0.0	72.0	72.0	18.0	0.0	90.0	72.0	0.0
Total Split (%)	25.0%	40.0%	0.0%	60.0%	60.0%	15.0%	0.0%	75.0%	60.0%	0.0%
Yellow Time (s)	3.0			3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0			2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag				Lag	Lag	Lead			Lag	
Lead-Lag Optimize?				Yes	Yes	Yes			Yes	
Recall Mode	None			C-Max	C-Max	None		C-Max	C-Max	
v/c Ratio	0.85	0.31		0.39	0.77	0.64		0.82	0.95	
Control Delay	59.7	30.1		15.7	8.6	58.2		10.7	22.7	
Queue Delay	0.0	0.0		0.0	0.0	0.0		3.1	0.5	
Total Delay	59.7	30.1		15.7	8.6	58.2		13.8	23.2	
Queue Length 50th (ft)	220	89		180	84	92		279	822	
Queue Length 95th (ft)	286	146		255	275	m111		366	m727	
Internal Link Dist (ft)	505			367			290		344	
Turn Bay Length (ft)										
Base Capacity (vph)	715	542		1079	1230	372		2684	2158	
Starvation Cap Reductn	0	0		0	0	0		372	0	
Spillback Cap Reductn	0	0		7	0	0		0	14	
Storage Cap Reductn	0	0		0	0	0		0	0	
Reduced v/c Ratio	0.81	0.30		0.40	0.77	0.58		0.95	0.96	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 33 (28%), Referenced to phase 2:NENB and 6:SBR, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.
! Phase conflict between lane groups.

Splits and Phases: 6: Tomasello Way & Route 1A



Movement	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations										
Volume (vph)	530	151	0	392	867	200	0	2028	1888	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	0.97	1.00		1.00	1.00	0.97		*1.00	*1.00	
Frt	1.00	0.85		1.00	0.85	1.00		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	0.95		1.00	1.00	
Satd. Flow (prot)	3433	1583		1863	1583	3433		3725	3725	
Flt Permitted	0.95	1.00		1.00	1.00	0.95		1.00	1.00	
Satd. Flow (perm)	3433	1583		1863	1583	3433		3725	3725	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	576	164	0	426	942	217	0	2204	2052	0
RTOR Reduction (vph)	0	1	0	0	313	0	0	0	0	0
Lane Group Flow (vph)	576	163	0	426	629	217	0	2204	2052	0
Turn Type		pt+ov			Perm	Prot		custom		
Protected Phases	8	8 1		2!		1		6	2!	
Permitted Phases					2					
Actuated Green, G (s)	23.6	40.5		69.5	69.5	11.9		86.4	69.5	
Effective Green, g (s)	23.6	40.5		69.5	69.5	11.9		86.4	69.5	
Actuated g/C Ratio	0.20	0.34		0.58	0.58	0.10		0.72	0.58	
Clearance Time (s)	5.0			5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0			3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	675	534		1079	917	340		2682	2157	
v/s Ratio Prot	c0.17	0.10		0.23		0.06		c0.59	c0.55	
v/s Ratio Perm					0.40					
v/c Ratio	0.85	0.30		0.39	0.69	0.64		0.82	0.95	
Uniform Delay, d1	46.5	29.4		13.8	17.6	52.0		11.5	23.7	
Progression Factor	1.00	1.00		1.00	1.00	1.03		0.75	0.55	
Incremental Delay, d2	10.2	0.3		1.1	4.2	2.1		1.6	8.2	
Delay (s)	56.7	29.7		14.9	21.8	55.6		10.2	21.1	
Level of Service	E	C		B	C	E		B	C	
Approach Delay (s)	50.7			19.6			14.2		21.1	
Approach LOS	D			B			B		C	

Intersection Summary

HCM Average Control Delay	21.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	111.2%	ICU Level of Service	H
Analysis Period (min)	15		

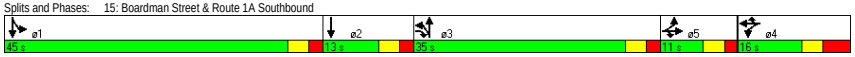
! Phase conflict between lane groups.
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	36	3	51	240	16	249	70	942	79	194	2375	12	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		0	200		200	100		200	250		0	
Storage Lanes	0		1	1		1	1		1	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		731			531			536			945		
Travel Time (s)		16.6			12.1			12.2			21.5		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99	
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%	
Shared Lane Traffic (%)				47%									
Lane Group Flow (vph)	0	41	54	135	137	265	76	1024	86	196	2411	0	
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases									Free				
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			10.0
Minimum Split (s)	14.0	14.0		14.0	14.0	14.0	14.0	14.0		18.0			18.0
Total Split (s)	11.0	11.0	46.0	16.0	16.0	16.0	35.0	35.0	0.0	45.0	58.0	0.0	13.0
Total Split (%)	9.2%	9.2%	38.3%	13.3%	13.3%	13.3%	29.2%	29.2%	0.0%	37.5%	48.3%	0.0%	11%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag	Lag	Lag					Lead	Lead		Lead			Lag
Lead-Lag Optimize?	Yes	Yes					Yes	Yes					
Recall Mode	None	None		None	None	None	None	None		None			C-Min
v/c Ratio		0.47	0.11	0.90	0.90	0.70	0.20	1.22	0.06	0.33	1.07		
Control Delay		73.4	26.9	106.0	105.5	17.2	37.2	150.8	0.1	28.1	69.5		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay		73.4	26.9	106.0	105.5	17.2	37.2	150.8	0.1	28.1	69.5		
Queue Length 50th (ft)		32	27	~121	~123	0	47	~514	0	104	~773		
Queue Length 95th (ft)		#74	58	#258	#261	#104	90	#647	0	m134	#507		
Internal Link Dist (ft)		651			451			456			865		
Turn Bay Length (ft)				200		200	100		200	250			
Base Capacity (vph)		87	485	150	152	377	389	836	1509	592	2245		
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio		0.47	0.11	0.90	0.90	0.70	0.20	1.22	0.06	0.33	1.07		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green, Master Intersection
Natural Cycle: 150
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 15: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	3	51	240	16	249	70	942	79	194	2375	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1735	1417	1698	1714	1538	1556	3343	1509	1752	5029	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1735	1417	1698	1714	1538	1556	3343	1509	1752	5029	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	38	3	54	255	17	265	76	1024	86	196	2399	12
RTOR Reduction (vph)	0	0	1	0	0	242	0	0	0	0	1	0
Lane Group Flow (vph)	0	41	53	135	137	23	76	1024	86	196	2410	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases									Free			
Actuated Green, G (s)		4.8	39.8	10.6	10.6	10.6	30.0	30.0	120.0	40.6	52.6	
Effective Green, g (s)		4.8	39.8	10.6	10.6	10.6	30.0	30.0	120.0	40.6	52.6	
Actuated g/C Ratio		0.04	0.33	0.09	0.09	0.09	0.25	0.25	1.00	0.34	0.44	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		69	470	150	151	136	389	836	1509	593	2204	
v/s Ratio Prot		c0.02	0.04	0.08	c0.08	0.02	0.05	c0.31		0.11	c0.48	
v/s Ratio Perm									0.06			
v/c Ratio		0.59	0.11	0.90	0.91	0.17	0.20	1.22	0.06	0.33	1.09	
Uniform Delay, d1		56.6	27.8	54.2	54.2	50.6	35.5	45.0	0.0	29.6	33.7	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.90	0.93	
Incremental Delay, d2		13.0	0.1	45.2	46.4	0.6	0.2	111.8	0.1	0.2	46.8	
Delay (s)		69.6	27.9	99.4	100.6	51.2	35.7	156.8	0.1	26.8	78.1	
Level of Service		E	C	F	F	D	D	F	A	C	E	
Approach Delay (s)		45.9			75.9			137.7			74.2	
Approach LOS		D			E			F			E	

Intersection Summary

HCM Average Control Delay	90.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	79.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	52	8	7	0	0	0	0	2137	2	0	2050	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		160			283			370			273	
Travel Time (s)		3.6			6.4			8.4			6.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	74	0	0	0	0	0	2325	0	0	2228	0
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Detector Phase	4	4						2			6	
Switch Phase												
Minimum Initial (s)	6.0	6.0						10.0			10.0	
Minimum Split (s)	20.0	20.0						20.0			20.0	
Total Split (s)	25.0	25.0	0.0	0.0	0.0	0.0	0.0	95.0	0.0	0.0	95.0	0.0
Total Split (%)	20.8%	20.8%	0.0%	0.0%	0.0%	0.0%	0.0%	79.2%	0.0%	0.0%	79.2%	0.0%
Yellow Time (s)	3.0	3.0						3.0			3.0	
All-Red Time (s)	2.0	2.0						2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None						C-Max			C-Max	
v/c Ratio		0.49						0.53			0.73	
Control Delay		59.5						1.1			6.4	
Queue Delay		0.0						0.2			0.1	
Total Delay		59.5						1.2			6.5	
Queue Length 50th (ft)		53						16			310	
Queue Length 95th (ft)		100						10			487	
Internal Link Dist (ft)		80			203			290			193	
Turn Bay Length (ft)												
Base Capacity (vph)		298						4370			3041	
Starvation Cap Reductn		0						944			0	
Spillback Cap Reductn		0						0			104	
Storage Cap Reductn		0						0			0	
Reduced v/c Ratio		0.25						0.68			0.76	

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	

Splits and Phases: 2: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	52	8	7	0	0	0	0	2137	2	0	2050	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.95	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1767						5085			3539	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1767						5085			3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	57	9	8	0	0	0	0	2323	2	0	2228	0
RTOR Reduction (vph)	0	4	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	70	0	0	0	0	0	2325	0	0	2228	0
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Actuated Green, G (s)		8.9						101.1			101.1	
Effective Green, g (s)		8.9						101.1			101.1	
Actuated g/C Ratio		0.07						0.84			0.84	
Clearance Time (s)		5.0						5.0			5.0	
Vehicle Extension (s)		3.0						3.0			3.0	
Lane Grp Cap (vph)		131						4284			2982	
v/s Ratio Prot								0.46			c0.63	
v/s Ratio Perm		0.04										
v/c Ratio		0.54						0.54			0.75	
Uniform Delay, d1		53.6						2.7			4.0	
Progression Factor		1.00						0.23			1.00	
Incremental Delay, d2		4.2						0.4			1.8	
Delay (s)		57.7						1.0			5.8	
Level of Service		E						A			A	
Approach Delay (s)		57.7			0.0			1.0			5.8	
Approach LOS		E			A			A			A	

Intersection Summary					
HCM Average Control Delay	4.2	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.73				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	70.0%	ICU Level of Service		C	
Analysis Period (min)	15				
c Critical Lane Group					

Lane Group	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations										
Volume (vph)	526	193	0	419	873	208	0	1850	1521	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red		Yes			Yes			No		
Link Speed (mph)	30			30			30		30	
Link Distance (ft)	585			447			370		424	
Travel Time (s)	13.3			10.2			8.4		9.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)										
Lane Group Flow (vph)	572	210	0	455	949	226	0	2011	1653	0
Turn Type		pt+ov			Perm	Prot		custom		
Protected Phases	8	8 1		2!		1		6	2!	
Permitted Phases					2					
Detector Phase	8	8 1		2	2	1		6	2	
Switch Phase										
Minimum Initial (s)	6.0			10.0	10.0	6.0		10.0	10.0	
Minimum Split (s)	20.0			15.0	15.0	11.0		15.0	15.0	
Total Split (s)	35.0	60.0	0.0	60.0	60.0	25.0	0.0	85.0	60.0	0.0
Total Split (%)	29.2%	50.0%	0.0%	50.0%	50.0%	20.8%	0.0%	70.8%	50.0%	0.0%
Yellow Time (s)	3.0			3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0			2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag				Lag	Lag	Lead			Lag	
Lead-Lag Optimize?				Yes	Yes	Yes			Yes	
Recall Mode	None			C-Max	C-Max	None		C-Max	C-Max	
v/c Ratio	0.79	0.37		0.44	0.79	0.60		0.76	0.80	
Control Delay	53.1	28.6		18.8	10.8	57.0		11.4	38.1	
Queue Delay	0.0	0.0		0.0	0.0	0.0		1.8	0.0	
Total Delay	53.1	28.6		18.8	10.8	57.0		13.2	38.1	
Queue Length 50th (ft)	215	116		202	110	92		303	489	
Queue Length 95th (ft)	268	164		328	383	m131		358	m532	
Internal Link Dist (ft)	505			367			290		344	
Turn Bay Length (ft)										
Base Capacity (vph)	858	654		1033	1202	572		2630	2065	
Starvation Cap Reductn	0	0		0	0	0		434	0	
Spillback Cap Reductn	0	0		0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0		0	0	
Reduced v/c Ratio	0.67	0.32		0.44	0.79	0.40		0.92	0.80	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NENB and 6:SBR, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.
! Phase conflict between lane groups.

Splits and Phases: 6: Tomasello Way & Route 1A



Movement	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations										
Volume (vph)	526	193	0	419	873	208	0	1850	1521	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	0.97	1.00		1.00	1.00	0.97		*1.00	*1.00	
Frt	1.00	0.85		1.00	0.85	1.00		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	0.95		1.00	1.00	
Satd. Flow (prot)	3433	1583		1863	1583	3433		3725	3725	
Flt Permitted	0.95	1.00		1.00	1.00	0.95		1.00	1.00	
Satd. Flow (perm)	3433	1583		1863	1583	3433		3725	3725	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	572	210	0	455	949	226	0	2011	1653	0
RTOR Reduction (vph)	0	1	0	0	325	0	0	0	0	0
Lane Group Flow (vph)	572	209	0	455	624	226	0	2011	1653	0
Turn Type		pt+ov			Perm	Prot		custom		
Protected Phases	8	8 1		2!		1		6	2!	
Permitted Phases					2					
Actuated Green, G (s)	25.3	43.5		66.5	66.5	13.2		84.7	66.5	
Effective Green, g (s)	25.3	43.5		66.5	66.5	13.2		84.7	66.5	
Actuated g/C Ratio	0.21	0.36		0.55	0.55	0.11		0.71	0.55	
Clearance Time (s)	5.0			5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0			3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	724	574		1032	877	378		2629	2064	
v/s Ratio Prot	c0.17	0.13		0.24		0.07		c0.54	c0.44	
v/s Ratio Perm					0.39					
v/c Ratio	0.79	0.36		0.44	0.71	0.60		0.76	0.80	
Uniform Delay, d1	44.8	28.1		15.8	19.7	50.9		11.3	21.4	
Progression Factor	1.00	1.00		1.00	1.00	1.04		0.81	1.59	
Incremental Delay, d2	5.9	0.4		1.4	4.9	1.7		1.5	2.0	
Delay (s)	50.7	28.5		17.1	24.6	54.5		10.6	36.0	
Level of Service	D	C		B	C	D		B	D	
Approach Delay (s)	44.7			22.2			15.0		36.0	
Approach LOS	D			C			B		D	

Intersection Summary

HCM Average Control Delay	26.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	102.2%	ICU Level of Service	G
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

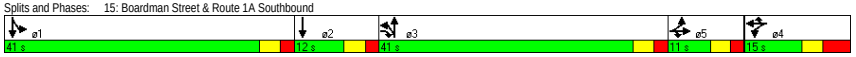
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	36	10	35	242	12	316	31	940	323	173	2197	27	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		0	200		200	100		200	250		0	
Storage Lanes	0		1	1		1	1		1	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		731			531			536			945		
Travel Time (s)		16.6			12.1			12.2			21.5		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99	
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%	
Shared Lane Traffic (%)				48%									
Lane Group Flow (vph)	0	49	37	134	136	336	34	1022	351	175	2246	0	
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases									Free				
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			10.0
Minimum Split (s)	14.0	14.0		14.0	14.0	14.0	14.0	14.0		18.0			18.0
Total Split (s)	11.0	11.0	52.0	15.0	15.0	15.0	41.0	41.0	0.0	41.0	53.0	0.0	12.0
Total Split (%)	9.2%	9.2%	43.3%	12.5%	12.5%	12.5%	34.2%	34.2%	0.0%	34.2%	44.2%	0.0%	10%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag	Lag	Lag					Lead	Lead		Lead			Lag
Lead-Lag Optimize?	Yes	Yes					Yes	Yes					
Recall Mode	None	None		None	None	None	None	None		None			C-Min
v/c Ratio		0.56	0.07	0.93	0.94	0.77	0.07	1.02	0.23	0.33	1.12		
Control Delay		79.5	22.9	114.1	115.1	18.3	30.7	75.0	0.4	35.5	96.6		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay		79.5	22.9	114.1	115.1	18.3	30.7	75.0	0.4	35.5	96.6		
Queue Length 50th (ft)		38	17	~131	~133	0	19	~441	0	110	~724		
Queue Length 95th (ft)		#92	40	#267	#271	#131	45	#574	0	m156	#848		
Internal Link Dist (ft)		651			451			456			865		
Turn Bay Length (ft)				200		200	100		200	250			
Base Capacity (vph)		88	556	144	145	438	467	1003	1509	526	2009		
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio		0.56	0.07	0.93	0.94	0.77	0.07	1.02	0.23	0.33	1.12		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green, Master Intersection
Natural Cycle: 150
Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 15: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	10	35	242	12	316	31	940	323	173	2197	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1761	1417	1698	1711	1538	1556	3343	1509	1752	5020	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1761	1417	1698	1711	1538	1556	3343	1509	1752	5020	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	38	11	37	257	13	336	34	1022	351	175	2219	27
RTOR Reduction (vph)	0	0	1	0	0	307	0	0	0	0	1	0
Lane Group Flow (vph)	0	49	36	134	136	29	34	1022	351	175	2245	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases									Free			
Actuated Green, G (s)		4.8	45.8	10.2	10.2	10.2	36.0	36.0	120.0	36.0	47.0	
Effective Green, g (s)		4.8	45.8	10.2	10.2	10.2	36.0	36.0	120.0	36.0	47.0	
Actuated g/C Ratio		0.04	0.38	0.08	0.08	0.08	0.30	0.30	1.00	0.30	0.39	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		70	541	144	145	131	467	1003	1509	526	1966	
v/s Ratio Prot		c0.03	0.03	0.08	c0.08	0.02	0.02	c0.31		0.10	c0.45	
v/s Ratio Perm									0.23			
v/c Ratio		0.70	0.07	0.93	0.94	0.22	0.07	1.02	0.23	0.33	1.14	
Uniform Delay, d1		56.9	23.5	54.5	54.6	51.2	30.1	42.0	0.0	32.7	36.5	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.04	1.14	
Incremental Delay, d2		26.3	0.1	54.3	55.7	0.8	0.1	33.3	0.4	0.2	68.3	
Delay (s)		83.2	23.6	108.9	110.2	52.0	30.1	75.3	0.4	34.1	110.0	
Level of Service		F	C	F	F	D	C	E	A	C	F	
Approach Delay (s)		57.6			77.7			55.5			104.5	
Approach LOS		E			E			E			F	

Intersection Summary

HCM Average Control Delay	84.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	75.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	9	8	0	0	0	0	1472	3	0	2564	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		160			283			370			273	
Travel Time (s)		3.6			6.4			8.4			6.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	84	0	0	0	0	0	1603	0	0	2787	0
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Detector Phase	4	4						2			6	
Switch Phase												
Minimum Initial (s)	6.0	6.0						10.0			10.0	
Minimum Split (s)	20.0	20.0						20.0			20.0	
Total Split (s)	25.0	25.0	0.0	0.0	0.0	0.0	0.0	85.0	0.0	0.0	85.0	0.0
Total Split (%)	22.7%	22.7%	0.0%	0.0%	0.0%	0.0%	0.0%	77.3%	0.0%	0.0%	77.3%	0.0%
Yellow Time (s)	3.0	3.0						3.0			3.0	
All-Red Time (s)	2.0	2.0						2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None						C-Max			C-Max	
v/c Ratio		0.49						0.37			0.93	
Control Delay		53.6						0.4			16.6	
Queue Delay		0.0						0.0			0.3	
Total Delay		53.6						0.4			17.0	
Queue Length 50th (ft)		54						2			687	
Queue Length 95th (ft)		101						7			#1224	
Internal Link Dist (ft)		80			203			290			193	
Turn Bay Length (ft)												
Base Capacity (vph)		326						4296			2990	
Starvation Cap Reductn		0						465			0	
Spillback Cap Reductn		0						0			28	
Storage Cap Reductn		0						0			0	
Reduced v/c Ratio		0.26						0.42			0.94	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	9	8	0	0	0	0	1472	3	0	2564	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.95	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1767						5084			3539	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1767						5084			3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	10	9	0	0	0	0	1600	3	0	2787	0
RTOR Reduction (vph)	0	5	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	79	0	0	0	0	0	1603	0	0	2787	0
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Actuated Green, G (s)		9.1						90.9			90.9	
Effective Green, g (s)		9.1						90.9			90.9	
Actuated g/C Ratio		0.08						0.83			0.83	
Clearance Time (s)		5.0						5.0			5.0	
Vehicle Extension (s)		3.0						3.0			3.0	
Lane Grp Cap (vph)		146						4201			2925	
v/s Ratio Prot								0.32			c0.79	
v/s Ratio Perm		0.04										
v/c Ratio		0.54						0.38			0.95	
Uniform Delay, d1		48.5						2.4			7.8	
Progression Factor		1.00						0.07			1.00	
Incremental Delay, d2		4.1						0.2			8.8	
Delay (s)		52.6						0.4			16.6	
Level of Service		D						A			B	
Approach Delay (s)		52.6			0.0			0.4			16.6	
Approach LOS		D			A			A			B	

Intersection Summary

HCM Average Control Delay	11.5	HCM Level of Service	B		
HCM Volume to Capacity ratio	0.92				
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	10.0		
Intersection Capacity Utilization	84.2%	ICU Level of Service	E		
Analysis Period (min)	15				
c Critical Lane Group					

Lane Group	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations										
Volume (vph)	142	39	0	244	255	59	0	2513	1189	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red		Yes			Yes			No		
Link Speed (mph)	30			30			30		30	
Link Distance (ft)	585			447			370		424	
Travel Time (s)	13.3			10.2			8.4		9.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)										
Lane Group Flow (vph)	154	42	0	265	277	64	0	2732	1292	0
Turn Type		pt+ov			Perm	Prot		custom		
Protected Phases	8	8 1		2!		1		6	2!	
Permitted Phases					2					
Detector Phase	8	8 1		2	2	1		6	2	
Switch Phase										
Minimum Initial (s)	6.0			10.0	10.0	6.0		10.0	10.0	
Minimum Split (s)	20.0			15.0	15.0	11.0		15.0	15.0	
Total Split (s)	20.0	35.0	0.0	75.0	75.0	15.0	0.0	90.0	75.0	0.0
Total Split (%)	18.2%	31.8%	0.0%	68.2%	68.2%	13.6%	0.0%	81.8%	68.2%	0.0%
Yellow Time (s)	3.0			3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0			2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag				Lag	Lag	Lead			Lag	
Lead-Lag Optimize?				Yes	Yes	Yes			Yes	
Recall Mode	None			C-Max	C-Max	None		C-Max	C-Max	
v/c Ratio	0.48	0.12		0.20	0.23	0.27		0.90	0.48	
Control Delay	52.0	11.7		6.3	1.3	50.2		6.6	6.6	
Queue Delay	0.0	0.0		0.0	0.0	0.0		1.5	0.0	
Total Delay	52.0	11.7		6.3	1.3	50.2		8.1	6.6	
Queue Length 50th (ft)	54	1		57	0	24		185	126	
Queue Length 95th (ft)	85	29		103	27	m26		239	201	
Internal Link Dist (ft)	505			367			290		344	
Turn Bay Length (ft)										
Base Capacity (vph)	468	381		1345	1220	312		3039	2690	
Starvation Cap Reductn	0	0		0	0	0		156	0	
Spillback Cap Reductn	0	0		0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0		0	0	
Reduced v/c Ratio	0.33	0.11		0.20	0.23	0.21		0.95	0.48	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:NENB and 6:SBR, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.
! Phase conflict between lane groups.

Splits and Phases: 6: Tomasello Way & Route 1A



Movement	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations										
Volume (vph)	142	39	0	244	255	59	0	2513	1189	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	0.97	1.00		1.00	1.00	0.97		*1.00	*1.00	
Frt	1.00	0.85		1.00	0.85	1.00		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	0.95		1.00	1.00	
Satd. Flow (prot)	3433	1583		1863	1583	3433		3725	3725	
Flt Permitted	0.95	1.00		1.00	1.00	0.95		1.00	1.00	
Satd. Flow (perm)	3433	1583		1863	1583	3433		3725	3725	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	154	42	0	265	277	64	0	2732	1292	0
RTOR Reduction (vph)	0	32	0	0	80	0	0	0	0	0
Lane Group Flow (vph)	154	10	0	265	197	64	0	2732	1292	0
Turn Type		pt+ov			Perm	Prot		custom		
Protected Phases	8	8 1		2!		1		6	2!	
Permitted Phases					2					
Actuated Green, G (s)	10.3	21.6		78.4	78.4	6.3		89.7	78.4	
Effective Green, g (s)	10.3	21.6		78.4	78.4	6.3		89.7	78.4	
Actuated g/C Ratio	0.09	0.20		0.71	0.71	0.06		0.82	0.71	
Clearance Time (s)	5.0			5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0			3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	321	311		1328	1128	197		3038	2655	
v/s Ratio Prot	c0.04	0.01		0.14		0.02		c0.73	0.35	
v/s Ratio Perm					0.12					
v/c Ratio	0.48	0.03		0.20	0.18	0.32		0.90	0.49	
Uniform Delay, d1	47.3	35.7		5.3	5.2	49.8		7.0	6.9	
Progression Factor	1.00	1.00		1.00	1.00	1.02		0.53	0.81	
Incremental Delay, d2	1.1	0.0		0.3	0.3	0.3		1.8	0.6	
Delay (s)	48.4	35.8		5.6	5.5	51.0		5.6	6.2	
Level of Service	D	D		A	A	D		A	A	
Approach Delay (s)	45.7			5.6			6.6		6.2	
Approach LOS	D			A			A		A	

Intersection Summary

HCM Average Control Delay	8.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	92.1%	ICU Level of Service	F
Analysis Period (min)	15		

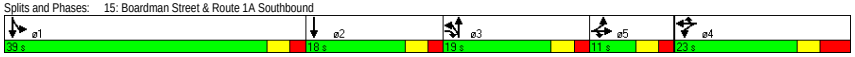
! Phase conflict between lane groups.
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	43	11	99	424	38	165	148	291	66	137	2537	15	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		0	200		200	100		200	250		0	
Storage Lanes	0		1	1		1	1		1	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		731			531			536			945		
Travel Time (s)		16.6			12.1			12.2			21.5		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99	
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%	
Shared Lane Traffic (%)				46%									
Lane Group Flow (vph)	0	58	105	244	247	176	161	316	72	138	2578	0	
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases									Free				
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			10.0
Minimum Split (s)	14.0	14.0		14.0	14.0	14.0	14.0	14.0		18.0			18.0
Total Split (s)	11.0	11.0	30.0	23.0	23.0	23.0	19.0	19.0	0.0	39.0	57.0	0.0	18.0
Total Split (%)	10.0%	10.0%	27.3%	20.9%	20.9%	20.9%	17.3%	17.3%	0.0%	35.5%	51.8%	0.0%	16%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag	Lag	Lag					Lead	Lead		Lead			Lag
Lead-Lag Optimize?	Yes	Yes					Yes	Yes					
Recall Mode	None	None		None	None	None	None	None		None			C-Min
v/c Ratio		0.60	0.33	0.96	0.96	0.46	0.84	0.77	0.05	0.25	1.08		
Control Delay		77.0	37.6	94.6	94.4	10.7	82.0	60.0	0.1	25.6	77.2		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay		77.0	37.6	94.6	94.4	10.7	82.0	60.0	0.1	25.6	77.2		
Queue Length 50th (ft)		41	60	183	185	0	112	114	0	71	~763		
Queue Length 95th (ft)		#102	111	#354	#357	62	#225	#172	0	m81	#873		
Internal Link Dist (ft)		651			451			456			865		
Turn Bay Length (ft)				200		200	100		200	250			
Base Capacity (vph)		96	312	254	257	380	198	425	1509	542	2377		
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio		0.60	0.34	0.96	0.96	0.46	0.81	0.74	0.05	0.25	1.08		

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green, Master Intersection
Natural Cycle: 100
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 15: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	43	11	99	424	38	165	148	291	66	137	2537	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1758	1417	1698	1718	1538	1556	3343	1509	1752	5028	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1758	1417	1698	1718	1538	1556	3343	1509	1752	5028	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	46	12	105	451	40	176	161	316	72	138	2563	15
RTOR Reduction (vph)	0	0	3	0	0	150	0	0	0	0	1	0
Lane Group Flow (vph)	0	58	102	244	247	26	161	316	72	138	2577	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases									Free			
Actuated Green, G (s)		6.0	24.5	16.5	16.5	16.5	13.5	13.5	110.0	34.0	52.0	
Effective Green, g (s)		6.0	24.5	16.5	16.5	16.5	13.5	13.5	110.0	34.0	52.0	
Actuated g/C Ratio		0.05	0.22	0.15	0.15	0.15	0.12	0.12	1.00	0.31	0.47	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		96	316	255	258	231	191	410	1509	542	2377	
v/s Ratio Prot		c0.03	0.07	0.14	c0.14	0.02	c0.10	0.09		0.08	c0.51	
v/s Ratio Perm									0.05			
v/c Ratio		0.60	0.32	0.96	0.96	0.11	0.84	0.77	0.05	0.25	1.08	
Uniform Delay, d1		50.8	35.8	46.4	46.4	40.4	47.2	46.8	0.0	28.5	29.0	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.87	1.25	
Incremental Delay, d2		10.3	0.6	44.1	43.9	0.2	27.2	8.7	0.1	0.1	42.1	
Delay (s)		61.1	36.4	90.5	90.3	40.7	74.4	55.4	0.1	24.8	78.4	
Level of Service		E	D	F	F	D	E	E	A	C	E	
Approach Delay (s)		45.2			77.2			53.7			75.7	
Approach LOS		D			E			D			E	

Intersection Summary

HCM Average Control Delay	71.8	HCM Level of Service	E
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	91.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	122	8	9	0	0	0	0	2540	0	0	2295	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		160			283			370			273	
Travel Time (s)		3.6			6.4			8.4			6.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	152	0	0	0	0	0	2761	0	0	2495	0
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Detector Phase	4	4						2			6	
Switch Phase												
Minimum Initial (s)	6.0	6.0						10.0			10.0	
Minimum Split (s)	20.0	20.0						20.0			20.0	
Total Split (s)	21.0	21.0	0.0	0.0	0.0	0.0	0.0	109.0	0.0	0.0	109.0	0.0
Total Split (%)	16.2%	16.2%	0.0%	0.0%	0.0%	0.0%	0.0%	83.8%	0.0%	0.0%	83.8%	0.0%
Yellow Time (s)	3.0	3.0						3.0			3.0	
All-Red Time (s)	2.0	2.0						2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None						C-Max			C-Max	
v/c Ratio		0.76						0.67			0.87	
Control Delay		79.0						1.6			12.7	
Queue Delay		0.0						0.0			0.2	
Total Delay		79.0						1.6			12.9	
Queue Length 50th (ft)		123						44			619	
Queue Length 95th (ft)		#215						47			755	
Internal Link Dist (ft)		80			203			290			193	
Turn Bay Length (ft)												
Base Capacity (vph)		219						4125			2871	
Starvation Cap Reductn		0						58			0	
Spillback Cap Reductn		0						0			39	
Storage Cap Reductn		0						0			0	
Reduced v/c Ratio		0.69						0.68			0.88	

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 29 (22%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	122	8	9	0	0	0	0	2540	0	0	2295	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.95	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1769						5085			3539	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1769						5085			3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	133	9	10	0	0	0	0	2761	0	0	2495	0
RTOR Reduction (vph)	0	2	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	150	0	0	0	0	0	2761	0	0	2495	0
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Actuated Green, G (s)		14.5						105.5			105.5	
Effective Green, g (s)		14.5						105.5			105.5	
Actuated g/C Ratio		0.11						0.81			0.81	
Clearance Time (s)		5.0						5.0			5.0	
Vehicle Extension (s)		3.0						3.0			3.0	
Lane Grp Cap (vph)		197						4127			2872	
v/s Ratio Prot								0.54			c0.70	
v/s Ratio Perm		0.08										
v/c Ratio		0.76						0.67			0.87	
Uniform Delay, d1		56.1						5.1			7.8	
Progression Factor		1.00						0.21			1.00	
Incremental Delay, d2		15.9						0.5			3.9	
Delay (s)		72.0						1.6			11.7	
Level of Service		E						A			B	
Approach Delay (s)		72.0			0.0			1.6			11.7	
Approach LOS		E			A			A			B	

Intersection Summary

HCM Average Control Delay	8.2	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.86				
Actuated Cycle Length (s)	130.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	79.5%	ICU Level of Service		D	
Analysis Period (min)	15				

c Critical Lane Group

Lane Group	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations										
Volume (vph)	552	151	0	413	899	202	0	2121	1975	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red		Yes			Yes			No		
Link Speed (mph)	30			30			30		30	
Link Distance (ft)	585			447			370		424	
Travel Time (s)	13.3			10.2			8.4		9.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)										
Lane Group Flow (vph)	600	164	0	449	977	220	0	2305	2147	0
Turn Type		pt+ov			Perm	Prot		custom		
Protected Phases	8	8 1		2!		1		6	2!	
Permitted Phases					2					
Detector Phase	8	8 1		2	2	1		6	2	
Switch Phase										
Minimum Initial (s)	6.0			10.0	10.0	6.0		10.0	10.0	
Minimum Split (s)	20.0			15.0	15.0	11.0		15.0	15.0	
Total Split (s)	30.0	45.0	0.0	85.0	85.0	15.0	0.0	100.0	85.0	0.0
Total Split (%)	23.1%	34.6%	0.0%	65.4%	65.4%	11.5%	0.0%	76.9%	65.4%	0.0%
Yellow Time (s)	3.0			3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0			2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag				Lag	Lag	Lead			Lag	
Lead-Lag Optimize?				Yes	Yes	Yes			Yes	
Recall Mode	None			C-Max	C-Max	None		C-Max	C-Max	
v/c Ratio	0.92	0.34		0.39	0.76	0.82		0.84	0.93	
Control Delay	72.7	36.6		13.8	7.6	86.0		7.1	31.6	
Queue Delay	0.0	0.0		0.0	0.0	0.0		1.7	0.0	
Total Delay	72.7	36.6		13.8	7.6	86.0		8.8	31.6	
Queue Length 50th (ft)	257	105		181	68	100		141	775	
Queue Length 95th (ft)	#361	169		250	243	m116		194	#914	
Internal Link Dist (ft)	505			367			290		344	
Turn Bay Length (ft)										
Base Capacity (vph)	660	478		1150	1278	267		2733	2300	
Starvation Cap Reductn	0	0		0	0	0		261	0	
Spillback Cap Reductn	0	0		0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0		0	0	
Reduced v/c Ratio	0.91	0.34		0.39	0.76	0.82		0.93	0.93	

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 44 (34%), Referenced to phase 2:NENB and 6:SBR, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.
! Phase conflict between lane groups.

Splits and Phases: 6: Tomasello Way & Route 1A



Movement	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations										
Volume (vph)	552	151	0	413	899	202	0	2121	1975	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	0.97	1.00		1.00	1.00	0.97		*1.00	*1.00	
Frt	1.00	0.85		1.00	0.85	1.00		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	0.95		1.00	1.00	
Satd. Flow (prot)	3433	1583		1863	1583	3433		3725	3725	
Flt Permitted	0.95	1.00		1.00	1.00	0.95		1.00	1.00	
Satd. Flow (perm)	3433	1583		1863	1583	3433		3725	3725	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	600	164	0	449	977	220	0	2305	2147	0
RTOR Reduction (vph)	0	2	0	0	300	0	0	0	0	0
Lane Group Flow (vph)	600	162	0	449	677	220	0	2305	2147	0
Turn Type		pt+ov			Perm	Prot		custom		
Protected Phases	8	8 1		2!		1		6	2!	
Permitted Phases					2					
Actuated Green, G (s)	24.6	39.7		80.3	80.3	10.1		95.4	80.3	
Effective Green, g (s)	24.6	39.7		80.3	80.3	10.1		95.4	80.3	
Actuated g/C Ratio	0.19	0.31		0.62	0.62	0.08		0.73	0.62	
Clearance Time (s)	5.0			5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0			3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	650	483		1151	978	267		2734	2301	
v/s Ratio Prot	c0.17	0.10		0.24		0.06		c0.62	c0.58	
v/s Ratio Perm					0.43					
v/c Ratio	0.92	0.34		0.39	0.69	0.82		0.84	0.93	
Uniform Delay, d1	51.8	34.9		12.5	16.6	59.1		12.1	22.4	
Progression Factor	1.00	1.00		1.00	1.00	1.25		0.43	1.00	
Incremental Delay, d2	18.8	0.4		1.0	4.0	9.7		1.7	8.5	
Delay (s)	70.6	35.4		13.5	20.6	83.2		6.8	30.9	
Level of Service	E	D		B	C	F		A	C	
Approach Delay (s)	63.0			18.4			13.5		30.9	
Approach LOS	E			B			B		C	

Intersection Summary

HCM Average Control Delay	25.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	115.4%	ICU Level of Service	H
Analysis Period (min)	15		

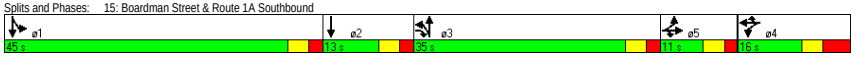
! Phase conflict between lane groups.
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	38	3	54	250	17	260	74	982	81	202	2461	12	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		0	200		200	100		200	250		0	
Storage Lanes	0		1	1		1	1		1	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		731			531			536			945		
Travel Time (s)		16.6			12.1			12.2			21.5		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99	
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%	
Shared Lane Traffic (%)				47%									
Lane Group Flow (vph)	0	43	57	141	143	277	80	1067	88	204	2498	0	
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases									Free				
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			10.0
Minimum Split (s)	14.0	14.0		14.0	14.0	14.0	14.0	14.0		18.0			18.0
Total Split (s)	11.0	11.0	46.0	16.0	16.0	16.0	35.0	35.0	0.0	45.0	58.0	0.0	13.0
Total Split (%)	9.2%	9.2%	38.3%	13.3%	13.3%	13.3%	29.2%	29.2%	0.0%	37.5%	48.3%	0.0%	11%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag	Lag	Lag					Lead	Lead		Lead			Lag
Lead-Lag Optimize?	Yes	Yes					Yes	Yes					
Recall Mode	None	None		None	None	None	None	None		None			C-Min
v/c Ratio		0.49	0.12	0.90	0.91	0.70	0.21	1.28	0.06	0.35	1.12		
Control Delay		75.0	27.1	105.4	104.9	16.7	37.3	171.4	0.1	32.3	93.8		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay		75.0	27.1	105.4	104.9	16.7	37.3	171.4	0.1	32.3	93.8		
Queue Length 50th (ft)		33	29	~131	~133	0	49	~550	0	119	~821		
Queue Length 95th (ft)		#78	61	#270	#274	#106	93	#684	0	186	#914		
Internal Link Dist (ft)		651			451			456			865		
Turn Bay Length (ft)				200		200	100		200	250			
Base Capacity (vph)		87	485	156	158	394	389	836	1509	586	2227		
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio		0.49	0.12	0.90	0.91	0.70	0.21	1.28	0.06	0.35	1.12		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green, Master Intersection
Natural Cycle: 150
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 15: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	3	54	250	17	260	74	982	81	202	2461	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1735	1417	1698	1714	1538	1556	3343	1509	1752	5030	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1735	1417	1698	1714	1538	1556	3343	1509	1752	5030	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	40	3	57	266	18	277	80	1067	88	204	2486	12
RTOR Reduction (vph)	0	0	1	0	0	251	0	0	0	0	1	0
Lane Group Flow (vph)	0	43	56	141	143	26	80	1067	88	204	2497	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases									Free			
Actuated Green, G (s)		4.8	39.8	11.1	11.1	11.1	30.0	30.0	120.0	40.1	52.1	
Effective Green, g (s)		4.8	39.8	11.1	11.1	11.1	30.0	30.0	120.0	40.1	52.1	
Actuated g/C Ratio		0.04	0.33	0.09	0.09	0.09	0.25	0.25	1.00	0.33	0.43	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		69	470	157	159	142	389	836	1509	585	2184	
v/s Ratio Prot		c0.02	0.04	0.08	c0.08	0.02	0.05	c0.32		0.12	c0.50	
v/s Ratio Perm									0.06			
v/c Ratio		0.62	0.12	0.90	0.90	0.18	0.21	1.28	0.06	0.35	1.14	
Uniform Delay, d1		56.7	27.9	53.9	53.9	50.3	35.6	45.0	0.0	30.1	34.0	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		16.2	0.1	43.0	42.8	0.6	0.3	133.6	0.1	0.4	70.6	
Delay (s)		72.9	28.0	96.9	96.7	50.9	35.8	178.6	0.1	30.5	104.5	
Level of Service		E	C	F	F	D	D	F	A	C	F	
Approach Delay (s)		47.3			74.1			156.6			98.9	
Approach LOS		D			E			F			F	

Intersection Summary

HCM Average Control Delay	110.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	81.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	59	8	9	0	0	0	0	2227	2	0	2132	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		160			283			370			273	
Travel Time (s)		3.6			6.4			8.4			6.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	83	0	0	0	0	0	2423	0	0	2317	0
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Detector Phase	4	4						2			6	
Switch Phase												
Minimum Initial (s)	6.0	6.0						10.0			10.0	
Minimum Split (s)	20.0	20.0						20.0			20.0	
Total Split (s)	25.0	25.0	0.0	0.0	0.0	0.0	0.0	95.0	0.0	0.0	95.0	0.0
Total Split (%)	20.8%	20.8%	0.0%	0.0%	0.0%	0.0%	0.0%	79.2%	0.0%	0.0%	79.2%	0.0%
Yellow Time (s)	3.0	3.0						3.0			3.0	
All-Red Time (s)	2.0	2.0						2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None						C-Max			C-Max	
v/c Ratio		0.51						0.56			0.77	
Control Delay		59.4						1.3			7.5	
Queue Delay		0.0						0.2			0.2	
Total Delay		59.4						1.6			7.7	
Queue Length 50th (ft)		59						18			362	
Queue Length 95th (ft)		108						15			570	
Internal Link Dist (ft)		80			203			290			193	
Turn Bay Length (ft)												
Base Capacity (vph)		298						4349			3027	
Starvation Cap Reductn		0						944			0	
Spillback Cap Reductn		0						0			146	
Storage Cap Reductn		0						0			0	
Reduced v/c Ratio		0.28						0.71			0.80	

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	

Splits and Phases: 2: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	59	8	9	0	0	0	0	2227	2	0	2132	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.95	
Frt		0.98						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1764						5085			3539	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1764						5085			3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	64	9	10	0	0	0	0	2421	2	0	2317	0
RTOR Reduction (vph)	0	5	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	78	0	0	0	0	0	2423	0	0	2317	0
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Actuated Green, G (s)		9.4						100.6			100.6	
Effective Green, g (s)		9.4						100.6			100.6	
Actuated g/C Ratio		0.08						0.84			0.84	
Clearance Time (s)		5.0						5.0			5.0	
Vehicle Extension (s)		3.0						3.0			3.0	
Lane Grp Cap (vph)		138						4263			2967	
v/s Ratio Prot								0.48			c0.65	
v/s Ratio Perm		0.04										
v/c Ratio		0.57						0.57			0.78	
Uniform Delay, d1		53.3						3.0			4.5	
Progression Factor		1.00						0.29			1.00	
Incremental Delay, d2		5.3						0.4			2.1	
Delay (s)		58.6						1.2			6.7	
Level of Service		E						A			A	
Approach Delay (s)		58.6			0.0			1.2			6.7	
Approach LOS		E			A			A			A	

Intersection Summary					
HCM Average Control Delay	4.8	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.76				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	72.3%	ICU Level of Service		C	
Analysis Period (min)	15				
c Critical Lane Group					

Lane Group	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations										
Volume (vph)	548	196	0	441	901	209	0	1934	1590	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red		Yes			Yes			No		
Link Speed (mph)	30			30			30		30	
Link Distance (ft)	585			447			370		424	
Travel Time (s)	13.3			10.2			8.4		9.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)										
Lane Group Flow (vph)	596	213	0	479	979	227	0	2102	1728	0
Turn Type		pt+ov			Perm	Prot		custom		
Protected Phases	8	8 1		2!		1		6	2!	
Permitted Phases					2					
Detector Phase	8	8 1		2	2	1		6	2	
Switch Phase										
Minimum Initial (s)	6.0			10.0	10.0	6.0		10.0	10.0	
Minimum Split (s)	20.0			15.0	15.0	11.0		15.0	15.0	
Total Split (s)	35.0	60.0	0.0	60.0	60.0	25.0	0.0	85.0	60.0	0.0
Total Split (%)	29.2%	50.0%	0.0%	50.0%	50.0%	20.8%	0.0%	70.8%	50.0%	0.0%
Yellow Time (s)	3.0			3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0			2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0
Lead/Lag				Lag	Lag	Lead			Lag	
Lead-Lag Optimize?				Yes	Yes	Yes			Yes	
Recall Mode	None			C-Max	C-Max	None		C-Max	C-Max	
v/c Ratio	0.81	0.37		0.47	0.82	0.60		0.81	0.84	
Control Delay	53.4	28.4		19.6	12.6	56.4		12.7	40.1	
Queue Delay	0.0	0.0		0.0	0.0	0.0		4.2	0.1	
Total Delay	53.4	28.4		19.6	12.6	56.4		16.9	40.2	
Queue Length 50th (ft)	225	118		219	145	93		317	525	
Queue Length 95th (ft)	280	166		350	452	m127		402	m549	
Internal Link Dist (ft)	505			367			290		344	
Turn Bay Length (ft)										
Base Capacity (vph)	858	657		1024	1198	572		2611	2046	
Starvation Cap Reductn	0	0		0	0	0		431	0	
Spillback Cap Reductn	0	0		8	0	0		0	17	
Storage Cap Reductn	0	0		0	0	0		0	0	
Reduced v/c Ratio	0.69	0.32		0.47	0.82	0.40		0.96	0.85	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NENB and 6:SBR, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.
! Phase conflict between lane groups.

Splits and Phases: 6: Tomasello Way & Route 1A



Movement	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations										
Volume (vph)	548	196	0	441	901	209	0	1934	1590	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	0.97	1.00		1.00	1.00	0.97		*1.00	*1.00	
Frt	1.00	0.85		1.00	0.85	1.00		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	0.95		1.00	1.00	
Satd. Flow (prot)	3433	1583		1863	1583	3433		3725	3725	
Flt Permitted	0.95	1.00		1.00	1.00	0.95		1.00	1.00	
Satd. Flow (perm)	3433	1583		1863	1583	3433		3725	3725	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	596	213	0	479	979	227	0	2102	1728	0
RTOR Reduction (vph)	0	1	0	0	328	0	0	0	0	0
Lane Group Flow (vph)	596	212	0	479	651	227	0	2102	1728	0
Turn Type		pt+ov			Perm	Prot		custom		
Protected Phases	8	8 1		2!		1		6	2!	
Permitted Phases					2					
Actuated Green, G (s)	25.9	44.1		65.9	65.9	13.2		84.1	65.9	
Effective Green, g (s)	25.9	44.1		65.9	65.9	13.2		84.1	65.9	
Actuated g/C Ratio	0.22	0.37		0.55	0.55	0.11		0.70	0.55	
Clearance Time (s)	5.0			5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0			3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	741	582		1023	869	378		2611	2046	
v/s Ratio Prot	c0.17	0.13		0.26		0.07		c0.56	c0.46	
v/s Ratio Perm					0.41					
v/c Ratio	0.80	0.36		0.47	0.75	0.60		0.81	0.84	
Uniform Delay, d1	44.6	27.7		16.4	20.7	50.9		12.3	22.7	
Progression Factor	1.00	1.00		1.00	1.00	1.03		0.81	1.57	
Incremental Delay, d2	6.3	0.4		1.5	5.9	1.7		1.7	2.5	
Delay (s)	51.0	28.1		18.0	26.6	54.2		11.8	38.3	
Level of Service	D	C		B	C	D		B	D	
Approach Delay (s)	45.0			23.8			15.9		38.3	
Approach LOS	D			C			B		D	

Intersection Summary

HCM Average Control Delay	27.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	106.0%	ICU Level of Service	G
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

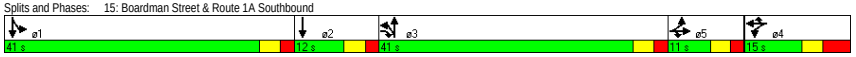
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	38	10	37	252	12	330	32	974	335	180	2276	28	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		0	200		200	100		200	250		0	
Storage Lanes	0		1	1		1	1		1	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		731			531			536			945		
Travel Time (s)		16.6			12.1			12.2			21.5		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99	
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%	
Shared Lane Traffic (%)				48%									
Lane Group Flow (vph)	0	51	39	139	142	351	35	1059	364	182	2327	0	
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases									Free				
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			10.0
Minimum Split (s)	14.0	14.0		14.0	14.0	14.0	14.0	14.0		18.0			18.0
Total Split (s)	11.0	11.0	52.0	15.0	15.0	15.0	41.0	41.0	0.0	41.0	53.0	0.0	12.0
Total Split (%)	9.2%	9.2%	43.3%	12.5%	12.5%	12.5%	34.2%	34.2%	0.0%	34.2%	44.2%	0.0%	10%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag	Lag	Lag					Lead	Lead		Lead			Lag
Lead-Lag Optimize?	Yes	Yes					Yes	Yes					
Recall Mode	None	None		None	None	None	None	None		None			C-Min
v/c Ratio		0.58	0.07	0.97	0.98	0.78	0.07	1.06	0.24	0.35	1.16		
Control Delay		81.4	22.9	122.0	124.8	18.4	30.8	85.2	0.4	35.3	113.0		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay		81.4	22.9	122.0	124.8	18.4	30.8	85.2	0.4	35.3	113.0		
Queue Length 50th (ft)		39	18	~140	~144	0	19	~473	0	115	~775		
Queue Length 95th (ft)		#97	42	#278	#283	#136	45	#606	0	m156	#897		
Internal Link Dist (ft)		651			451			456			865		
Turn Bay Length (ft)				200		200	100		200	250			
Base Capacity (vph)		88	556	144	145	452	467	1003	1509	526	2009		
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio		0.58	0.07	0.97	0.98	0.78	0.07	1.06	0.24	0.35	1.16		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green, Master Intersection
Natural Cycle: 150
Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 15: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	10	37	252	12	330	32	974	335	180	2276	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1759	1417	1698	1711	1538	1556	3343	1509	1752	5020	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1759	1417	1698	1711	1538	1556	3343	1509	1752	5020	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	40	11	39	268	13	351	35	1059	364	182	2299	28
RTOR Reduction (vph)	0	0	1	0	0	321	0	0	0	0	1	0
Lane Group Flow (vph)	0	51	38	139	142	30	35	1059	364	182	2326	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases									Free			
Actuated Green, G (s)		4.8	45.8	10.2	10.2	10.2	36.0	36.0	120.0	36.0	47.0	
Effective Green, g (s)		4.8	45.8	10.2	10.2	10.2	36.0	36.0	120.0	36.0	47.0	
Actuated g/C Ratio		0.04	0.38	0.08	0.08	0.08	0.30	0.30	1.00	0.30	0.39	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		70	541	144	145	131	467	1003	1509	526	1966	
v/s Ratio Prot		c0.03	0.03	0.08	c0.08	0.02	0.02	c0.32		0.10	c0.46	
v/s Ratio Perm									0.24			
v/c Ratio		0.73	0.07	0.97	0.98	0.23	0.07	1.06	0.24	0.35	1.18	
Uniform Delay, d1		57.0	23.6	54.7	54.8	51.2	30.1	42.0	0.0	32.8	36.5	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.03	1.15	
Incremental Delay, d2		31.2	0.1	63.9	67.7	0.9	0.1	44.4	0.4	0.2	85.8	
Delay (s)		88.2	23.6	118.6	122.5	52.1	30.1	86.4	0.4	33.9	127.9	
Level of Service		F	C	F	F	D	C	F	A	C	F	
Approach Delay (s)		60.2			82.5			63.5			121.1	
Approach LOS		E			F			E			F	

Intersection Summary

HCM Average Control Delay	96.8	HCM Level of Service		F	
HCM Volume to Capacity ratio	1.09				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		22.0	
Intersection Capacity Utilization	77.7%	ICU Level of Service		D	
Analysis Period (min)	15				

c Critical Lane Group

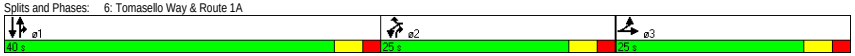
Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

Synchro 7 Capacity Analysis
Option 7 - Multiple Flyover Alternative at Boardman and Tomasello/Jughandle

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	62	8	7	20	0	8	0	220	68	0	131	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		913			585			432			2930	
Travel Time (s)		20.8			13.3			9.8			66.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	84	0	22	0	9	0	239	74	0	142	0
Turn Type	Split			Prot		custom			pt+ov			
Protected Phases	3	3		2		2		1	1 2		1	
Permitted Phases												
Detector Phase	3	3		2		2		1	1 2		1	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0		6.0		10.0			10.0	
Minimum Split (s)	11.0	11.0		11.0		11.0		15.0			15.0	
Total Split (s)	25.0	25.0	0.0	25.0	0.0	25.0	0.0	40.0	65.0	0.0	40.0	0.0
Total Split (%)	27.8%	27.8%	0.0%	27.8%	0.0%	27.8%	0.0%	44.4%	72.2%	0.0%	44.4%	0.0%
Yellow Time (s)	3.0	3.0		3.0		3.0		3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0		2.0		2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	4.0	5.0	4.0	5.0	5.0	4.0	5.0	4.0
Lead/Lag				Lag		Lag		Lead			Lead	
Lead-Lag Optimize?				Yes		Yes		Yes			Yes	
Recall Mode	None	None		None		None		C-Max			C-Max	
v/c Ratio		0.29		0.09		0.08		0.09	0.06		0.05	
Control Delay		37.2		39.9		22.9		5.7	2.3		4.9	
Queue Delay		0.0		0.0		0.0		0.0	0.0		0.0	
Total Delay		37.2		39.9		22.9		5.7	2.3		4.9	
Queue Length 50th (ft)		21		6		0		24	0		11	
Queue Length 95th (ft)		43		18		15		51	18		22	
Internal Link Dist (ft)		833			505			352			2850	
Turn Bay Length (ft)												
Base Capacity (vph)		752		763		359		2757	1526		2757	
Starvation Cap Reductn		0		0		0		0	0		0	
Spillback Cap Reductn		0		0		0		0	0		0	
Storage Cap Reductn		0		0		0		0	0		0	
Reduced v/c Ratio		0.11		0.03		0.03		0.09	0.05		0.05	

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 2 (2%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 40	
Control Type: Actuated-Coordinated	

Splits and Phases: 6: Tomasello Way & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	62	8	7	20	0	8	0	220	68	0	131	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0		5.0		5.0	5.0		5.0	
Lane Util. Factor		0.95		0.97		1.00		*1.00	1.00		*1.00	
Frt		0.99		1.00		0.85		1.00	0.85		1.00	
Flt Protected		0.96		0.95		1.00		1.00	1.00		1.00	
Satd. Flow (prot)		3355		3433		1583		3725	1583		3725	
Flt Permitted		0.96		0.95		1.00		1.00	1.00		1.00	
Satd. Flow (perm)		3355		3433		1583		3725	1583		3725	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	67	9	8	22	0	9	0	239	74	0	142	0
RTOR Reduction (vph)	0	7	0	0	0	8	0	0	13	0	0	0
Lane Group Flow (vph)	0	77	0	22	0	1	0	239	61	0	142	0
Turn Type	Split			Prot		custom			pt+ov			
Protected Phases	3	3		2		2		1	1 2		1	
Permitted Phases												
Actuated Green, G (s)		6.3		5.1		5.1		63.6	73.7		63.6	
Effective Green, g (s)		6.3		5.1		5.1		63.6	73.7		63.6	
Actuated g/C Ratio		0.07		0.06		0.06		0.71	0.82		0.71	
Clearance Time (s)		5.0		5.0		5.0		5.0			5.0	
Vehicle Extension (s)		3.0		3.0		3.0		3.0			3.0	
Lane Grp Cap (vph)		235		195		90		2632	1296		2632	
v/s Ratio Prot		c0.02		c0.01		0.00		c0.06	0.04		0.04	
v/s Ratio Perm												
v/c Ratio		0.33		0.11		0.01		0.09	0.05		0.05	
Uniform Delay, d1		39.8		40.3		40.1		4.1	1.5		4.0	
Progression Factor		1.00		1.00		1.00		1.18	4.03		1.00	
Incremental Delay, d2		0.8		0.3		0.0		0.1	0.0		0.0	
Delay (s)		40.6		40.6		40.1		4.9	6.2		4.1	
Level of Service		D		D		D		A	A		A	
Approach Delay (s)		40.6			40.4			5.2			4.1	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	12.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.11		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	30.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	39	10	90	384	34	149	134	100	60	124	20	14	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		0	200		200	100		200	250		0	
Storage Lanes	0		1	1		1	1		0	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		731			531			536			935		
Travel Time (s)		16.6			12.1			12.2			21.3		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99	
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%	
Shared Lane Traffic (%)				46%									
Lane Group Flow (vph)	0	52	96	221	224	159	146	174	0	125	34	0	
Turn Type	Split		pt+ov	Split		Prot	Split			Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases													
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			10.0
Minimum Split (s)	14.0	14.0		14.0	14.0	14.0	14.0	14.0		18.0			18.0
Total Split (s)	11.0	11.0	29.0	25.0	25.0	25.0	18.0	18.0	0.0	25.0	36.0	0.0	11.0
Total Split (%)	12.2%	12.2%	32.2%	27.8%	27.8%	27.8%	20.0%	20.0%	0.0%	27.8%	40.0%	0.0%	12%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag	Lag	Lag					Lead	Lead		Lead			Lag
Lead-Lag Optimize?	Yes	Yes					Yes	Yes					
Recall Mode	None	None		None	None	None	C-Max	C-Max		None			Min
v/c Ratio		0.44	0.17	0.74	0.74	0.40	0.40	0.16		0.52	0.04		
Control Delay		52.8	6.5	50.6	50.5	8.5	37.0	20.2		45.7	19.1		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		
Total Delay		52.8	6.5	50.6	50.5	8.5	37.0	20.2		45.7	19.1		
Queue Length 50th (ft)		29	0	123	125	0	74	19		70	5		
Queue Length 95th (ft)		66	36	203	206	50	#159	40		123	16		
Internal Link Dist (ft)		651			451			456			855		
Turn Bay Length (ft)				200		200	100			250			
Base Capacity (vph)		117	569	340	344	435	366	1121		389	955		
Starvation Cap Reductn		0	0	0	0	0	0	0		0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0		0	0		
Storage Cap Reductn		0	0	0	0	0	0	0		0	0		
Reduced v/c Ratio		0.44	0.17	0.65	0.65	0.37	0.40	0.16		0.32	0.04		

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 3:NBTL, Start of Green, Master Intersection
Natural Cycle: 80
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 15: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	39	10	90	384	34	149	134	100	60	124	20	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.95	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	0.94		1.00	0.94	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1759	1417	1698	1718	1538	1556	4549		1752	3150	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1759	1417	1698	1718	1538	1556	4549		1752	3150	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	41	11	96	409	36	159	146	109	65	125	20	14
RTOR Reduction (vph)	0	0	64	0	0	131	0	50	0	0	10	0
Lane Group Flow (vph)	0	52	32	221	224	28	146	124	0	125	24	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split		Prot	Split			Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases												
Actuated Green, G (s)		4.8	30.1	15.7	15.7	15.7	20.3	20.3		12.3	27.2	
Effective Green, g (s)		4.8	30.1	15.7	15.7	15.7	20.3	20.3		12.3	27.2	
Actuated g/C Ratio		0.05	0.33	0.17	0.17	0.17	0.23	0.23		0.14	0.30	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		94	474	296	300	268	351	1026		239	952	
v/s Ratio Prot		c0.03	0.02	0.13	c0.13	0.02	c0.09	0.03		c0.07	c0.01	
v/s Ratio Perm												
v/c Ratio		0.55	0.07	0.75	0.75	0.10	0.42	0.12		0.52	0.03	
Uniform Delay, d1		41.6	20.4	35.3	35.3	31.2	29.8	27.7		36.1	22.1	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.06	1.33	
Incremental Delay, d2		6.9	0.1	9.8	9.7	0.2	3.6	0.2		2.1	0.0	
Delay (s)		48.4	20.5	45.1	45.0	31.4	33.4	28.0		40.3	29.4	
Level of Service		D	C	D	D	C	C	C		D	C	
Approach Delay (s)		30.3			41.4			30.4			38.0	
Approach LOS		C			D			C			D	

Intersection Summary

HCM Average Control Delay		36.8	HCM Level of Service		D
HCM Volume to Capacity ratio		0.43			
Actuated Cycle Length (s)		90.0	Sum of lost time (s)		22.0
Intersection Capacity Utilization		48.1%	ICU Level of Service		A
Analysis Period (min)		15			

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	107	30	8	19	0	13	0	334	200	0	155	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		701			585			424			2930	
Travel Time (s)		15.9			13.3			9.6			66.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	158	0	21	0	14	0	363	217	0	168	0
Turn Type	Split			Prot		custom			pt+ov			
Protected Phases	3	3		2		2		1	1 2		1	
Permitted Phases												
Detector Phase	3	3		2		2		1	1 2		1	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0		6.0		10.0			10.0	
Minimum Split (s)	11.0	11.0		11.0		11.0		15.0			15.0	
Total Split (s)	23.0	23.0	0.0	36.0	0.0	36.0	0.0	78.0	114.0	0.0	78.0	0.0
Total Split (%)	16.8%	16.8%	0.0%	26.3%	0.0%	26.3%	0.0%	56.9%	83.2%	0.0%	56.9%	0.0%
Yellow Time (s)	3.0	3.0		3.0		3.0		3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0		2.0		2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	4.0	5.0	4.0	5.0	5.0	4.0	5.0	4.0
Lead/Lag				Lag		Lag		Lead			Lead	
Lead-Lag Optimize?				Yes		Yes		Yes			Yes	
Recall Mode	None	None		Max		Max		C-Max			C-Max	
v/c Ratio		0.54		0.03		0.04		0.17	0.16		0.08	
Control Delay		65.4		41.5		18.2		13.9	0.5		13.2	
Queue Delay		0.0		0.0		0.0		0.0	0.0		0.0	
Total Delay		65.4		41.5		18.2		13.9	0.5		13.2	
Queue Length 50th (ft)		70		7		0		72	0		31	
Queue Length 95th (ft)		106		19		19		103	13		51	
Internal Link Dist (ft)		621			505			344			2850	
Turn Bay Length (ft)												
Base Capacity (vph)		448		777		369		2160	1368		2160	
Starvation Cap Reductn		0		0		0		0	0		0	
Spillback Cap Reductn		0		0		0		0	0		0	
Storage Cap Reductn		0		0		0		0	0		0	
Reduced v/c Ratio		0.35		0.03		0.04		0.17	0.16		0.08	

Intersection Summary

Area Type: Other
Cycle Length: 137
Actuated Cycle Length: 137
Offset: 78 (57%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 40
Control Type: Actuated-Coordinated

Splits and Phases: 6: Tomasello Way & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	107	30	8	19	0	13	0	334	200	0	155	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0		5.0		5.0	5.0		5.0	
Lane Util. Factor		0.95		0.97		1.00		*1.00	1.00		*1.00	
Frt		0.99		1.00		0.85		1.00	0.85		1.00	
Flt Protected		0.96		0.95		1.00		1.00	1.00		1.00	
Satd. Flow (prot)		3385		3433		1583		3725	1583		3725	
Flt Permitted		0.96		0.95		1.00		1.00	1.00		1.00	
Satd. Flow (perm)		3385		3433		1583		3725	1583		3725	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	116	33	9	21	0	14	0	363	217	0	168	0
RTOR Reduction (vph)	0	4	0	0	0	11	0	0	34	0	0	0
Lane Group Flow (vph)	0	154	0	21	0	3	0	363	183	0	168	0
Turn Type	Split			Prot		custom			pt+ov			
Protected Phases	3	3		2		2		1	1 2		1	
Permitted Phases												
Actuated Green, G (s)		11.6		31.0		31.0		79.4	115.4		79.4	
Effective Green, g (s)		11.6		31.0		31.0		79.4	115.4		79.4	
Actuated g/C Ratio		0.08		0.23		0.23		0.58	0.84		0.58	
Clearance Time (s)		5.0		5.0		5.0		5.0			5.0	
Vehicle Extension (s)		3.0		3.0		3.0		3.0			3.0	
Lane Grp Cap (vph)		287		777		358		2159	1333		2159	
v/s Ratio Prot		c0.05		0.01		0.00		c0.10	c0.12		0.05	
v/s Ratio Perm												
v/c Ratio		0.54		0.03		0.01		0.17	0.14		0.08	
Uniform Delay, d1		60.1		41.3		41.1		13.4	1.9		12.7	
Progression Factor		1.00		1.00		1.00		1.00	1.00		1.00	
Incremental Delay, d2		1.9		0.1		0.0		0.2	0.2		0.1	
Delay (s)		62.1		41.3		41.1		13.6	2.1		12.8	
Level of Service		E		D		D		B	A		B	
Approach Delay (s)		62.1			41.2			9.3			12.8	
Approach LOS		E			D			A			B	

Intersection Summary

HCM Average Control Delay	20.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	137.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	32.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	34	3	48	182	15	201	66	367	23	152	19	11	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		0	200		200	100		200	250		0	
Storage Lanes	0		1	1		1	1		0	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		731			531			536			943		
Travel Time (s)		16.6			12.1			12.2			21.4		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99	
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%	
Shared Lane Traffic (%)				46%									
Lane Group Flow (vph)	0	39	51	105	105	214	72	424	0	154	30	0	
Turn Type	Split		pt+ov	Split		Prot	Split			Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases													
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			10.0
Minimum Split (s)	14.0	14.0		14.0	14.0	14.0	14.0	14.0		18.0			18.0
Total Split (s)	13.0	13.0	43.0	20.0	20.0	20.0	30.0	30.0	0.0	26.0	37.0	0.0	11.0
Total Split (%)	13.0%	13.0%	43.0%	20.0%	20.0%	20.0%	30.0%	30.0%	0.0%	26.0%	37.0%	0.0%	11%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag	Lag	Lag					Lead	Lead		Lead			Lag
Lead-Lag Optimize?	Yes	Yes					Yes	Yes					
Recall Mode	None	None		None	None	None	C-Max	C-Max		None			Min
v/c Ratio		0.31	0.08	0.57	0.57	0.60	0.14	0.27		0.62	0.03		
Control Delay		50.5	6.1	54.4	54.0	13.3	28.5	26.5		50.5	17.6		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		
Total Delay		50.5	6.1	54.4	54.0	13.3	28.5	26.5		50.5	17.6		
Queue Length 50th (ft)		24	0	67	67	0	34	74		94	4		
Queue Length 95th (ft)		57	24	123	123	66	74	110		150	15		
Internal Link Dist (ft)		651			451			456			863		
Turn Bay Length (ft)				200		200	100			250			
Base Capacity (vph)		139	684	221	223	386	519	1595		368	904		
Starvation Cap Reductn		0	0	0	0	0	0	0		0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0		0	0		
Storage Cap Reductn		0	0	0	0	0	0	0		0	0		
Reduced v/c Ratio		0.28	0.07	0.48	0.47	0.55	0.14	0.27		0.42	0.03		

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 3:NBTL, Start of Green, Master Intersection
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 15: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	3	48	182	15	201	66	367	23	152	19	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.95	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.94	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1736	1417	1698	1717	1538	1556	4763		1752	3187	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1736	1417	1698	1717	1538	1556	4763		1752	3187	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	36	3	51	194	16	214	72	399	25	154	19	11
RTOR Reduction (vph)	0	0	29	0	0	191	0	6	0	0	8	0
Lane Group Flow (vph)	0	39	22	105	105	23	72	418	0	154	22	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split		Prot	Split			Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases												
Actuated Green, G (s)		6.0	43.4	10.8	10.8	10.8	32.4	32.4		14.3	28.8	
Effective Green, g (s)		6.0	43.4	10.8	10.8	10.8	32.4	32.4		14.3	28.8	
Actuated g/C Ratio		0.06	0.43	0.11	0.11	0.11	0.32	0.32		0.14	0.29	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		104	615	183	185	166	504	1543		251	918	
v/s Ratio Prot		c0.02	0.02	c0.06	0.06	0.02	0.05	c0.09		c0.09	c0.01	
v/s Ratio Perm												
v/c Ratio		0.38	0.04	0.57	0.57	0.14	0.14	0.27		0.61	0.02	
Uniform Delay, d1		45.2	16.3	42.4	42.4	40.4	24.0	25.0		40.3	25.5	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.3	0.0	4.3	4.0	0.4	0.6	0.4		4.4	0.0	
Delay (s)		47.5	16.3	46.7	46.3	40.8	24.6	25.5		44.7	25.5	
Level of Service		D	B	D	D	D	C	C		D	C	
Approach Delay (s)		29.8			43.6			25.3			41.5	
Approach LOS		C			D			C			D	

Intersection Summary

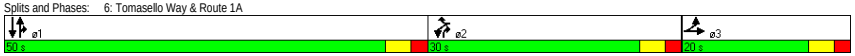
HCM Average Control Delay	34.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	42.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	57	26	7	41	0	59	0	351	165	0	151	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		494			585			410			2930	
Travel Time (s)		11.2			13.3			9.3			66.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	98	0	45	0	64	0	382	179	0	164	0
Turn Type	Split			Prot		custom			pt+ov			
Protected Phases	3	3		2		2		1	1 2		1	
Permitted Phases												
Detector Phase	3	3		2		2		1	1 2		1	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0		6.0		10.0			10.0	
Minimum Split (s)	11.0	11.0		11.0		11.0		15.0			15.0	
Total Split (s)	20.0	20.0	0.0	30.0	0.0	30.0	0.0	50.0	80.0	0.0	50.0	0.0
Total Split (%)	20.0%	20.0%	0.0%	30.0%	0.0%	30.0%	0.0%	50.0%	80.0%	0.0%	50.0%	0.0%
Yellow Time (s)	3.0	3.0		3.0		3.0		3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0		2.0		2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	4.0	5.0	4.0	5.0	5.0	4.0	5.0	4.0
Lead/Lag				Lag		Lag		Lead			Lead	
Lead-Lag Optimize?				Yes		Yes		Yes			Yes	
Recall Mode	None	None		None		None		C-Max			C-Max	
v/c Ratio		0.35		0.18		0.37		0.14	0.13		0.06	
Control Delay		42.9		44.9		17.8		4.7	0.6		5.0	
Queue Delay		0.0		0.0		0.0		0.0	0.0		0.0	
Total Delay		42.9		44.9		17.8		4.7	0.6		5.0	
Queue Length 50th (ft)		28		14		0		39	0		14	
Queue Length 95th (ft)		54		31		40		49	1		28	
Internal Link Dist (ft)		414			505			330			2850	
Turn Bay Length (ft)												
Base Capacity (vph)		515		858		444		2684	1567		2684	
Starvation Cap Reductn		0		0		0		0	0		0	
Spillback Cap Reductn		0		0		0		0	0		0	
Storage Cap Reductn		0		0		0		0	0		0	
Reduced v/c Ratio		0.19		0.05		0.14		0.14	0.11		0.06	

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 40	
Control Type: Actuated-Coordinated	

Splits and Phases: 6: Tomasello Way & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	57	26	7	41	0	59	0	351	165	0	151	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0		5.0		5.0	5.0		5.0	
Lane Util. Factor		0.95		0.97		1.00		*1.00	1.00		*1.00	
Frt		0.99		1.00		0.85		1.00	0.85		1.00	
Flt Protected		0.97		0.95		1.00		1.00	1.00		1.00	
Satd. Flow (prot)		3389		3433		1583		3725	1583		3725	
Flt Permitted		0.97		0.95		1.00		1.00	1.00		1.00	
Satd. Flow (perm)		3389		3433		1583		3725	1583		3725	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	62	28	8	45	0	64	0	382	179	0	164	0
RTOR Reduction (vph)	0	7	0	0	0	59	0	0	30	0	0	0
Lane Group Flow (vph)	0	91	0	45	0	5	0	382	149	0	164	0
Turn Type	Split			Prot		custom			pt+ov			
Protected Phases	3	3		2		2		1	1 2		1	
Permitted Phases												
Actuated Green, G (s)		6.8		7.1		7.1		71.1	83.2		71.1	
Effective Green, g (s)		6.8		7.1		7.1		71.1	83.2		71.1	
Actuated g/C Ratio		0.07		0.07		0.07		0.71	0.83		0.71	
Clearance Time (s)		5.0		5.0		5.0		5.0			5.0	
Vehicle Extension (s)		3.0		3.0		3.0		3.0			3.0	
Lane Grp Cap (vph)		230		244		112		2648	1317		2648	
v/s Ratio Prot		c0.03		c0.01		0.00		c0.10	0.09		0.04	
v/s Ratio Perm												
v/c Ratio		0.39		0.18		0.04		0.14	0.11		0.06	
Uniform Delay, d1		44.6		43.7		43.3		4.7	1.6		4.4	
Progression Factor		1.00		1.00		1.00		0.91	1.12		1.00	
Incremental Delay, d2		1.1		0.4		0.1		0.1	0.0		0.0	
Delay (s)		45.7		44.1		43.4		4.3	1.8		4.4	
Level of Service		D		D		D		A	A		A	
Approach Delay (s)		45.7			43.7			3.5			4.4	
Approach LOS		D			D			A			A	

Intersection Summary					
HCM Average Control Delay		12.8	HCM Level of Service		B
HCM Volume to Capacity ratio		0.17			
Actuated Cycle Length (s)		100.0	Sum of lost time (s)		15.0
Intersection Capacity Utilization		32.2%	ICU Level of Service		A
Analysis Period (min)		15			
c Critical Lane Group					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	34	9	33	184	11	256	29	226	239	126	41	25	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		0	200		200	100		200	250		0	
Storage Lanes	0		1	1		1	1		0	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		731			531			536			957		
Travel Time (s)		16.6			12.1			12.2			21.8		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99	
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%	
Shared Lane Traffic (%)				47%									
Lane Group Flow (vph)	0	46	35	104	104	272	32	506	0	127	66	0	
Turn Type	Split		pt+ov	Split		Prot	Split			Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases													
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			10.0
Minimum Split (s)	14.0	14.0		14.0	14.0	14.0	14.0	14.0		18.0			18.0
Total Split (s)	13.0	13.0	49.0	24.0	24.0	24.0	36.0	36.0	0.0	16.0	27.0	0.0	11.0
Total Split (%)	13.0%	13.0%	49.0%	24.0%	24.0%	24.0%	36.0%	36.0%	0.0%	16.0%	27.0%	0.0%	11%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag	Lag	Lag					Lead	Lead		Lead			Lag
Lead-Lag Optimize?	Yes	Yes					Yes	Yes					
Recall Mode	None	None		None	None	None	C-Max	C-Max		None			Min
v/c Ratio		0.35	0.05	0.51	0.50	0.64	0.06	0.29		0.62	0.08		
Control Delay		51.7	5.8	49.0	48.8	12.3	24.6	12.3		55.8	24.1		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		
Total Delay		51.7	5.8	49.0	48.8	12.3	24.6	12.3		55.8	24.1		
Queue Length 50th (ft)		28	0	66	66	0	14	41		82	10		
Queue Length 95th (ft)		65	18	116	116	71	36	69		#134	28		
Internal Link Dist (ft)		651			451			456			877		
Turn Bay Length (ft)				200		200	100			250			
Base Capacity (vph)		141	712	289	291	487	560	1769		209	752		
Starvation Cap Reductn		0	0	0	0	0	0	0		0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0		0	0		
Storage Cap Reductn		0	0	0	0	0	0	0		0	0		
Reduced v/c Ratio		0.33	0.05	0.36	0.36	0.56	0.06	0.29		0.61	0.09		

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 3:NBTL, Start of Green, Master Intersection
Natural Cycle: 80
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 15: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	9	33	184	11	256	29	226	239	126	41	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.95	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	0.92		1.00	0.94	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1760	1417	1698	1713	1538	1556	4454		1752	3177	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1760	1417	1698	1713	1538	1556	4454		1752	3177	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	36	10	35	196	12	272	32	246	260	127	41	25
RTOR Reduction (vph)	0	0	19	0	0	239	0	169	0	0	19	0
Lane Group Flow (vph)	0	46	16	104	104	33	32	337	0	127	47	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split		Prot	Split			Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases												
Actuated Green, G (s)		6.2	46.1	12.0	12.0	12.0	34.9	34.9		11.7	24.9	
Effective Green, g (s)		6.2	46.1	12.0	12.0	12.0	34.9	34.9		11.7	24.9	
Actuated g/C Ratio		0.06	0.46	0.12	0.12	0.12	0.35	0.35		0.12	0.25	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		109	653	204	206	185	543	1554		205	791	
v/s Ratio Prot		c0.03	0.01	c0.06	0.06	0.02	0.02	c0.08		c0.07	c0.01	
v/s Ratio Perm												
v/c Ratio		0.42	0.02	0.51	0.50	0.18	0.06	0.22		0.62	0.06	
Uniform Delay, d1		45.2	14.7	41.2	41.2	39.6	21.6	22.9		42.0	28.6	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.99	1.17	
Incremental Delay, d2		2.6	0.0	2.0	1.9	0.5	0.2	0.3		5.5	0.0	
Delay (s)		47.8	14.7	43.2	43.2	40.0	21.8	23.2		47.2	33.6	
Level of Service		D	B	D	D	D	C	C		D	C	
Approach Delay (s)		33.5			41.4			23.2			42.6	
Approach LOS		C			D			C			D	

Intersection Summary

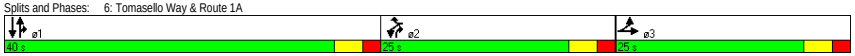
HCM Average Control Delay	33.5	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.31				
Actuated Cycle Length (s)	100.0	Sum of lost time (s)		22.0	
Intersection Capacity Utilization	44.8%	ICU Level of Service		A	
Analysis Period (min)	15				

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	65	58	7	141	0	38	0	232	251	0	137	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		913			585			432			2930	
Travel Time (s)		20.8			13.3			9.8			66.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	142	0	153	0	41	0	252	273	0	149	0
Turn Type	Split			Prot		custom			pt+ov			
Protected Phases	3	3		2		2		1	1 2		1	
Permitted Phases												
Detector Phase	3	3		2		2		1	1 2		1	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0		6.0		10.0			10.0	
Minimum Split (s)	11.0	11.0		11.0		11.0		15.0			15.0	
Total Split (s)	25.0	25.0	0.0	25.0	0.0	25.0	0.0	40.0	65.0	0.0	40.0	0.0
Total Split (%)	27.8%	27.8%	0.0%	27.8%	0.0%	27.8%	0.0%	44.4%	72.2%	0.0%	44.4%	0.0%
Yellow Time (s)	3.0	3.0		3.0		3.0		3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0		2.0		2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	4.0	5.0	4.0	5.0	5.0	4.0	5.0	4.0
Lead/Lag				Lag		Lag		Lead			Lead	
Lead-Lag Optimize?				Yes		Yes		Yes			Yes	
Recall Mode	None	None		None		None		C-Max			C-Max	
v/c Ratio		0.41		0.42		0.20		0.11	0.21		0.06	
Control Delay		39.6		40.7		13.9		8.3	1.3		7.4	
Queue Delay		0.0		0.0		0.0		0.0	0.0		0.0	
Total Delay		39.6		40.7		13.9		8.3	1.3		7.4	
Queue Length 50th (ft)		38		42		0		19	0		14	
Queue Length 95th (ft)		66		70		29		60	21		30	
Internal Link Dist (ft)		833			505			352			2850	
Turn Bay Length (ft)												
Base Capacity (vph)		766		763		384		2340	1460		2340	
Starvation Cap Reductn		0		0		0		0	0		0	
Spillback Cap Reductn		0		0		0		0	0		0	
Storage Cap Reductn		0		0		0		0	0		0	
Reduced v/c Ratio		0.19		0.20		0.11		0.11	0.19		0.06	

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 2 (2%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 40	
Control Type: Actuated-Coordinated	

Splits and Phases: 6: Tomasello Way & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	65	58	7	141	0	38	0	232	251	0	137	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0		5.0		5.0	5.0		5.0	
Lane Util. Factor		0.95		0.97		1.00		*1.00	1.00		*1.00	
Frt		0.99		1.00		0.85		1.00	0.85		1.00	
Flt Protected		0.98		0.95		1.00		1.00	1.00		1.00	
Satd. Flow (prot)		3424		3433		1583		3725	1583		3725	
Flt Permitted		0.98		0.95		1.00		1.00	1.00		1.00	
Satd. Flow (perm)		3424		3433		1583		3725	1583		3725	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	71	63	8	153	0	41	0	252	273	0	149	0
RTOR Reduction (vph)	0	5	0	0	0	37	0	0	57	0	0	0
Lane Group Flow (vph)	0	137	0	153	0	4	0	252	216	0	149	0
Turn Type	Split			Prot		custom			pt+ov			
Protected Phases	3	3		2		2		1	1 2		1	
Permitted Phases												
Actuated Green, G (s)		8.9		9.5		9.5		56.6	71.1		56.6	
Effective Green, g (s)		8.9		9.5		9.5		56.6	71.1		56.6	
Actuated g/C Ratio		0.10		0.11		0.11		0.63	0.79		0.63	
Clearance Time (s)		5.0		5.0		5.0		5.0			5.0	
Vehicle Extension (s)		3.0		3.0		3.0		3.0			3.0	
Lane Grp Cap (vph)		339		362		167		2343	1251		2343	
v/s Ratio Prot		c0.04		c0.04		0.00		0.07	c0.14		0.04	
v/s Ratio Perm												
v/c Ratio		0.40		0.42		0.03		0.11	0.17		0.06	
Uniform Delay, d1		38.1		37.7		36.1		6.6	2.3		6.5	
Progression Factor		1.00		1.00		1.00		1.12	2.53		1.00	
Incremental Delay, d2		0.8		0.8		0.1		0.1	0.1		0.1	
Delay (s)		38.8		38.5		36.2		7.5	5.9		6.5	
Level of Service		D		D		D		A	A		A	
Approach Delay (s)		38.8			38.0			6.7			6.5	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	17.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	30.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	41	11	95	404	34	149	141	293	63	130	140	15	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		0	200		200	100		200	250		0	
Storage Lanes	0		1	1		1	1		0	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		731			531			536			935		
Travel Time (s)		16.6			12.1			12.2			21.3		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99	
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%	
Shared Lane Traffic (%)				46%									
Lane Group Flow (vph)	0	56	101	232	234	159	153	386	0	131	156	0	
Turn Type	Split		pt+ov	Split		Prot	Split			Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases													
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			10.0
Minimum Split (s)	14.0	14.0		14.0	14.0	14.0	14.0	14.0		18.0			18.0
Total Split (s)	11.0	11.0	29.0	25.0	25.0	25.0	18.0	18.0	0.0	25.0	36.0	0.0	11.0
Total Split (%)	12.2%	12.2%	32.2%	27.8%	27.8%	27.8%	20.0%	20.0%	0.0%	27.8%	40.0%	0.0%	12%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag	Lag	Lag					Lead	Lead		Lead			Lag
Lead-Lag Optimize?	Yes	Yes					Yes	Yes					
Recall Mode	None	None		None	None	None	C-Max	C-Max		None			Min
v/c Ratio		0.48	0.18	0.76	0.76	0.39	0.43	0.35		0.53	0.15		
Control Delay		54.5	6.4	51.1	51.0	8.3	38.2	28.9		58.3	13.7		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		
Total Delay		54.5	6.4	51.1	51.0	8.3	38.2	28.9		58.3	13.7		
Queue Length 50th (ft)		31	0	129	130	0	79	63		76	17		
Queue Length 95th (ft)		#75	37	#228	#229	50	#169	98		134	32		
Internal Link Dist (ft)		651			451			456			855		
Turn Bay Length (ft)				200		200	100			250			
Base Capacity (vph)		117	562	340	343	435	356	1105		389	1032		
Starvation Cap Reductn		0	0	0	0	0	0	0		0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0		0	0		
Storage Cap Reductn		0	0	0	0	0	0	0		0	0		
Reduced v/c Ratio		0.48	0.18	0.68	0.68	0.37	0.43	0.35		0.34	0.15		

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 3:NBTL, Start of Green, Master Intersection
Natural Cycle: 80
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 15: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	11	95	404	34	149	141	293	63	130	140	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.95	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.99	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1759	1417	1698	1717	1538	1556	4684		1752	3419	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1759	1417	1698	1717	1538	1556	4684		1752	3419	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	44	12	101	430	36	159	153	318	68	131	141	15
RTOR Reduction (vph)	0	0	68	0	0	130	0	34	0	0	10	0
Lane Group Flow (vph)	0	56	33	232	234	29	153	352	0	131	146	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split		Prot	Split			Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases												
Actuated Green, G (s)		4.8	29.4	16.2	16.2	16.2	19.6	19.6		12.7	27.4	
Effective Green, g (s)		4.8	29.4	16.2	16.2	16.2	19.6	19.6		12.7	27.4	
Actuated g/C Ratio		0.05	0.33	0.18	0.18	0.18	0.22	0.22		0.14	0.30	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		94	463	306	309	277	339	1020		247	1041	
v/s Ratio Prot		c0.03	0.02	c0.14	0.14	0.02	c0.10	0.08		c0.07	c0.04	
v/s Ratio Perm												
v/c Ratio		0.60	0.07	0.76	0.76	0.10	0.45	0.34		0.53	0.14	
Uniform Delay, d1		41.7	20.9	35.0	35.0	30.8	30.5	29.8		35.9	22.7	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.43	0.66	
Incremental Delay, d2		9.7	0.1	10.3	10.1	0.2	4.3	0.9		2.2	0.1	
Delay (s)		51.4	21.0	45.3	45.2	31.0	34.8	30.7		53.4	15.2	
Level of Service		D	C	D	D	C	C	C		D	B	
Approach Delay (s)		31.8			41.6			31.9			32.6	
Approach LOS		C			D			C			C	

Intersection Summary

HCM Average Control Delay	35.8	HCM Level of Service		D	
HCM Volume to Capacity ratio	0.48				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		22.0	
Intersection Capacity Utilization	49.1%	ICU Level of Service		A	
Analysis Period (min)	15				

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	112	200	8	530	0	151	0	392	867	0	193	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		701			585			424			2930	
Travel Time (s)		15.9			13.3			9.6			66.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	348	0	576	0	164	0	426	942	0	210	0
Turn Type	Split			Prot		custom			pt+ov			
Protected Phases	3	3		2		2		1	1 2		1	
Permitted Phases												
Detector Phase	3	3		2		2		1	1 2		1	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0		6.0		10.0			10.0	
Minimum Split (s)	11.0	11.0		11.0		11.0		15.0			15.0	
Total Split (s)	23.0	23.0	0.0	36.0	0.0	36.0	0.0	78.0	114.0	0.0	78.0	0.0
Total Split (%)	16.8%	16.8%	0.0%	26.3%	0.0%	26.3%	0.0%	56.9%	83.2%	0.0%	56.9%	0.0%
Yellow Time (s)	3.0	3.0		3.0		3.0		3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0		2.0		2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	4.0	5.0	4.0	5.0	5.0	4.0	5.0	4.0
Lead/Lag				Lag		Lag		Lead			Lead	
Lead-Lag Optimize?				Yes		Yes		Yes			Yes	
Recall Mode	None	None		Max		Max		C-Max			C-Max	
v/c Ratio		0.80		0.74		0.34		0.21	0.73		0.10	
Control Delay		72.6		56.0		8.1		16.9	9.6		15.8	
Queue Delay		0.0		0.0		0.0		0.0	0.0		0.0	
Total Delay		72.6		56.0		8.1		16.9	9.6		15.8	
Queue Length 50th (ft)		158		247		0		97	297		45	
Queue Length 95th (ft)		215		314		59		127	446		65	
Internal Link Dist (ft)		621			505			344			2850	
Turn Bay Length (ft)												
Base Capacity (vph)		457		777		485		2010	1295		2010	
Starvation Cap Reductn		0		0		0		0	0		0	
Spillback Cap Reductn		0		0		0		0	0		0	
Storage Cap Reductn		0		0		0		0	0		0	
Reduced v/c Ratio		0.76		0.74		0.34		0.21	0.73		0.10	

Intersection Summary

Area Type: Other
Cycle Length: 137
Actuated Cycle Length: 137
Offset: 78 (57%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 6: Tomasello Way & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	112	200	8	530	0	151	0	392	867	0	193	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0		5.0		5.0	5.0		5.0	
Lane Util. Factor		0.95		0.97		1.00		*1.00	1.00		*1.00	
Frt		1.00		1.00		0.85		1.00	0.85		1.00	
Flt Protected		0.98		0.95		1.00		1.00	1.00		1.00	
Satd. Flow (prot)		3465		3433		1583		3725	1583		3725	
Flt Permitted		0.98		0.95		1.00		1.00	1.00		1.00	
Satd. Flow (perm)		3465		3433		1583		3725	1583		3725	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	122	217	9	576	0	164	0	426	942	0	210	0
RTOR Reduction (vph)	0	2	0	0	0	127	0	0	24	0	0	0
Lane Group Flow (vph)	0	346	0	576	0	37	0	426	918	0	210	0
Turn Type	Split			Prot		custom			pt+ov			
Protected Phases	3	3		2		2		1	1 2		1	
Permitted Phases												
Actuated Green, G (s)		17.1		31.0		31.0		73.9	109.9		73.9	
Effective Green, g (s)		17.1		31.0		31.0		73.9	109.9		73.9	
Actuated g/C Ratio		0.12		0.23		0.23		0.54	0.80		0.54	
Clearance Time (s)		5.0		5.0		5.0		5.0			5.0	
Vehicle Extension (s)		3.0		3.0		3.0		3.0			3.0	
Lane Grp Cap (vph)		432		777		358		2009	1270		2009	
v/s Ratio Prot		c0.10		0.17		0.02		0.11	c0.58		0.06	
v/s Ratio Perm												
v/c Ratio		0.80		0.74		0.10		0.21	0.72		0.10	
Uniform Delay, d1		58.3		49.3		42.0		16.4	6.4		15.4	
Progression Factor		1.00		1.00		1.00		1.00	1.00		1.00	
Incremental Delay, d2		10.3		6.3		0.6		0.2	3.6		0.1	
Delay (s)		68.6		55.6		42.6		16.6	10.0		15.5	
Level of Service		E		E		D		B	A		B	
Approach Delay (s)		68.6			52.7			12.0			15.5	
Approach LOS		E			D			B			B	

Intersection Summary

HCM Average Control Delay	31.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	137.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	36	3	51	240	16	249	70	942	79	194	525	12	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		0	200		200	100		200	250		0	
Storage Lanes	0		1	1		1	1		0	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		731			531			536			943		
Travel Time (s)		16.6			12.1			12.2			21.4		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99	
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%	
Shared Lane Traffic (%)				47%									
Lane Group Flow (vph)	0	41	54	135	137	265	76	1110	0	196	542	0	
Turn Type	Split		pt+ov	Split		Prot	Split			Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases													
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			10.0
Minimum Split (s)	14.0	14.0		14.0	14.0	14.0	14.0	14.0		18.0			18.0
Total Split (s)	13.0	13.0	43.0	20.0	20.0	20.0	30.0	30.0	0.0	26.0	37.0	0.0	11.0
Total Split (%)	13.0%	13.0%	43.0%	20.0%	20.0%	20.0%	30.0%	30.0%	0.0%	26.0%	37.0%	0.0%	11%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag	Lag	Lag					Lead	Lead		Lead			Lag
Lead-Lag Optimize?	Yes	Yes					Yes	Yes					
Recall Mode	None	None		None	None	None	C-Max	C-Max		None			Min
v/c Ratio		0.33	0.09	0.68	0.68	0.64	0.16	0.78		0.60	0.50		
Control Delay		50.9	6.1	59.4	59.5	12.9	30.3	38.0		45.2	29.5		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		
Total Delay		50.9	6.1	59.4	59.5	12.9	30.3	38.0		45.2	29.5		
Queue Length 50th (ft)		25	0	86	88	0	38	251		114	144		
Queue Length 95th (ft)		59	24	#156	#164	74	77	#338		184	195		
Internal Link Dist (ft)		651			451			456			863		
Turn Bay Length (ft)				200		200	100			250			
Base Capacity (vph)		139	638	222	224	431	465	1428		368	1058		
Starvation Cap Reductn		0	0	0	0	0	0	0		0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0		0	0		
Storage Cap Reductn		0	0	0	0	0	0	0		0	0		
Reduced v/c Ratio		0.29	0.08	0.61	0.61	0.61	0.16	0.78		0.53	0.51		

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 3:NBTL, Start of Green, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 15: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	3	51	240	16	249	70	942	79	194	525	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.95	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1735	1417	1698	1714	1538	1556	4750		1752	3485	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1735	1417	1698	1714	1538	1556	4750		1752	3485	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	38	3	54	255	17	265	76	1024	86	196	530	12
RTOR Reduction (vph)	0	0	32	0	0	234	0	9	0	0	1	0
Lane Group Flow (vph)	0	41	22	135	137	31	76	1101	0	196	541	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split		Prot	Split			Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases												
Actuated Green, G (s)		6.1	40.0	11.7	11.7	11.7	28.9	28.9		18.5	31.3	
Effective Green, g (s)		6.1	40.0	11.7	11.7	11.7	28.9	28.9		18.5	31.3	
Actuated g/C Ratio		0.06	0.40	0.12	0.12	0.12	0.29	0.29		0.18	0.31	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		106	567	199	201	180	450	1373		324	1091	
v/s Ratio Prot		c0.02	0.02	0.08	c0.08	0.02	0.05	c0.23		c0.11	c0.16	
v/s Ratio Perm												
v/c Ratio		0.39	0.04	0.68	0.68	0.17	0.17	0.80		0.60	0.50	
Uniform Delay, d1		45.2	18.3	42.3	42.4	39.8	26.6	32.9		37.4	27.9	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.3	0.0	8.8	9.2	0.5	0.8	5.0		3.2	0.4	
Delay (s)		47.5	18.3	51.2	51.5	40.2	27.4	37.9		40.6	28.3	
Level of Service		D	B	D	D	D	C	D		D	C	
Approach Delay (s)		30.9			45.9			37.2			31.5	
Approach LOS		C			D			D			C	

Intersection Summary

HCM Average Control Delay	37.2	HCM Level of Service		D	
HCM Volume to Capacity ratio	0.64				
Actuated Cycle Length (s)	100.0	Sum of lost time (s)		22.0	
Intersection Capacity Utilization	58.6%	ICU Level of Service		B	
Analysis Period (min)	15				

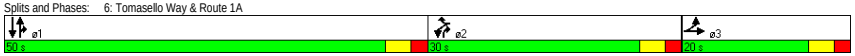
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	208	7	526	0	193	0	419	873	0	187	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		494			585			410			2930	
Travel Time (s)		11.2			13.3			9.3			66.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	299	0	572	0	210	0	455	949	0	203	0
Turn Type	Split			Prot		custom			pt+ov			
Protected Phases	3	3		2		2		1	1 2		1	
Permitted Phases												
Detector Phase	3	3		2		2		1	1 2		1	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0		6.0		10.0			10.0	
Minimum Split (s)	11.0	11.0		11.0		11.0		15.0			15.0	
Total Split (s)	20.0	20.0	0.0	30.0	0.0	30.0	0.0	50.0	80.0	0.0	50.0	0.0
Total Split (%)	20.0%	20.0%	0.0%	30.0%	0.0%	30.0%	0.0%	50.0%	80.0%	0.0%	50.0%	0.0%
Yellow Time (s)	3.0	3.0		3.0		3.0		3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0		2.0		2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	4.0	5.0	4.0	5.0	5.0	4.0	5.0	4.0
Lead/Lag				Lag		Lag		Lead			Lead	
Lead-Lag Optimize?				Yes		Yes		Yes			Yes	
Recall Mode	None	None		None		None		C-Max			C-Max	
v/c Ratio		0.65		0.72		0.40		0.25	0.76		0.11	
Control Delay		47.6		40.7		6.7		21.7	14.8		15.1	
Queue Delay		0.0		0.0		0.0		0.0	0.0		0.0	
Total Delay		47.6		40.7		6.7		21.7	14.8		15.1	
Queue Length 50th (ft)		95		169		0		84	253		35	
Queue Length 95th (ft)		138		227		56		m116	350		57	
Internal Link Dist (ft)		414			505			330			2850	
Turn Bay Length (ft)												
Base Capacity (vph)		525		858		553		1809	1276		1809	
Starvation Cap Reductn		0		0		0		0	0		0	
Spillback Cap Reductn		0		0		0		0	0		0	
Storage Cap Reductn		0		0		0		0	0		0	
Reduced v/c Ratio		0.57		0.67		0.38		0.25	0.74		0.11	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Tomasello Way & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	208	7	526	0	193	0	419	873	0	187	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0		5.0		5.0	5.0		5.0	
Lane Util. Factor		0.95		0.97		1.00		*1.00	1.00		*1.00	
Frt		1.00		1.00		0.85		1.00	0.85		1.00	
Flt Protected		0.99		0.95		1.00		1.00	1.00		1.00	
Satd. Flow (prot)		3487		3433		1583		3725	1583		3725	
Flt Permitted		0.99		0.95		1.00		1.00	1.00		1.00	
Satd. Flow (perm)		3487		3433		1583		3725	1583		3725	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	226	8	572	0	210	0	455	949	0	203	0
RTOR Reduction (vph)	0	2	0	0	0	161	0	0	35	0	0	0
Lane Group Flow (vph)	0	297	0	572	0	49	0	455	914	0	203	0
Turn Type	Split			Prot		custom			pt+ov			
Protected Phases	3	3		2		2		1	1 2		1	
Permitted Phases												
Actuated Green, G (s)		13.2		23.3		23.3		48.5	76.8		48.5	
Effective Green, g (s)		13.2		23.3		23.3		48.5	76.8		48.5	
Actuated g/C Ratio		0.13		0.23		0.23		0.48	0.77		0.48	
Clearance Time (s)		5.0		5.0		5.0		5.0			5.0	
Vehicle Extension (s)		3.0		3.0		3.0		3.0			3.0	
Lane Grp Cap (vph)		460		800		369		1807	1216		1807	
v/s Ratio Prot		c0.09		0.17		0.03		0.12	c0.58		0.05	
v/s Ratio Perm												
v/c Ratio		0.65		0.71		0.13		0.25	0.75		0.11	
Uniform Delay, d1		41.2		35.3		30.4		15.1	6.4		14.0	
Progression Factor		1.00		1.00		1.00		1.35	1.94		1.00	
Incremental Delay, d2		3.1		3.1		0.2		0.2	1.7		0.1	
Delay (s)		44.3		38.3		30.5		20.6	14.0		14.2	
Level of Service		D		D		C		C	B		B	
Approach Delay (s)		44.3			36.2			16.2			14.2	
Approach LOS		D			D			B			B	

Intersection Summary

HCM Average Control Delay	25.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	70.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	36	10	35	242	12	316	31	940	323	180	520	27	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		0	200		200	100		200	250		0	
Storage Lanes	0		1	1		1	1		0	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		731			531			536			957		
Travel Time (s)		16.6			12.1			12.2			21.8		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99	
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%	
Shared Lane Traffic (%)				48%									
Lane Group Flow (vph)	0	49	37	134	136	336	34	1373	0	182	552	0	
Turn Type	Split		pt+ov	Split		Prot	Split			Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases													
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			10.0
Minimum Split (s)	14.0	14.0		14.0	14.0	14.0	14.0	14.0		18.0			18.0
Total Split (s)	13.0	13.0	49.0	24.0	24.0	24.0	36.0	36.0	0.0	16.0	27.0	0.0	11.0
Total Split (%)	13.0%	13.0%	49.0%	24.0%	24.0%	24.0%	36.0%	36.0%	0.0%	16.0%	27.0%	0.0%	11%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag	Lag	Lag					Lead	Lead		Lead			Lag
Lead-Lag Optimize?	Yes	Yes					Yes	Yes					
Recall Mode	None	None		None	None	None	C-Max	C-Max		None			Min
v/c Ratio		0.38	0.05	0.58	0.58	0.67	0.06	0.84		0.78	0.63		
Control Delay		52.4	5.6	49.9	50.1	11.6	24.9	35.1		80.2	30.2		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		
Total Delay		52.4	5.6	49.9	50.1	11.6	24.9	35.1		80.2	30.2		
Queue Length 50th (ft)		30	0	85	86	0	15	290		109	73		
Queue Length 95th (ft)		67	18	144	146	79	38	#383		m#231	137		
Internal Link Dist (ft)		651			451			456			877		
Turn Bay Length (ft)				200		200	100			250			
Base Capacity (vph)		141	687	289	291	540	531	1640		233	871		
Starvation Cap Reductn		0	0	0	0	0	0	0		0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0		0	0		
Storage Cap Reductn		0	0	0	0	0	0	0		0	0		
Reduced v/c Ratio		0.35	0.05	0.46	0.47	0.62	0.06	0.84		0.78	0.63		

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 3:NBTL, Start of Green, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 15: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	10	35	242	12	316	31	940	323	180	520	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.95	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	0.99	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1761	1417	1698	1711	1538	1556	4630		1752	3461	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1761	1417	1698	1711	1538	1556	4630		1752	3461	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	38	11	37	257	13	336	34	1022	351	182	525	27
RTOR Reduction (vph)	0	0	21	0	0	290	0	60	0	0	4	0
Lane Group Flow (vph)	0	49	16	134	136	46	34	1313	0	182	548	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split		Prot	Split			Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases												
Actuated Green, G (s)		6.2	44.3	13.6	13.6	13.6	33.1	33.1		13.3	25.1	
Effective Green, g (s)		6.2	44.3	13.6	13.6	13.6	33.1	33.1		13.3	25.1	
Actuated g/C Ratio		0.06	0.44	0.14	0.14	0.14	0.33	0.33		0.13	0.25	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		109	628	231	233	209	515	1533		233	869	
v/s Ratio Prot		c0.03	0.01	0.08	c0.08	0.03	0.02	c0.28		c0.10	c0.16	
v/s Ratio Perm												
v/c Ratio		0.45	0.03	0.58	0.58	0.22	0.07	0.86		0.78	0.63	
Uniform Delay, d1		45.3	15.7	40.5	40.5	38.5	22.9	31.2		41.9	33.3	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.43	0.80	
Incremental Delay, d2		2.9	0.0	3.7	3.7	0.5	0.2	6.4		13.6	1.3	
Delay (s)		48.2	15.7	44.2	44.2	39.0	23.1	37.6		73.8	27.9	
Level of Service		D	B	D	D	D	C	D		E	C	
Approach Delay (s)		34.2			41.3			37.3			39.3	
Approach LOS		C			D			D			D	

Intersection Summary

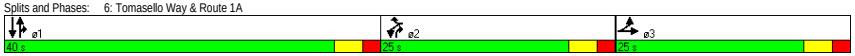
HCM Average Control Delay	38.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	64.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	69	59	8	142	0	39	0	244	255	0	144	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		913			585			432			2930	
Travel Time (s)		20.8			13.3			9.8			66.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	148	0	154	0	42	0	265	277	0	157	0
Turn Type	Split			Prot		custom			pt+ov			
Protected Phases	3	3		2		2		1	1 2		1	
Permitted Phases												
Detector Phase	3	3		2		2		1	1 2		1	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0		6.0		10.0			10.0	
Minimum Split (s)	11.0	11.0		11.0		11.0		15.0			15.0	
Total Split (s)	25.0	25.0	0.0	25.0	0.0	25.0	0.0	40.0	65.0	0.0	40.0	0.0
Total Split (%)	27.8%	27.8%	0.0%	27.8%	0.0%	27.8%	0.0%	44.4%	72.2%	0.0%	44.4%	0.0%
Yellow Time (s)	3.0	3.0		3.0		3.0		3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0		2.0		2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	4.0	5.0	4.0	5.0	5.0	4.0	5.0	4.0
Lead/Lag				Lag		Lag		Lead			Lead	
Lead-Lag Optimize?				Yes		Yes		Yes			Yes	
Recall Mode	None	None		None		None		C-Max			C-Max	
v/c Ratio		0.42		0.42		0.20		0.11	0.21		0.07	
Control Delay		39.5		40.7		14.0		8.4	1.2		7.4	
Queue Delay		0.0		0.0		0.0		0.0	0.0		0.0	
Total Delay		39.5		40.7		14.0		8.4	1.2		7.4	
Queue Length 50th (ft)		40		42		0		21	0		15	
Queue Length 95th (ft)		68		70		29		64	18		32	
Internal Link Dist (ft)		833			505			352			2850	
Turn Bay Length (ft)												
Base Capacity (vph)		765		763		384		2334	1458		2334	
Starvation Cap Reductn		0		0		0		0	0		0	
Spillback Cap Reductn		0		0		0		0	0		0	
Storage Cap Reductn		0		0		0		0	0		0	
Reduced v/c Ratio		0.19		0.20		0.11		0.11	0.19		0.07	

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 2 (2%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 40	
Control Type: Actuated-Coordinated	

Splits and Phases: 6: Tomasello Way & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	69	59	8	142	0	39	0	244	255	0	144	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0		5.0		5.0	5.0		5.0	
Lane Util. Factor		0.95		0.97		1.00		*1.00	1.00		*1.00	
Frt		0.99		1.00		0.85		1.00	0.85		1.00	
Flt Protected		0.98		0.95		1.00		1.00	1.00		1.00	
Satd. Flow (prot)		3420		3433		1583		3725	1583		3725	
Flt Permitted		0.98		0.95		1.00		1.00	1.00		1.00	
Satd. Flow (perm)		3420		3433		1583		3725	1583		3725	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	75	64	9	154	0	42	0	265	277	0	157	0
RTOR Reduction (vph)	0	6	0	0	0	38	0	0	59	0	0	0
Lane Group Flow (vph)	0	142	0	154	0	4	0	265	218	0	157	0
Turn Type	Split			Prot		custom			pt+ov			
Protected Phases	3	3		2		2		1	1 2		1	
Permitted Phases												
Actuated Green, G (s)		9.1		9.6		9.6		56.3	70.9		56.3	
Effective Green, g (s)		9.1		9.6		9.6		56.3	70.9		56.3	
Actuated g/C Ratio		0.10		0.11		0.11		0.63	0.79		0.63	
Clearance Time (s)		5.0		5.0		5.0		5.0			5.0	
Vehicle Extension (s)		3.0		3.0		3.0		3.0			3.0	
Lane Grp Cap (vph)		346		366		169		2330	1247		2330	
v/s Ratio Prot		c0.04		c0.04		0.00		0.07	c0.14		0.04	
v/s Ratio Perm												
v/c Ratio		0.41		0.42		0.03		0.11	0.17		0.07	
Uniform Delay, d1		37.9		37.6		36.0		6.8	2.4		6.6	
Progression Factor		1.00		1.00		1.00		1.12	2.35		1.00	
Incremental Delay, d2		0.8		0.8		0.1		0.1	0.1		0.1	
Delay (s)		38.7		38.4		36.1		7.7	5.6		6.6	
Level of Service		D		D		D		A	A		A	
Approach Delay (s)		38.7			37.9			6.6			6.6	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	17.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	30.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	43	11	99	424	38	165	148	291	66	137	142	15	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		0	200		200	100		200	250		0	
Storage Lanes	0		1	1		1	1		0	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		731			531			536			935		
Travel Time (s)		16.6			12.1			12.2			21.3		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99	
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%	
Shared Lane Traffic (%)				46%									
Lane Group Flow (vph)	0	58	105	244	247	176	161	388	0	138	158	0	
Turn Type	Split		pt+ov	Split		Prot	Split			Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases													
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			10.0
Minimum Split (s)	14.0	14.0		14.0	14.0	14.0	14.0	14.0		18.0			18.0
Total Split (s)	11.0	11.0	29.0	25.0	25.0	25.0	18.0	18.0	0.0	25.0	36.0	0.0	11.0
Total Split (%)	12.2%	12.2%	32.2%	27.8%	27.8%	27.8%	20.0%	20.0%	0.0%	27.8%	40.0%	0.0%	12%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag	Lag	Lag					Lead	Lead		Lead			Lag
Lead-Lag Optimize?	Yes	Yes					Yes	Yes					
Recall Mode	None	None		None	None	None	C-Max	C-Max		None			Min
v/c Ratio		0.50	0.19	0.78	0.78	0.41	0.46	0.36		0.55	0.15		
Control Delay		55.6	6.4	53.1	52.9	8.3	39.4	29.0		58.2	14.1		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		
Total Delay		55.6	6.4	53.1	52.9	8.3	39.4	29.0		58.2	14.1		
Queue Length 50th (ft)		33	0	137	138	0	84	63		81	18		
Queue Length 95th (ft)		#77	38	#247	#249	53	#181	98		140	34		
Internal Link Dist (ft)		651			451			456			855		
Turn Bay Length (ft)				200		200	100			250			
Base Capacity (vph)		117	558	340	344	448	347	1079		389	1037		
Starvation Cap Reductn		0	0	0	0	0	0	0		0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0		0	0		
Storage Cap Reductn		0	0	0	0	0	0	0		0	0		
Reduced v/c Ratio		0.50	0.19	0.72	0.72	0.39	0.46	0.36		0.35	0.15		

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 3:NBTL, Start of Green, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 15: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	43	11	99	424	38	165	148	291	66	137	142	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.95	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.99	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1758	1417	1698	1718	1538	1556	4677		1752	3420	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1758	1417	1698	1718	1538	1556	4677		1752	3420	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	46	12	105	451	40	176	161	316	72	138	143	15
RTOR Reduction (vph)	0	0	71	0	0	144	0	38	0	0	9	0
Lane Group Flow (vph)	0	58	34	244	247	32	161	350	0	138	149	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split		Prot	Split			Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases												
Actuated Green, G (s)		4.8	28.9	16.5	16.5	16.5	19.1	19.1		13.0	27.6	
Effective Green, g (s)		4.8	28.9	16.5	16.5	16.5	19.1	19.1		13.0	27.6	
Actuated g/C Ratio		0.05	0.32	0.18	0.18	0.18	0.21	0.21		0.14	0.31	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		94	455	311	315	282	330	993		253	1049	
v/s Ratio Prot		c0.03	0.02	0.14	c0.14	0.02	c0.10	0.07		c0.08	c0.04	
v/s Ratio Perm												
v/c Ratio		0.62	0.07	0.78	0.78	0.11	0.49	0.35		0.55	0.14	
Uniform Delay, d1		41.7	21.2	35.1	35.1	30.7	31.2	30.2		35.8	22.6	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.42	0.69	
Incremental Delay, d2		11.5	0.1	12.2	12.0	0.2	5.1	1.0		2.4	0.1	
Delay (s)		53.2	21.3	47.3	47.1	30.8	36.2	31.2		53.2	15.6	
Level of Service		D	C	D	D	C	D	C		D	B	
Approach Delay (s)		32.6			42.9			32.7			33.1	
Approach LOS		C			D			C			C	

Intersection Summary

HCM Average Control Delay	36.8	HCM Level of Service		D	
HCM Volume to Capacity ratio	0.50				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		22.0	
Intersection Capacity Utilization	50.1%	ICU Level of Service		A	
Analysis Period (min)	15				

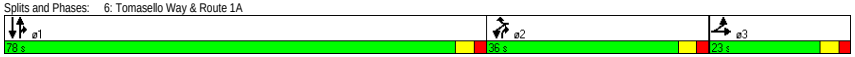
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	130	202	9	552	0	151	0	413	899	0	199	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		701			585			424			2930	
Travel Time (s)		15.9			13.3			9.6			66.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	371	0	600	0	164	0	449	977	0	216	0
Turn Type	Split			Prot		custom			pt+ov			
Protected Phases	3	3		2		2		1	1 2		1	
Permitted Phases												
Detector Phase	3	3		2		2		1	1 2		1	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0		6.0		10.0			10.0	
Minimum Split (s)	11.0	11.0		11.0		11.0		15.0			15.0	
Total Split (s)	23.0	23.0	0.0	36.0	0.0	36.0	0.0	78.0	114.0	0.0	78.0	0.0
Total Split (%)	16.8%	16.8%	0.0%	26.3%	0.0%	26.3%	0.0%	56.9%	83.2%	0.0%	56.9%	0.0%
Yellow Time (s)	3.0	3.0		3.0		3.0		3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0		2.0		2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	4.0	5.0	4.0	5.0	5.0	4.0	5.0	4.0
Lead/Lag				Lag		Lag		Lead			Lead	
Lead-Lag Optimize?				Yes		Yes		Yes			Yes	
Recall Mode	None	None		Max		Max		C-Max			C-Max	
v/c Ratio		0.84		0.77		0.34		0.22	0.76		0.11	
Control Delay		75.2		57.4		8.1		17.2	10.8		15.9	
Queue Delay		0.0		0.0		0.0		0.0	0.0		0.0	
Total Delay		75.2		57.4		8.1		17.2	10.8		15.9	
Queue Length 50th (ft)		170		260		0		103	331		46	
Queue Length 95th (ft)		#244		329		59		134	503		67	
Internal Link Dist (ft)		621			505			344			2850	
Turn Bay Length (ft)												
Base Capacity (vph)		456		777		485		2000	1290		2000	
Starvation Cap Reductn		0		0		0		0	0		0	
Spillback Cap Reductn		0		0		0		0	0		0	
Storage Cap Reductn		0		0		0		0	0		0	
Reduced v/c Ratio		0.81		0.77		0.34		0.22	0.76		0.11	

Intersection Summary

Area Type: Other
Cycle Length: 137
Actuated Cycle Length: 137
Offset: 78 (57%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 50
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Tomasello Way & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	130	202	9	552	0	151	0	413	899	0	199	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0		5.0		5.0	5.0		5.0	
Lane Util. Factor		0.95		0.97		1.00		*1.00	1.00		*1.00	
Frt		1.00		1.00		0.85		1.00	0.85		1.00	
Flt Protected		0.98		0.95		1.00		1.00	1.00		1.00	
Satd. Flow (prot)		3459		3433		1583		3725	1583		3725	
Flt Permitted		0.98		0.95		1.00		1.00	1.00		1.00	
Satd. Flow (perm)		3459		3433		1583		3725	1583		3725	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	141	220	10	600	0	164	0	449	977	0	216	0
RTOR Reduction (vph)	0	2	0	0	0	127	0	0	24	0	0	0
Lane Group Flow (vph)	0	369	0	600	0	37	0	449	953	0	216	0
Turn Type	Split			Prot		custom			pt+ov			
Protected Phases	3	3		2		2		1	1 2		1	
Permitted Phases												
Actuated Green, G (s)		17.5		31.0		31.0		73.5	109.5		73.5	
Effective Green, g (s)		17.5		31.0		31.0		73.5	109.5		73.5	
Actuated g/C Ratio		0.13		0.23		0.23		0.54	0.80		0.54	
Clearance Time (s)		5.0		5.0		5.0		5.0			5.0	
Vehicle Extension (s)		3.0		3.0		3.0		3.0			3.0	
Lane Grp Cap (vph)		442		777		358		1998	1265		1998	
v/s Ratio Prot		c0.11		0.17		0.02		0.12	c0.60		0.06	
v/s Ratio Perm												
v/c Ratio		0.84		0.77		0.10		0.22	0.75		0.11	
Uniform Delay, d1		58.3		49.7		42.0		16.7	6.9		15.6	
Progression Factor		1.00		1.00		1.00		1.00	1.00		1.00	
Incremental Delay, d2		12.8		7.3		0.6		0.3	4.2		0.1	
Delay (s)		71.2		57.0		42.6		17.0	11.1		15.7	
Level of Service		E		E		D		B	B		B	
Approach Delay (s)		71.2			53.9			13.0			15.7	
Approach LOS		E			D			B			B	

Intersection Summary

HCM Average Control Delay	32.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	137.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	38	3	54	250	17	260	74	982	81	202	546	12	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		0	200		200	100		200	250		0	
Storage Lanes	0		1	1		1	1		0	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		731			531			536			943		
Travel Time (s)		16.6			12.1			12.2			21.4		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99	
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%	
Shared Lane Traffic (%)				47%									
Lane Group Flow (vph)	0	43	57	141	143	277	80	1155	0	204	564	0	
Turn Type	Split		pt+ov	Split		Prot	Split			Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases													
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			10.0
Minimum Split (s)	14.0	14.0		14.0	14.0	14.0	14.0	14.0		18.0			18.0
Total Split (s)	13.0	13.0	43.0	20.0	20.0	20.0	30.0	30.0	0.0	26.0	37.0	0.0	11.0
Total Split (%)	13.0%	13.0%	43.0%	20.0%	20.0%	20.0%	30.0%	30.0%	0.0%	26.0%	37.0%	0.0%	11%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag	Lag	Lag					Lead	Lead		Lead			Lag
Lead-Lag Optimize?	Yes	Yes					Yes	Yes					
Recall Mode	None	None		None	None	None	C-Max	C-Max		None			Min
v/c Ratio		0.34	0.09	0.70	0.70	0.65	0.18	0.83		0.61	0.51		
Control Delay		51.3	6.0	61.2	61.2	12.9	30.6	40.4		45.0	29.5		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		
Total Delay		51.3	6.0	61.2	61.2	12.9	30.6	40.4		45.0	29.5		
Queue Length 50th (ft)		26	0	90	92	0	40	264		118	152		
Queue Length 95th (ft)		61	25	#170	#173	76	80	#361		192	204		
Internal Link Dist (ft)		651			451			456			863		
Turn Bay Length (ft)				200		200	100			250			
Base Capacity (vph)		139	631	221	223	441	455	1398		368	1063		
Starvation Cap Reductn		0	0	0	0	0	0	0		0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0		0	0		
Storage Cap Reductn		0	0	0	0	0	0	0		0	0		
Reduced v/c Ratio		0.31	0.09	0.64	0.64	0.63	0.18	0.83		0.55	0.53		

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 3:NBTL, Start of Green, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 15: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	3	54	250	17	260	74	982	81	202	546	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.95	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1735	1417	1698	1714	1538	1556	4751		1752	3486	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1735	1417	1698	1714	1538	1556	4751		1752	3486	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	40	3	57	266	18	277	80	1067	88	204	552	12
RTOR Reduction (vph)	0	0	35	0	0	244	0	9	0	0	1	0
Lane Group Flow (vph)	0	43	22	141	143	33	80	1146	0	204	563	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split		Prot	Split			Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases												
Actuated Green, G (s)		6.1	39.4	11.8	11.8	11.8	28.3	28.3		19.1	31.8	
Effective Green, g (s)		6.1	39.4	11.8	11.8	11.8	28.3	28.3		19.1	31.8	
Actuated g/C Ratio		0.06	0.39	0.12	0.12	0.12	0.28	0.28		0.19	0.32	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		106	558	200	202	181	440	1345		335	1109	
v/s Ratio Prot		c0.02	0.02	0.08	c0.08	0.02	0.05	c0.24		c0.12	c0.16	
v/s Ratio Perm												
v/c Ratio		0.41	0.04	0.70	0.71	0.18	0.18	0.85		0.61	0.51	
Uniform Delay, d1		45.2	18.7	42.4	42.4	39.7	27.1	33.9		37.0	27.7	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.5	0.0	10.7	10.8	0.5	0.9	7.0		3.1	0.4	
Delay (s)		47.7	18.7	53.2	53.2	40.2	28.0	40.8		40.2	28.1	
Level of Service		D	B	D	D	D	C	D		D	C	
Approach Delay (s)		31.2			46.8			40.0			31.3	
Approach LOS		C			D			D			C	

Intersection Summary					
HCM Average Control Delay	38.6	HCM Level of Service		D	
HCM Volume to Capacity ratio	0.66				
Actuated Cycle Length (s)	100.0	Sum of lost time (s)		22.0	
Intersection Capacity Utilization	60.2%	ICU Level of Service		B	
Analysis Period (min)	15				

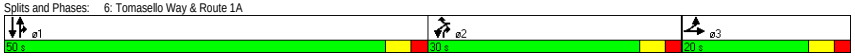
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	68	209	8	548	0	196	0	441	901	0	194	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		494			585			410			2930	
Travel Time (s)		11.2			13.3			9.3			66.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	310	0	596	0	213	0	479	979	0	211	0
Turn Type	Split			Prot		custom			pt+ov			
Protected Phases	3	3		2		2		1	1 2		1	
Permitted Phases												
Detector Phase	3	3		2		2		1	1 2		1	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0		6.0		10.0			10.0	
Minimum Split (s)	11.0	11.0		11.0		11.0		15.0			15.0	
Total Split (s)	20.0	20.0	0.0	30.0	0.0	30.0	0.0	50.0	80.0	0.0	50.0	0.0
Total Split (%)	20.0%	20.0%	0.0%	30.0%	0.0%	30.0%	0.0%	50.0%	80.0%	0.0%	50.0%	0.0%
Yellow Time (s)	3.0	3.0		3.0		3.0		3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0		2.0		2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	4.0	5.0	4.0	5.0	5.0	4.0	5.0	4.0
Lead/Lag				Lag		Lag		Lead			Lead	
Lead-Lag Optimize?				Yes		Yes		Yes			Yes	
Recall Mode	None	None		None		None		C-Max			C-Max	
v/c Ratio		0.66		0.73		0.40		0.27	0.78		0.12	
Control Delay		48.0		41.1		6.7		22.2	16.0		15.4	
Queue Delay		0.0		0.0		0.0		0.0	0.0		0.0	
Total Delay		48.0		41.1		6.7		22.2	16.0		15.4	
Queue Length 50th (ft)		98		178		0		91	258		37	
Queue Length 95th (ft)		143		238		56		m118	m349		59	
Internal Link Dist (ft)		414			505			330			2850	
Turn Bay Length (ft)												
Base Capacity (vph)		524		858		556		1787	1267		1787	
Starvation Cap Reductn		0		0		0		0	0		0	
Spillback Cap Reductn		0		0		0		0	0		0	
Storage Cap Reductn		0		0		0		0	0		0	
Reduced v/c Ratio		0.59		0.69		0.38		0.27	0.77		0.12	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Tomasello Way & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	68	209	8	548	0	196	0	441	901	0	194	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0		5.0		5.0	5.0		5.0	
Lane Util. Factor		0.95		0.97		1.00		*1.00	1.00		*1.00	
Frt		1.00		1.00		0.85		1.00	0.85		1.00	
Flt Protected		0.99		0.95		1.00		1.00	1.00		1.00	
Satd. Flow (prot)		3482		3433		1583		3725	1583		3725	
Flt Permitted		0.99		0.95		1.00		1.00	1.00		1.00	
Satd. Flow (perm)		3482		3433		1583		3725	1583		3725	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	74	227	9	596	0	213	0	479	979	0	211	0
RTOR Reduction (vph)	0	2	0	0	0	163	0	0	35	0	0	0
Lane Group Flow (vph)	0	308	0	596	0	50	0	479	944	0	211	0
Turn Type	Split			Prot		custom			pt+ov			
Protected Phases	3	3		2		2		1	1 2		1	
Permitted Phases												
Actuated Green, G (s)		13.4		23.7		23.7		47.9	76.6		47.9	
Effective Green, g (s)		13.4		23.7		23.7		47.9	76.6		47.9	
Actuated g/C Ratio		0.13		0.24		0.24		0.48	0.77		0.48	
Clearance Time (s)		5.0		5.0		5.0		5.0			5.0	
Vehicle Extension (s)		3.0		3.0		3.0		3.0			3.0	
Lane Grp Cap (vph)		467		814		375		1784	1213		1784	
v/s Ratio Prot		c0.09		0.17		0.03		0.13	c0.60		0.06	
v/s Ratio Perm												
v/c Ratio		0.66		0.73		0.13		0.27	0.78		0.12	
Uniform Delay, d1		41.1		35.2		30.1		15.6	6.8		14.4	
Progression Factor		1.00		1.00		1.00		1.35	1.94		1.00	
Incremental Delay, d2		3.5		3.4		0.2		0.2	1.9		0.1	
Delay (s)		44.6		38.6		30.2		21.2	15.0		14.5	
Level of Service		D		D		C		C	B		B	
Approach Delay (s)		44.6			36.4			17.1			14.5	
Approach LOS		D			D			B			B	

Intersection Summary

HCM Average Control Delay	25.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	38	10	37	252	12	330	32	974	335	180	542	28	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		0	200		200	100		200	250		0	
Storage Lanes	0		1	1		1	1		0	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		731			531			536			957		
Travel Time (s)		16.6			12.1			12.2			21.8		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99	
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%	
Shared Lane Traffic (%)				48%									
Lane Group Flow (vph)	0	51	39	139	142	351	35	1423	0	182	575	0	
Turn Type	Split		pt+ov	Split		Prot	Split			Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases													
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			10.0
Minimum Split (s)	14.0	14.0		14.0	14.0	14.0	14.0	14.0		18.0			18.0
Total Split (s)	13.0	13.0	49.0	24.0	24.0	24.0	36.0	36.0	0.0	16.0	27.0	0.0	11.0
Total Split (%)	13.0%	13.0%	49.0%	24.0%	24.0%	24.0%	36.0%	36.0%	0.0%	16.0%	27.0%	0.0%	11%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag	Lag	Lag					Lead	Lead		Lead			Lag
Lead-Lag Optimize?	Yes	Yes					Yes	Yes					
Recall Mode	None	None		None	None	None	C-Max	C-Max		None			Min
v/c Ratio		0.39	0.06	0.59	0.60	0.68	0.07	0.88		0.78	0.66		
Control Delay		52.9	5.5	50.4	50.7	11.6	25.0	37.5		79.5	31.8		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		
Total Delay		52.9	5.5	50.4	50.7	11.6	25.0	37.5		79.5	31.8		
Queue Length 50th (ft)		31	0	88	90	0	16	306		110	82		
Queue Length 95th (ft)		69	19	149	152	81	39	#409		m#220	146		
Internal Link Dist (ft)		651			451			456			877		
Turn Bay Length (ft)				200		200	100			250			
Base Capacity (vph)		141	684	289	291	553	526	1626		234	875		
Starvation Cap Reductn		0	0	0	0	0	0	0		0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0		0	0		
Storage Cap Reductn		0	0	0	0	0	0	0		0	0		
Reduced v/c Ratio		0.36	0.06	0.48	0.49	0.63	0.07	0.88		0.78	0.66		

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 3:NBTL, Start of Green, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 15: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	10	37	252	12	330	32	974	335	180	542	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.95	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	0.99	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1759	1417	1698	1711	1538	1556	4629		1752	3461	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1759	1417	1698	1711	1538	1556	4629		1752	3461	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	40	11	39	268	13	351	35	1059	364	182	547	28
RTOR Reduction (vph)	0	0	22	0	0	303	0	60	0	0	4	0
Lane Group Flow (vph)	0	51	17	139	142	48	35	1363	0	182	571	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split		Prot	Split			Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases												
Actuated Green, G (s)		6.2	44.0	13.8	13.8	13.8	32.8	32.8		13.4	25.2	
Effective Green, g (s)		6.2	44.0	13.8	13.8	13.8	32.8	32.8		13.4	25.2	
Actuated g/C Ratio		0.06	0.44	0.14	0.14	0.14	0.33	0.33		0.13	0.25	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		109	623	234	236	212	510	1518		235	872	
v/s Ratio Prot		c0.03	0.01	0.08	c0.08	0.03	0.02	c0.29		0.10	c0.17	
v/s Ratio Perm												
v/c Ratio		0.47	0.03	0.59	0.60	0.23	0.07	0.90		0.77	0.66	
Uniform Delay, d1		45.3	15.9	40.5	40.5	38.4	23.1	32.0		41.8	33.5	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.44	0.83	
Incremental Delay, d2		3.2	0.0	4.0	4.3	0.6	0.3	8.7		12.6	1.5	
Delay (s)		48.5	15.9	44.5	44.8	38.9	23.4	40.7		72.9	29.4	
Level of Service		D	B	D	D	D	C	D		E	C	
Approach Delay (s)		34.3			41.5			40.3			39.8	
Approach LOS		C			D			D			D	

Intersection Summary

HCM Average Control Delay	40.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	65.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

Synchro 7 Capacity Analysis
Option 11 - Modified At-Grade Alternative

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	1290	0	173	0	2560
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		0		200	
Storage Lanes	0	0		0		1	
Taper Length (ft)	25	25		25		25	
Right Turn on Red		Yes		Yes			
Link Speed (mph)	40		40				30
Link Distance (ft)	68		532				359
Travel Time (s)	1.2		9.1				8.2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	0	1402	0	188	0	2783
Turn Type					Prot		
Protected Phases			1		2		1 2
Permitted Phases							
Detector Phase			1		2		1 2
Switch Phase							
Minimum Initial (s)			4.0		4.0		
Minimum Split (s)			20.0		20.0		
Total Split (s)	0.0	0.0	62.0	0.0	28.0	0.0	90.0
Total Split (%)	0.0%	0.0%	68.9%	0.0%	31.1%	0.0%	100.0%
Maximum Green (s)			58.0		24.0		
Yellow Time (s)			3.5		3.5		
All-Red Time (s)			0.5		0.5		
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag			Lead		Lag		
Lead-Lag Optimize?			Yes		Yes		
Vehicle Extension (s)			3.0		3.0		
Recall Mode			C-Max		None		
Walk Time (s)			5.0		5.0		
Flash Dont Walk (s)			11.0		11.0		
Pedestrian Calls (#/hr)			0		0		
v/c Ratio			0.43		0.40		0.56
Control Delay			8.3		25.8		0.3
Queue Delay			0.0		0.0		0.0
Total Delay			8.3		25.8		0.3
Queue Length 50th (ft)			128		98		0
Queue Length 95th (ft)			156		m125		0
Internal Link Dist (ft)	1		452				279
Turn Bay Length (ft)					200		
Base Capacity (vph)			3277		472		4940
Starvation Cap Reductn			0		0		0
Spillback Cap Reductn			0		0		0
Storage Cap Reductn			0		0		0
Reduced v/c Ratio			0.43		0.40		0.56

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 83 (92%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 40	
Control Type: Actuated-Coordinated	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 1: Southern U-turn & Route 1A



Movement	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	1290	0	173	0	2560
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0		4.0		4.0
Lane Util. Factor			0.91		1.00		0.91
Frt			1.00		1.00		1.00
Flt Protected			1.00		0.95		1.00
Satd. Flow (prot)			5085		1770		4940
Flt Permitted			1.00		0.95		1.00
Satd. Flow (perm)			5085		1770		4940
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	1402	0	188	0	2783
RTOR Reduction (vph)	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	1402	0	188	0	2783
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%
Turn Type					Prot		
Protected Phases			1		2		1 2
Permitted Phases							
Actuated Green, G (s)			58.0		24.0		90.0
Effective Green, g (s)			58.0		24.0		90.0
Actuated g/C Ratio			0.64		0.27		1.00
Clearance Time (s)			4.0		4.0		
Vehicle Extension (s)			3.0		3.0		
Lane Grp Cap (vph)			3277		472		4940
v/s Ratio Prot			0.28		0.11		c0.56
v/s Ratio Perm							
v/c Ratio			0.43		0.40		0.56
Uniform Delay, d1			7.9		27.1		0.0
Progression Factor			1.00		0.87		1.00
Incremental Delay, d2			0.4		0.4		0.1
Delay (s)			8.3		24.0		0.1
Level of Service			A		C		A
Approach Delay (s)	0.0		8.3				1.6
Approach LOS	A		A				A

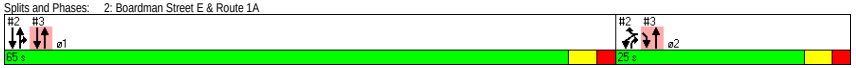
Intersection Summary			
HCM Average Control Delay	3.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	52.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	384	183	1261	202	0	2349
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250	250		100	330	
Storage Lanes	1	1		1	0	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	40		40			40
Link Distance (ft)	948		410			128
Travel Time (s)	16.2		7.0			2.2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	6%	6%	6%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	417	199	1371	220	0	2553
Turn Type		Prot		pt+ov		
Protected Phases	2	2	1	1 2		1
Permitted Phases						
Detector Phase	2	2	1	1 2		1
Switch Phase						
Minimum Initial (s)	6.0	6.0	10.0			10.0
Minimum Split (s)	15.0	15.0	15.0			15.0
Total Split (s)	25.0	25.0	65.0	90.0	0.0	65.0
Total Split (%)	27.8%	27.8%	72.2%	100.0%	0.0%	72.2%
Maximum Green (s)	20.0	20.0	60.0			60.0
Yellow Time (s)	3.0	3.0	3.0			3.0
All-Red Time (s)	2.0	2.0	2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	-1.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	4.0	4.0	5.0
Lead/Lag	Lag	Lag	Lead			Lead
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Recall Mode	None	None	C-Max			C-Max
v/c Ratio	0.57	0.51	0.42	0.14		0.78
Control Delay	34.7	24.7	3.7	0.2		2.8
Queue Delay	0.0	0.0	0.0	0.0		0.2
Total Delay	34.7	24.7	3.7	0.2		3.0
Queue Length 50th (ft)	109	63	49	0		38
Queue Length 95th (ft)	156	131	56	0		42
Internal Link Dist (ft)	868		330			48
Turn Bay Length (ft)	250	250		100		
Base Capacity (vph)	734	393	3262	1524		3293
Starvation Cap Reductn	0	0	0	0		135
Spillback Cap Reductn	0	0	0	0		0
Storage Cap Reductn	0	0	0	0		0
Reduced v/c Ratio	0.57	0.51	0.42	0.14		0.81

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green, Master Intersection	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	

Splits and Phases: 2: Boardman Street E & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	384	183	1261	202	0	2349
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.0		5.0
Lane Util. Factor	0.97	1.00	0.91	1.00		0.91
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3303	1524	4893	1524		4940
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3303	1524	4893	1524		4940
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	417	199	1371	220	0	2553
RTOR Reduction (vph)	0	54	0	0	0	0
Lane Group Flow (vph)	417	145	1371	220	0	2553
Heavy Vehicles (%)	6%	6%	6%	6%	5%	5%
Turn Type		Prot		pt+ov		
Protected Phases	2	2	1	1 2		1
Permitted Phases						
Actuated Green, G (s)	20.0	20.0	60.0	90.0		60.0
Effective Green, g (s)	20.0	20.0	60.0	90.0		60.0
Actuated g/C Ratio	0.22	0.22	0.67	1.00		0.67
Clearance Time (s)	5.0	5.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	734	339	3262	1524		3293
v/s Ratio Prot	c0.13	0.09	0.28	0.14		c0.52
v/s Ratio Perm						
v/c Ratio	0.57	0.43	0.42	0.14		0.78
Uniform Delay, d1	31.2	30.1	6.9	0.0		10.3
Progression Factor	1.00	1.00	0.48	1.00		0.15
Incremental Delay, d2	1.0	0.9	0.4	0.0		1.2
Delay (s)	32.2	30.9	3.7	0.0		2.8
Level of Service	C	C	A	A		A
Approach Delay (s)	31.8		3.2			2.8
Approach LOS	C		A			A

Intersection Summary			
HCM Average Control Delay	6.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	64.7%	ICU Level of Service	C
Analysis Period (min)	15		

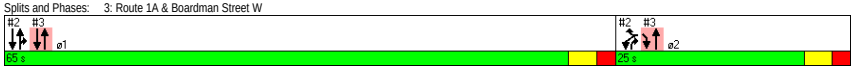
c Critical Lane Group

Lane Group	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (vph)	0	1444	2210	148	0	139
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Right Turn on Red				Yes		Yes
Link Speed (mph)		30	30		40	
Link Distance (ft)		128	896		377	
Travel Time (s)		2.9	20.4		6.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1570	2563	0	0	151
Turn Type						custom
Protected Phases		1 2	1			2
Permitted Phases						
Detector Phase		1 2	1			2
Switch Phase						
Minimum Initial (s)			10.0			6.0
Minimum Split (s)			15.0			15.0
Total Split (s)	0.0	90.0	65.0	0.0	0.0	25.0
Total Split (%)	0.0%	100.0%	72.2%	0.0%	0.0%	27.8%
Maximum Green (s)			60.0			20.0
Yellow Time (s)			3.0			3.0
All-Red Time (s)			2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	4.0	5.0
Lead/Lag			Lead			Lag
Lead-Lag Optimize?						
Vehicle Extension (s)			3.0			3.0
Recall Mode			C-Max			None
v/c Ratio		0.31	0.76			0.41
Control Delay		0.1	5.1			32.4
Queue Delay		0.0	0.0			147.7
Total Delay		0.1	5.1			180.2
Queue Length 50th (ft)		0	53			70
Queue Length 95th (ft)		0	58			128
Internal Link Dist (ft)		48	816		297	
Turn Bay Length (ft)						
Base Capacity (vph)		5085	3368			364
Starvation Cap Reductn		0	0			0
Spillback Cap Reductn		0	5			247
Storage Cap Reductn		0	0			0
Reduced v/c Ratio		0.31	0.76			1.29

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green, Master Intersection
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 3: Route 1A & Boardman Street W



Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (vph)	0	1444	2210	148	0	139
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0			5.0
Lane Util. Factor		0.91	0.91			1.00
Frt		1.00	0.99			0.86
Flt Protected		1.00	1.00			1.00
Satd. Flow (prot)		5085	5037			1611
Flt Permitted		1.00	1.00			1.00
Satd. Flow (perm)		5085	5037			1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1570	2402	161	0	151
RTOR Reduction (vph)	0	0	8	0	0	6
Lane Group Flow (vph)	0	1570	2555	0	0	145
Turn Type						custom
Protected Phases		1 2	1			2
Permitted Phases						
Actuated Green, G (s)		90.0	60.0			20.0
Effective Green, g (s)		90.0	60.0			20.0
Actuated g/C Ratio		1.00	0.67			0.22
Clearance Time (s)			5.0			5.0
Vehicle Extension (s)			3.0			3.0
Lane Grp Cap (vph)		5085	3358			358
v/s Ratio Prot		0.31	c0.51			c0.09
v/s Ratio Perm						
v/c Ratio		0.31	0.76			0.40
Uniform Delay, d1		0.0	10.1			29.9
Progression Factor		1.00	0.36			1.00
Incremental Delay, d2		0.0	1.5			0.7
Delay (s)		0.0	5.1			30.7
Level of Service		A	A			C
Approach Delay (s)		0.0	5.1		30.7	
Approach LOS		A	A		C	

Intersection Summary

HCM Average Control Delay	4.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	ø1	ø2	ø3	ø4
Lane Configurations										
Volume (vph)	0	0	1171	273	8	2358				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900				
Storage Length (ft)	170	170		150	220					
Storage Lanes	0	0		1	2					
Taper Length (ft)	25	25		25	25					
Right Turn on Red		Yes		Yes						
Link Speed (mph)	40		40			40				
Link Distance (ft)	398		504			215				
Travel Time (s)	6.8		8.6			3.7				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Shared Lane Traffic (%)										
Lane Group Flow (vph)	0	0	1273	297	9	2563				
Turn Type				Free	Prot					
Protected Phases			1 4		2 3	1 2 3 4	1	2	3	4
Permitted Phases				Free						
Detector Phase			1 4		2 3	1 2 3 4				
Switch Phase										
Minimum Initial (s)							10.0	6.0	6.0	6.0
Minimum Split (s)							15.0	11.0	11.0	11.0
Total Split (s)	0.0	0.0	68.0	0.0	22.0	90.0	52.0	11.0	11.0	16.0
Total Split (%)	0.0%	0.0%	75.6%	0.0%	24.4%	100.0%	58%	12%	12%	18%
Maximum Green (s)							47.0	6.0	6.0	11.0
Yellow Time (s)							3.0	3.0	3.0	3.0
All-Red Time (s)							2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	4.0	4.0	5.0	4.0	5.0	5.0				
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes
Vehicle Extension (s)							3.0	3.0	3.0	3.0
Recall Mode							C-Max	None	None	None
v/c Ratio			0.36	0.19	0.01	0.50				
Control Delay			3.8	0.3	26.0	0.3				
Queue Delay			0.1	0.0	0.0	0.0				
Total Delay			3.9	0.3	26.0	0.3				
Queue Length 50th (ft)			53	0	2	0				
Queue Length 95th (ft)			87	0	m3	0				
Internal Link Dist (ft)	318		424			135				
Turn Bay Length (ft)				150	220					
Base Capacity (vph)			3560	1583	648	5085				
Starvation Cap Reductn			0	0	0	0				
Spillback Cap Reductn			695	0	0	0				
Storage Cap Reductn			0	0	0	0				
Reduced v/c Ratio			0.44	0.19	0.01	0.50				

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 55 (61%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Tomesello Way Entrance & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	0	1171	273	8	2358
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			5.0	4.0	5.0	5.0
Lane Util. Factor			0.91	1.00	0.97	0.91
Frt			1.00	0.85	1.00	1.00
Flt Protected			1.00	1.00	0.95	1.00
Satd. Flow (prot)			5085	1583	3433	5085
Flt Permitted			1.00	1.00	0.95	1.00
Satd. Flow (perm)			5085	1583	3433	5085
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	1273	297	9	2563
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	1273	297	9	2563
Turn Type				Free	Prot	
Protected Phases			1 4		2 3	1 2 3 4
Permitted Phases				Free		
Actuated Green, G (s)			63.0	90.0	17.0	90.0
Effective Green, g (s)			63.0	90.0	17.0	90.0
Actuated g/C Ratio			0.70	1.00	0.19	1.00
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)			3560	1583	648	5085
v/s Ratio Prot			0.25		0.00	c0.50
v/s Ratio Perm				0.19		
v/c Ratio			0.36	0.19	0.01	0.50
Uniform Delay, d1			5.4	0.0	29.7	0.0
Progression Factor			0.65	1.00	0.87	1.00
Incremental Delay, d2			0.1	0.3	0.0	0.1
Delay (s)			3.6	0.3	25.8	0.1
Level of Service			A	A	C	A
Approach Delay (s)	0.0		3.0			0.1
Approach LOS	A		A			A

Intersection Summary

HCM Average Control Delay	1.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	56.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR	ø1	ø2	ø3	ø4
Lane Configurations										
Volume (vph)	1171	0	0	2147	225	11				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900				
Right Turn on Red		Yes				Yes				
Link Speed (mph)	40			40	40					
Link Distance (ft)	215			174	388					
Travel Time (s)	3.7			3.0	6.6					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Shared Lane Traffic (%)										
Lane Group Flow (vph)	1273	0	0	2334	245	12				
Turn Type						Prot				
Protected Phases	1 2			1 2	3 4	3 4	1	2	3	4
Permitted Phases										
Detector Phase	1 2			1 2	3 4	3 4				
Switch Phase										
Minimum Initial (s)							10.0	6.0	6.0	6.0
Minimum Split (s)							15.0	11.0	11.0	11.0
Total Split (s)	63.0	0.0	0.0	63.0	27.0	27.0	52.0	11.0	11.0	16.0
Total Split (%)	70.0%	0.0%	0.0%	70.0%	30.0%	30.0%	58%	12%	12%	18%
Maximum Green (s)							47.0	6.0	6.0	11.0
Yellow Time (s)							3.0	3.0	3.0	3.0
All-Red Time (s)							2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	5.0	4.0	4.0	5.0	5.0	5.0				
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes
Vehicle Extension (s)							3.0	3.0	3.0	3.0
Recall Mode							C-Max	None	None	None
v/c Ratio	0.39			0.71	0.29	0.03				
Control Delay	8.5			2.0	38.9	23.5				
Queue Delay	0.2			0.0	0.0	0.0				
Total Delay	8.7			2.0	38.9	23.5				
Queue Length 50th (ft)	188			18	65	1				
Queue Length 95th (ft)	239			20	98	15				
Internal Link Dist (ft)	135			94	308					
Turn Bay Length (ft)										
Base Capacity (vph)	3277			3277	839	396				
Starvation Cap Reductn	1058			0	0	0				
Spillback Cap Reductn	0			0	0	0				
Storage Cap Reductn	0			0	0	0				
Reduced v/c Ratio	0.57			0.71	0.29	0.03				

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 55 (61%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 5: Route 1A & Tomesello Way Exit



Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (vph)	1171	0	0	2147	225	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.91			0.91	0.97	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	5085			5085	3433	1583
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	5085			5085	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1273	0	0	2334	245	12
RTOR Reduction (vph)	0	0	0	0	0	9
Lane Group Flow (vph)	1273	0	0	2334	245	3
Turn Type						Prot
Protected Phases	1 2			1 2	3 4	3 4
Permitted Phases						
Actuated Green, G (s)	58.0			58.0	22.0	22.0
Effective Green, g (s)	58.0			58.0	22.0	22.0
Actuated g/C Ratio	0.64			0.64	0.24	0.24
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)	3277			3277	839	387
v/s Ratio Prot	0.25			c0.46	c0.07	0.00
v/s Ratio Perm						
v/c Ratio	0.39			0.71	0.29	0.01
Uniform Delay, d1	7.6			10.5	27.7	25.7
Progression Factor	1.06			0.10	1.36	1.71
Incremental Delay, d2	0.1			0.5	0.2	0.0
Delay (s)	8.1			1.6	37.9	44.0
Level of Service	A			A	D	D
Approach Delay (s)	8.1			1.6	38.1	
Approach LOS	A			A	D	

Intersection Summary

HCM Average Control Delay	6.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	56.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø2	ø3
Lane Configurations															
Volume (vph)	54	8	7	0	0	0	0	1179	3	0	2140	0			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Right Turn on Red			Yes			Yes			Yes			Yes			
Link Speed (mph)		40			40			40			40				
Link Distance (ft)		169			294			174			232				
Travel Time (s)		2.9			5.0			3.0			4.0				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	76	0	0	0	0	0	1285	0	0	2326	0			
Turn Type	Split														
Protected Phases	4	4						1 2 3			1 2		1	2	3
Permitted Phases															
Detector Phase	4	4						1 2 3			1 2				
Switch Phase															
Minimum Initial (s)	6.0	6.0											10.0	6.0	6.0
Minimum Split (s)	11.0	11.0											15.0	11.0	11.0
Total Split (s)	16.0	16.0	0.0	0.0	0.0	0.0	0.0	74.0	0.0	0.0	63.0	0.0	52.0	11.0	11.0
Total Split (%)	17.8%	17.8%	0.0%	0.0%	0.0%	0.0%	0.0%	82.2%	0.0%	0.0%	70.0%	0.0%	58%	12%	12%
Maximum Green (s)	11.0	11.0											47.0	6.0	6.0
Yellow Time (s)	3.0	3.0											3.0	3.0	3.0
All-Red Time (s)	2.0	2.0											2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0			
Lead/Lag	Lag	Lag											Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes											Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0											3.0	3.0	3.0
Recall Mode	None	None											C-Max	None	None
v/c Ratio		0.34						0.33			0.71				
Control Delay		38.6						0.3			12.0				
Queue Delay		0.0						0.1			0.0				
Total Delay		38.6						0.4			12.0				
Queue Length 50th (ft)		38						0			283				
Queue Length 95th (ft)		80						0			337				
Internal Link Dist (ft)		89			214			94			152				
Turn Bay Length (ft)															
Base Capacity (vph)		221						3899			3277				
Starvation Cap Reductn		0						1131			0				
Spillback Cap Reductn		0						0			0				
Storage Cap Reductn		0						0			0				
Reduced v/c Ratio		0.34						0.46			0.71				

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 55 (61%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 6: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	54	8	7	0	0	0	0	1179	3	0	2140	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.91	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1768						5084			5085	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1768						5084			5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	59	9	8	0	0	0	0	1282	3	0	2326	0
RTOR Reduction (vph)	0	4	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	72	0	0	0	0	0	1285	0	0	2326	0
Turn Type	Split											
Protected Phases	4	4						1 2 3			1 2	
Permitted Phases												
Actuated Green, G (s)		11.0						69.0			58.0	
Effective Green, g (s)		11.0						69.0			58.0	
Actuated g/C Ratio		0.12						0.77			0.64	
Clearance Time (s)		5.0										
Vehicle Extension (s)		3.0										
Lane Grp Cap (vph)		216						3898			3277	
v/s Ratio Prot		c0.04						c0.25			c0.46	
v/s Ratio Perm												
v/c Ratio		0.33						0.33			0.71	
Uniform Delay, d1		36.1						3.3			10.5	
Progression Factor		1.00						0.01			1.00	
Incremental Delay, d2		0.9						0.0			0.7	
Delay (s)		37.0						0.1			11.2	
Level of Service		D						A			B	
Approach Delay (s)		37.0			0.0			0.1			11.2	
Approach LOS		D			A			A			B	

Intersection Summary

HCM Average Control Delay	7.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	64.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	2050	0	189	0	1847
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		0		200	
Storage Lanes	0	0		0		1	
Taper Length (ft)	25	25		25		25	
Right Turn on Red		Yes		Yes			
Link Speed (mph)	40		40				30
Link Distance (ft)	62		532				359
Travel Time (s)	1.1		9.1				8.2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	0	2228	0	205	0	2008
Turn Type					Prot		
Protected Phases			1		2		1 2
Permitted Phases							
Detector Phase			1		2		1 2
Switch Phase							
Minimum Initial (s)			4.0		4.0		
Minimum Split (s)			20.0		20.0		
Total Split (s)	0.0	0.0	67.0	0.0	23.0	0.0	90.0
Total Split (%)	0.0%	0.0%	74.4%	0.0%	25.6%	0.0%	100.0%
Maximum Green (s)			63.0		19.0		
Yellow Time (s)			3.5		3.5		
All-Red Time (s)			0.5		0.5		
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag			Lead		Lag		
Lead-Lag Optimize?			Yes		Yes		
Vehicle Extension (s)			3.0		3.0		
Recall Mode			C-Max		None		
Walk Time (s)			5.0		5.0		
Flash Dont Walk (s)			11.0		11.0		
Pedestrian Calls (#/hr)			0		0		
v/c Ratio			0.63		0.55		0.41
Control Delay			8.2		27.9		0.2
Queue Delay			0.0		0.0		0.0
Total Delay			8.2		27.9		0.2
Queue Length 50th (ft)			212		109		0
Queue Length 95th (ft)			252		181		0
Internal Link Dist (ft)	1		452				279
Turn Bay Length (ft)					200		
Base Capacity (vph)			3560		374		4940
Starvation Cap Reductn			0		0		0
Spillback Cap Reductn			0		0		0
Storage Cap Reductn			0		0		0
Reduced v/c Ratio			0.63		0.55		0.41

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 77 (86%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 50
Control Type: Actuated-Coordinated

Splits and Phases: 1: Southern U-turn & Route 1A



Movement	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	2050	0	189	0	1847
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0		4.0		4.0
Lane Util. Factor			0.91		1.00		0.91
Frt			1.00		1.00		1.00
Flt Protected			1.00		0.95		1.00
Satd. Flow (prot)			5085		1770		4940
Flt Permitted			1.00		0.95		1.00
Satd. Flow (perm)			5085		1770		4940
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	2228	0	205	0	2008
RTOR Reduction (vph)	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	2228	0	205	0	2008
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%
Turn Type					Prot		
Protected Phases			1		2		1 2
Permitted Phases							
Actuated Green, G (s)			63.0		19.0		90.0
Effective Green, g (s)			63.0		19.0		90.0
Actuated g/C Ratio			0.70		0.21		1.00
Clearance Time (s)			4.0		4.0		
Vehicle Extension (s)			3.0		3.0		
Lane Grp Cap (vph)			3560		374		4940
v/s Ratio Prot			c0.44		c0.12		0.41
v/s Ratio Perm							
v/c Ratio			0.63		0.55		0.41
Uniform Delay, d1			7.2		31.7		0.0
Progression Factor			1.00		0.72		1.00
Incremental Delay, d2			0.8		1.3		0.0
Delay (s)			8.0		24.1		0.0
Level of Service			A		C		A
Approach Delay (s)	0.0		8.0				2.3
Approach LOS	A		A				A

Intersection Summary

HCM Average Control Delay	5.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	56.7%	ICU Level of Service	B
Analysis Period (min)	15		

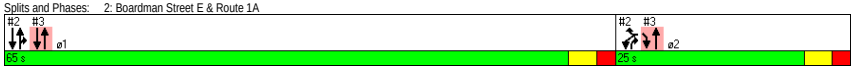
c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	182	216	2061	178	0	1854
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250	250		100	330	
Storage Lanes	1	1		1	0	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	40		40			40
Link Distance (ft)	948		410			128
Travel Time (s)	16.2		7.0			2.2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	6%	6%	6%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	198	235	2240	193	0	2015
Turn Type		Prot		pt+ov		
Protected Phases	2	2	1	1 2		1
Permitted Phases						
Detector Phase	2	2	1	1 2		1
Switch Phase						
Minimum Initial (s)	6.0	6.0	10.0			10.0
Minimum Split (s)	15.0	15.0	15.0			15.0
Total Split (s)	25.0	25.0	65.0	90.0	0.0	65.0
Total Split (%)	27.8%	27.8%	72.2%	100.0%	0.0%	72.2%
Maximum Green (s)	20.0	20.0	60.0			60.0
Yellow Time (s)	3.0	3.0	3.0			3.0
All-Red Time (s)	2.0	2.0	2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	-1.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	4.0	4.0	5.0
Lead/Lag	Lag	Lag	Lead			Lead
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Recall Mode	None	None	C-Max			C-Max
v/c Ratio	0.27	0.68	0.69	0.13		0.61
Control Delay	30.2	41.7	5.8	0.1		2.0
Queue Delay	0.0	0.0	0.0	0.0		0.0
Total Delay	30.2	41.7	5.8	0.1		2.0
Queue Length 50th (ft)	48	117	59	0		26
Queue Length 95th (ft)	78	#205	65	0		30
Internal Link Dist (ft)	868		330			48
Turn Bay Length (ft)	250	250		100		
Base Capacity (vph)	734	347	3262	1524		3293
Starvation Cap Reductn	0	0	0	0		35
Spillback Cap Reductn	0	0	0	0		0
Storage Cap Reductn	0	0	0	0		0
Reduced v/c Ratio	0.27	0.68	0.69	0.13		0.62

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green, Master Intersection
Natural Cycle: 55
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Boardman Street E & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	182	216	2061	178	0	1854
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.0		5.0
Lane Util. Factor	0.97	1.00	0.91	1.00		0.91
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3303	1524	4893	1524		4940
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3303	1524	4893	1524		4940
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	198	235	2240	193	0	2015
RTOR Reduction (vph)	0	9	0	0	0	0
Lane Group Flow (vph)	198	226	2240	193	0	2015
Heavy Vehicles (%)	6%	6%	6%	6%	5%	5%
Turn Type		Prot		pt+ov		
Protected Phases	2	2	1	1 2		1
Permitted Phases						
Actuated Green, G (s)	20.0	20.0	60.0	90.0		60.0
Effective Green, g (s)	20.0	20.0	60.0	90.0		60.0
Actuated g/C Ratio	0.22	0.22	0.67	1.00		0.67
Clearance Time (s)	5.0	5.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	734	339	3262	1524		3293
v/s Ratio Prot	0.06	c0.15	c0.46	0.13		0.41
v/s Ratio Perm						
v/c Ratio	0.27	0.67	0.69	0.13		0.61
Uniform Delay, d1	29.0	32.0	9.2	0.0		8.4
Progression Factor	1.00	1.00	0.52	1.00		0.15
Incremental Delay, d2	0.2	4.9	0.9	0.0		0.7
Delay (s)	29.2	36.9	5.7	0.0		1.9
Level of Service	C	D	A	A		A
Approach Delay (s)	33.4		5.3			1.9
Approach LOS	C		A			A

Intersection Summary

HCM Average Control Delay	6.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	61.5%	ICU Level of Service	B
Analysis Period (min)	15		

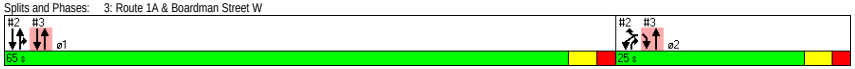
c Critical Lane Group

Lane Group	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (vph)	0	2277	1769	66	0	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Right Turn on Red				Yes		Yes
Link Speed (mph)		30	30		40	
Link Distance (ft)		128	896		377	
Travel Time (s)		2.9	20.4		6.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	2475	1995	0	0	92
Turn Type						custom
Protected Phases		1 2	1			2
Permitted Phases						
Detector Phase		1 2	1			2
Switch Phase						
Minimum Initial (s)			10.0			6.0
Minimum Split (s)			15.0			15.0
Total Split (s)	0.0	90.0	65.0	0.0	0.0	25.0
Total Split (%)	0.0%	100.0%	72.2%	0.0%	0.0%	27.8%
Maximum Green (s)			60.0			20.0
Yellow Time (s)			3.0			3.0
All-Red Time (s)			2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	4.0	5.0
Lead/Lag			Lead			Lag
Lead-Lag Optimize?						
Vehicle Extension (s)			3.0			3.0
Recall Mode			C-Max			None
v/c Ratio		0.49	0.59			0.25
Control Delay		0.2	2.0			24.3
Queue Delay		0.0	0.0			0.4
Total Delay		0.2	2.0			24.6
Queue Length 50th (ft)		0	25			33
Queue Length 95th (ft)		0	28			74
Internal Link Dist (ft)		48	816		297	
Turn Bay Length (ft)						
Base Capacity (vph)		5085	3378			375
Starvation Cap Reductn		0	0			0
Spillback Cap Reductn		0	1			81
Storage Cap Reductn		0	0			0
Reduced v/c Ratio		0.49	0.59			0.31

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green, Master Intersection
Natural Cycle: 55
Control Type: Actuated-Coordinated

Splits and Phases: 3: Route 1A & Boardman Street W



Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (vph)	0	2277	1769	66	0	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0			5.0
Lane Util. Factor		0.91	0.91			1.00
Frt		1.00	0.99			0.86
Flt Protected		1.00	1.00			1.00
Satd. Flow (prot)		5085	5058			1611
Flt Permitted		1.00	1.00			1.00
Satd. Flow (perm)		5085	5058			1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	2475	1923	72	0	92
RTOR Reduction (vph)	0	0	4	0	0	17
Lane Group Flow (vph)	0	2475	1991	0	0	75
Turn Type						custom
Protected Phases		1 2	1			2
Permitted Phases						
Actuated Green, G (s)		90.0	60.0			20.0
Effective Green, g (s)		90.0	60.0			20.0
Actuated g/C Ratio		1.00	0.67			0.22
Clearance Time (s)			5.0			5.0
Vehicle Extension (s)			3.0			3.0
Lane Grp Cap (vph)		5085	3372			358
v/s Ratio Prot		c0.49	c0.39			0.05
v/s Ratio Perm						
v/c Ratio		0.49	0.59			0.21
Uniform Delay, d1		0.0	8.2			28.5
Progression Factor		1.00	0.15			1.00
Incremental Delay, d2		0.1	0.7			0.3
Delay (s)		0.1	2.0			28.8
Level of Service		A	A			C
Approach Delay (s)		0.1	2.0		28.8	
Approach LOS		A	A		C	

Intersection Summary

HCM Average Control Delay	1.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	5.0
Intersection Capacity Utilization	49.2%	ICU Level of Service	A
Analysis Period (min)	15		

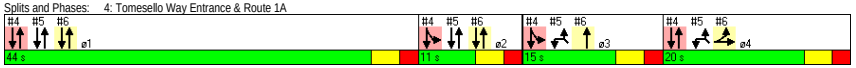
c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	ø1	ø2	ø3	ø4
Lane Configurations										
Volume (vph)	0	0	2007	300	30	1835				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900				
Storage Length (ft)	170	170		150	220					
Storage Lanes	0	0		1	2					
Taper Length (ft)	25	25		25	25					
Right Turn on Red		Yes		Yes						
Link Speed (mph)	40		40			40				
Link Distance (ft)	398		504			215				
Travel Time (s)	6.8		8.6			3.7				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Shared Lane Traffic (%)										
Lane Group Flow (vph)	0	0	2182	326	33	1995				
Turn Type				Free	Prot					
Protected Phases			1 4		2 3	1 2 3 4	1	2	3	4
Permitted Phases				Free						
Detector Phase			1 4		2 3	1 2 3 4				
Switch Phase										
Minimum Initial (s)							10.0	6.0	6.0	6.0
Minimum Split (s)							15.0	11.0	11.0	11.0
Total Split (s)	0.0	0.0	64.0	0.0	26.0	90.0	44.0	11.0	15.0	20.0
Total Split (%)	0.0%	0.0%	71.1%	0.0%	28.9%	100.0%	49%	12%	17%	22%
Maximum Green (s)							39.0	6.0	10.0	15.0
Yellow Time (s)							3.0	3.0	3.0	3.0
All-Red Time (s)							2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	4.0	4.0	5.0	4.0	5.0	5.0				
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes
Vehicle Extension (s)							3.0	3.0	3.0	3.0
Recall Mode							C-Max	None	None	None
v/c Ratio			0.65	0.21	0.04	0.39				
Control Delay			10.2	0.3	19.5	0.2				
Queue Delay			1.7	0.0	0.0	0.0				
Total Delay			11.9	0.3	19.5	0.2				
Queue Length 50th (ft)			349	0	8	0				
Queue Length 95th (ft)			420	0	m13	0				
Internal Link Dist (ft)	318		424			135				
Turn Bay Length (ft)				150	220					
Base Capacity (vph)			3334	1583	801	5085				
Starvation Cap Reductn			0	0	0	0				
Spillback Cap Reductn			921	0	0	0				
Storage Cap Reductn			0	0	0	0				
Reduced v/c Ratio			0.90	0.21	0.04	0.39				

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 64 (71%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Tomesello Way Entrance & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	0	2007	300	30	1835
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			5.0	4.0	5.0	5.0
Lane Util. Factor			0.91	1.00	0.97	0.91
Frt			1.00	0.85	1.00	1.00
Flt Protected			1.00	1.00	0.95	1.00
Satd. Flow (prot)			5085	1583	3433	5085
Flt Permitted			1.00	1.00	0.95	1.00
Satd. Flow (perm)			5085	1583	3433	5085
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	2182	326	33	1995
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	2182	326	33	1995
Turn Type				Free	Prot	
Protected Phases			1 4		2 3	1 2 3 4
Permitted Phases				Free		
Actuated Green, G (s)			59.0	90.0	21.0	90.0
Effective Green, g (s)			59.0	90.0	21.0	90.0
Actuated g/C Ratio			0.66	1.00	0.23	1.00
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)			3334	1583	801	5085
v/s Ratio Prot			c0.43		0.01	c0.39
v/s Ratio Perm				0.21		
v/c Ratio			0.65	0.21	0.04	0.39
Uniform Delay, d1			9.4	0.0	26.7	0.0
Progression Factor			0.97	1.00	0.72	1.00
Incremental Delay, d2			0.4	0.3	0.0	0.0
Delay (s)			9.5	0.3	19.4	0.0
Level of Service			A	A	B	A
Approach Delay (s)	0.0		8.3			0.4
Approach LOS	A		A			A

Intersection Summary

HCM Average Control Delay	4.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	5.0
Intersection Capacity Utilization	52.1%	ICU Level of Service	A
Analysis Period (min)	15		

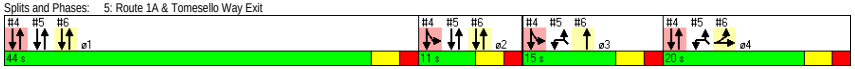
c Critical Lane Group

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR	ø1	ø2	ø3	ø4
Lane Configurations										
Volume (vph)	2007	0	0	1746	119	24				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900				
Right Turn on Red		Yes				Yes				
Link Speed (mph)	40			40	40					
Link Distance (ft)	215			174	388					
Travel Time (s)	3.7			3.0	6.6					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Shared Lane Traffic (%)										
Lane Group Flow (vph)	2182	0	0	1898	129	26				
Turn Type						Prot				
Protected Phases	1 2			1 2	3 4	3 4	1	2	3	4
Permitted Phases										
Detector Phase	1 2			1 2	3 4	3 4				
Switch Phase										
Minimum Initial (s)							10.0	6.0	6.0	6.0
Minimum Split (s)							15.0	11.0	11.0	11.0
Total Split (s)	55.0	0.0	0.0	55.0	35.0	35.0	44.0	11.0	15.0	20.0
Total Split (%)	61.1%	0.0%	0.0%	61.1%	38.9%	38.9%	49%	12%	17%	22%
Maximum Green (s)							39.0	6.0	10.0	15.0
Yellow Time (s)							3.0	3.0	3.0	3.0
All-Red Time (s)							2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	5.0	4.0	4.0	5.0	5.0	5.0				
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes
Vehicle Extension (s)							3.0	3.0	3.0	3.0
Recall Mode							C-Max	None	None	None
v/c Ratio	0.77			0.67	0.11	0.05				
Control Delay	16.2			2.3	24.4	21.3				
Queue Delay	1.4			0.0	0.0	0.0				
Total Delay	17.6			2.3	24.4	21.3				
Queue Length 50th (ft)	469			15	25	8				
Queue Length 95th (ft)	531			16	45	26				
Internal Link Dist (ft)	135			94	308					
Turn Bay Length (ft)										
Base Capacity (vph)	2825			2825	1144	531				
Starvation Cap Reductn	412			0	0	0				
Spillback Cap Reductn	0			0	0	0				
Storage Cap Reductn	0			0	0	0				
Reduced v/c Ratio	0.90			0.67	0.11	0.05				

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 64 (71%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 5: Route 1A & Tomesello Way Exit



Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (vph)	2007	0	0	1746	119	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.91			0.91	0.97	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	5085			5085	3433	1583
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	5085			5085	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2182	0	0	1898	129	26
RTOR Reduction (vph)	0	0	0	0	0	3
Lane Group Flow (vph)	2182	0	0	1898	129	23
Turn Type						Prot
Protected Phases	1 2			1 2	3 4	3 4
Permitted Phases						
Actuated Green, G (s)	50.0			50.0	30.0	30.0
Effective Green, g (s)	50.0			50.0	30.0	30.0
Actuated g/C Ratio	0.56			0.56	0.33	0.33
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)	2825			2825	1144	528
v/s Ratio Prot	c0.43			0.37	c0.04	0.01
v/s Ratio Perm						
v/c Ratio	0.77			0.67	0.11	0.04
Uniform Delay, d1	15.6			14.2	20.8	20.3
Progression Factor	0.92			0.09	1.15	1.19
Incremental Delay, d2	1.0			0.5	0.0	0.0
Delay (s)	15.4			1.8	24.0	24.2
Level of Service	B			A	C	C
Approach Delay (s)	15.4			1.8	24.1	
Approach LOS	B			A	C	

Intersection Summary

HCM Average Control Delay	9.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	52.1%	ICU Level of Service	A
Analysis Period (min)	15		

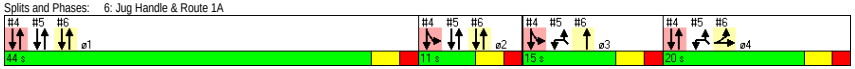
c Critical Lane Group



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø2	ø3
Lane Configurations															
Volume (vph)	100	7	8	0	0	0	0	2031	0	0	1738	0			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Right Turn on Red			Yes			Yes			Yes			Yes			
Link Speed (mph)		40			40			40			40				
Link Distance (ft)		169			294			174			232				
Travel Time (s)		2.9			5.0			3.0			4.0				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	126	0	0	0	0	0	2208	0	0	1889	0			
Turn Type	Split														
Protected Phases	4	4						1 2 3			1 2		1	2	3
Permitted Phases															
Detector Phase	4	4						1 2 3			1 2				
Switch Phase															
Minimum Initial (s)	6.0	6.0											10.0	6.0	6.0
Minimum Split (s)	11.0	11.0											15.0	11.0	11.0
Total Split (s)	20.0	20.0	0.0	0.0	0.0	0.0	0.0	70.0	0.0	0.0	55.0	0.0	44.0	11.0	15.0
Total Split (%)	22.2%	22.2%	0.0%	0.0%	0.0%	0.0%	0.0%	77.8%	0.0%	0.0%	61.1%	0.0%	49%	12%	17%
Maximum Green (s)	15.0	15.0											39.0	6.0	10.0
Yellow Time (s)	3.0	3.0											3.0	3.0	3.0
All-Red Time (s)	2.0	2.0											2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0			
Lead/Lag	Lag	Lag											Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes											Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0											3.0	3.0	3.0
Recall Mode	None	None											C-Max	None	None
v/c Ratio		0.42						0.60			0.67				
Control Delay		37.5						0.5			15.6				
Queue Delay		0.0						0.3			0.0				
Total Delay		37.5						0.8			15.6				
Queue Length 50th (ft)		63						1			260				
Queue Length 95th (ft)		118						1			311				
Internal Link Dist (ft)		89			214			94			152				
Turn Bay Length (ft)															
Base Capacity (vph)		298						3673			2825				
Starvation Cap Reductn		0						669			0				
Spillback Cap Reductn		0						0			0				
Storage Cap Reductn		0						0			0				
Reduced v/c Ratio		0.42						0.74			0.67				

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 64 (71%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	

Splits and Phases: 6: Jug Handle & Route 1A





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	100	7	8	0	0	0	0	2031	0	0	1738	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.91	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1768						5085			5085	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1768						5085			5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	109	8	9	0	0	0	0	2208	0	0	1889	0
RTOR Reduction (vph)	0	3	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	123	0	0	0	0	0	2208	0	0	1889	0
Turn Type	Split											
Protected Phases	4	4						1 2 3			1 2	
Permitted Phases												
Actuated Green, G (s)		15.0						65.0			50.0	
Effective Green, g (s)		15.0						65.0			50.0	
Actuated g/C Ratio		0.17						0.72			0.56	
Clearance Time (s)		5.0										
Vehicle Extension (s)		3.0										
Lane Grp Cap (vph)		295						3673			2825	
v/s Ratio Prot		c0.07						c0.43			c0.37	
v/s Ratio Perm												
v/c Ratio		0.42						0.60			0.67	
Uniform Delay, d1		33.6						6.1			14.1	
Progression Factor		1.00						0.01			1.00	
Incremental Delay, d2		1.0						0.2			0.6	
Delay (s)		34.5						0.3			14.8	
Level of Service		C						A			B	
Approach Delay (s)		34.5			0.0			0.3			14.8	
Approach LOS		C			A			A			B	

Intersection Summary					
HCM Average Control Delay	7.8	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.60				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	55.0%	ICU Level of Service		B	
Analysis Period (min)	15				
c Critical Lane Group					

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	1895	0	169	0	1709
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		0		200	
Storage Lanes	0	0		0		1	
Taper Length (ft)	25	25		25		25	
Right Turn on Red		Yes		Yes			
Link Speed (mph)	40		40				30
Link Distance (ft)	75		532				359
Travel Time (s)	1.3		9.1				8.2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	0	2060	0	184	0	1858
Turn Type					Prot		
Protected Phases			1		2		1 2
Permitted Phases							
Detector Phase			1		2		1 2
Switch Phase							
Minimum Initial (s)			4.0		4.0		
Minimum Split (s)			20.0		20.0		
Total Split (s)	0.0	0.0	50.0	0.0	20.0	0.0	70.0
Total Split (%)	0.0%	0.0%	71.4%	0.0%	28.6%	0.0%	100.0%
Maximum Green (s)			46.0		16.0		
Yellow Time (s)			3.5		3.5		
All-Red Time (s)			0.5		0.5		
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag			Lead		Lag		
Lead-Lag Optimize?			Yes		Yes		
Vehicle Extension (s)			3.0		3.0		
Recall Mode			C-Max		None		
Walk Time (s)			5.0		5.0		
Flash Dont Walk (s)			11.0		11.0		
Pedestrian Calls (#/hr)			0		0		
v/c Ratio			0.62		0.45		0.38
Control Delay			7.9		17.6		0.2
Queue Delay			0.0		0.0		0.0
Total Delay			7.9		17.6		0.2
Queue Length 50th (ft)			158		49		0
Queue Length 95th (ft)			198		m90		0
Internal Link Dist (ft)	1		452				279
Turn Bay Length (ft)					200		
Base Capacity (vph)			3342		405		4940
Starvation Cap Reductn			0		0		0
Spillback Cap Reductn			0		0		0
Storage Cap Reductn			0		0		0
Reduced v/c Ratio			0.62		0.45		0.38

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 54 (77%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 45
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Southern U-turn & Route 1A



Movement	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	1895	0	169	0	1709
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0		4.0		4.0
Lane Util. Factor			0.91		1.00		0.91
Frt			1.00		1.00		1.00
Flt Protected			1.00		0.95		1.00
Satd. Flow (prot)			5085		1770		4940
Flt Permitted			1.00		0.95		1.00
Satd. Flow (perm)			5085		1770		4940
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	2060	0	184	0	1858
RTOR Reduction (vph)	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	2060	0	184	0	1858
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%
Turn Type					Prot		
Protected Phases			1		2		1 2
Permitted Phases							
Actuated Green, G (s)			46.0		16.0		70.0
Effective Green, g (s)			46.0		16.0		70.0
Actuated g/C Ratio			0.66		0.23		1.00
Clearance Time (s)			4.0		4.0		
Vehicle Extension (s)			3.0		3.0		
Lane Grp Cap (vph)			3342		405		4940
v/s Ratio Prot			c0.41		0.10		c0.38
v/s Ratio Perm							
v/c Ratio			0.62		0.45		0.38
Uniform Delay, d1			6.9		23.2		0.0
Progression Factor			1.00		0.61		1.00
Incremental Delay, d2			0.9		0.7		0.0
Delay (s)			7.8		14.9		0.0
Level of Service			A		B		A
Approach Delay (s)	0.0		7.8				1.4
Approach LOS	A		A				A

Intersection Summary

HCM Average Control Delay	4.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	52.6%	ICU Level of Service	A
Analysis Period (min)	15		

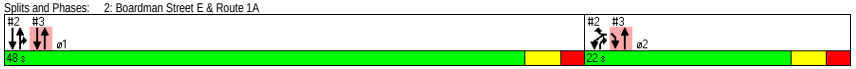
c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	184	267	1726	338	0	1694
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250	250		100	330	
Storage Lanes	1	1		1	0	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	40		40			40
Link Distance (ft)	948		410			128
Travel Time (s)	16.2		7.0			2.2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	6%	6%	6%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	200	290	1876	367	0	1841
Turn Type		Prot		pt+ov		
Protected Phases	2	2	1	1 2		1
Permitted Phases						
Detector Phase	2	2	1	1 2		1
Switch Phase						
Minimum Initial (s)	6.0	6.0	10.0			10.0
Minimum Split (s)	15.0	15.0	15.0			15.0
Total Split (s)	22.0	22.0	48.0	70.0	0.0	48.0
Total Split (%)	31.4%	31.4%	68.6%	100.0%	0.0%	68.6%
Maximum Green (s)	17.0	17.0	43.0			43.0
Yellow Time (s)	3.0	3.0	3.0			3.0
All-Red Time (s)	2.0	2.0	2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	-1.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	4.0	4.0	5.0
Lead/Lag	Lag	Lag	Lead			Lead
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Recall Mode	None	None	C-Max			C-Max
v/c Ratio	0.25	0.76	0.62	0.24		0.61
Control Delay	22.4	38.1	4.7	0.3		2.1
Queue Delay	0.0	0.0	0.0	0.0		0.0
Total Delay	22.4	38.1	4.7	0.3		2.1
Queue Length 50th (ft)	36	109	27	0		21
Queue Length 95th (ft)	61	#225	31	0		26
Internal Link Dist (ft)	868		330			48
Turn Bay Length (ft)	250	250		100		
Base Capacity (vph)	802	383	3006	1524		3035
Starvation Cap Reductn	0	0	0	0		9
Spillback Cap Reductn	0	0	0	0		0
Storage Cap Reductn	0	0	0	0		0
Reduced v/c Ratio	0.25	0.76	0.62	0.24		0.61

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green, Master Intersection
Natural Cycle: 40
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Boardman Street E & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	184	267	1726	338	0	1694
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.0		5.0
Lane Util. Factor	0.97	1.00	0.91	1.00		0.91
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3303	1524	4893	1524		4940
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3303	1524	4893	1524		4940
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	200	290	1876	367	0	1841
RTOR Reduction (vph)	0	13	0	0	0	0
Lane Group Flow (vph)	200	277	1876	367	0	1841
Heavy Vehicles (%)	6%	6%	6%	6%	5%	5%
Turn Type		Prot		pt+ov		
Protected Phases	2	2	1	1 2		1
Permitted Phases						
Actuated Green, G (s)	17.0	17.0	43.0	70.0		43.0
Effective Green, g (s)	17.0	17.0	43.0	70.0		43.0
Actuated g/C Ratio	0.24	0.24	0.61	1.00		0.61
Clearance Time (s)	5.0	5.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	802	370	3006	1524		3035
v/s Ratio Prot	0.06	c0.18	c0.38	0.24		0.37
v/s Ratio Perm						
v/c Ratio	0.25	0.75	0.62	0.24		0.61
Uniform Delay, d1	21.4	24.5	8.4	0.0		8.3
Progression Factor	1.00	1.00	0.46	1.00		0.16
Incremental Delay, d2	0.2	8.1	0.8	0.1		0.8
Delay (s)	21.5	32.6	4.7	0.1		2.1
Level of Service	C	C	A	A		A
Approach Delay (s)	28.1		3.9			2.1
Approach LOS	C		A			A

Intersection Summary

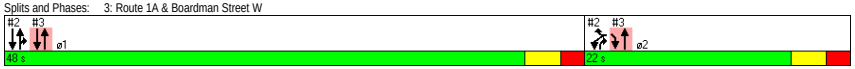
HCM Average Control Delay	5.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	58.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (vph)	0	1993	1618	47	0	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Right Turn on Red				Yes		Yes
Link Speed (mph)		30	30		40	
Link Distance (ft)		128	896		377	
Travel Time (s)		2.9	20.4		6.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	2166	1810	0	0	83
Turn Type						custom
Protected Phases		1 2	1			2
Permitted Phases						
Detector Phase		1 2	1			2
Switch Phase						
Minimum Initial (s)			10.0			6.0
Minimum Split (s)			15.0			15.0
Total Split (s)	0.0	70.0	48.0	0.0	0.0	22.0
Total Split (%)	0.0%	100.0%	68.6%	0.0%	0.0%	31.4%
Maximum Green (s)			43.0			17.0
Yellow Time (s)			3.0			3.0
All-Red Time (s)			2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	4.0	5.0
Lead/Lag			Lead			Lag
Lead-Lag Optimize?						
Vehicle Extension (s)			3.0			3.0
Recall Mode			C-Max			None
v/c Ratio		0.43	0.58			0.20
Control Delay		0.2	3.2			18.1
Queue Delay		0.0	0.0			0.0
Total Delay		0.2	3.2			18.1
Queue Length 50th (ft)		0	36			21
Queue Length 95th (ft)		0	42			54
Internal Link Dist (ft)		48	816		297	
Turn Bay Length (ft)						
Base Capacity (vph)		5085	3116			408
Starvation Cap Reductn		0	0			0
Spillback Cap Reductn		0	0			20
Storage Cap Reductn		0	0			0
Reduced v/c Ratio		0.43	0.58			0.21

Intersection Summary	
Area Type:	Other
Cycle Length: 70	
Actuated Cycle Length: 70	
Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green, Master Intersection	
Natural Cycle: 40	
Control Type: Actuated-Coordinated	

Splits and Phases: 3: Route 1A & Boardman Street W



Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (vph)	0	1993	1618	47	0	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0			5.0
Lane Util. Factor		0.91	0.91			1.00
Frt		1.00	1.00			0.86
Flt Protected		1.00	1.00			1.00
Satd. Flow (prot)		5085	5064			1611
Flt Permitted		1.00	1.00			1.00
Satd. Flow (perm)		5085	5064			1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	2166	1759	51	0	83
RTOR Reduction (vph)	0	0	4	0	0	17
Lane Group Flow (vph)	0	2166	1806	0	0	66
Turn Type						custom
Protected Phases		1 2	1			2
Permitted Phases						
Actuated Green, G (s)		70.0	43.0			17.0
Effective Green, g (s)		70.0	43.0			17.0
Actuated g/C Ratio		1.00	0.61			0.24
Clearance Time (s)			5.0			5.0
Vehicle Extension (s)			3.0			3.0
Lane Grp Cap (vph)		5085	3111			391
v/s Ratio Prot		c0.43	c0.36			0.04
v/s Ratio Perm						
v/c Ratio		0.43	0.58			0.17
Uniform Delay, d1		0.0	8.1			20.9
Progression Factor		1.00	0.30			1.00
Incremental Delay, d2		0.0	0.8			0.2
Delay (s)		0.0	3.2			21.1
Level of Service		A	A			C
Approach Delay (s)		0.0	3.2		21.1	
Approach LOS		A	A		C	

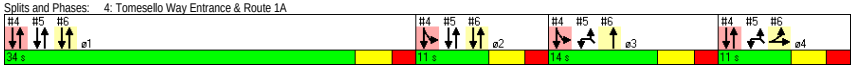
Intersection Summary			
HCM Average Control Delay	1.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	5.0
Intersection Capacity Utilization	45.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	ø1	ø2	ø3	ø4
Lane Configurations										
Volume (vph)	0	0	1691	222	26	1665				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900				
Storage Length (ft)	170	170		150	220					
Storage Lanes	0	0		1	2					
Taper Length (ft)	25	25		25	25					
Right Turn on Red		Yes		Yes						
Link Speed (mph)	40		40			40				
Link Distance (ft)	398		504			215				
Travel Time (s)	6.8		8.6			3.7				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Shared Lane Traffic (%)										
Lane Group Flow (vph)	0	0	1838	241	28	1810				
Turn Type				Free	Prot					
Protected Phases			1 4		2 3	1 2 3 4	1	2	3	4
Permitted Phases				Free						
Detector Phase			1 4		2 3	1 2 3 4				
Switch Phase										
Minimum Initial (s)							10.0	6.0	6.0	6.0
Minimum Split (s)							15.0	11.0	11.0	11.0
Total Split (s)	0.0	0.0	45.0	0.0	25.0	70.0	34.0	11.0	14.0	11.0
Total Split (%)	0.0%	0.0%	64.3%	0.0%	35.7%	100.0%	49%	16%	20%	16%
Maximum Green (s)							29.0	6.0	9.0	6.0
Yellow Time (s)							3.0	3.0	3.0	3.0
All-Red Time (s)							2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	4.0	4.0	5.0	4.0	5.0	5.0				
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes
Vehicle Extension (s)							3.0	3.0	3.0	3.0
Recall Mode							C-Max	None	None	None
v/c Ratio			0.63	0.15	0.03	0.36				
Control Delay			5.9	0.2	14.4	0.2				
Queue Delay			0.5	0.0	0.0	0.0				
Total Delay			6.4	0.2	14.4	0.2				
Queue Length 50th (ft)			61	0	5	0				
Queue Length 95th (ft)			71	0	m9	0				
Internal Link Dist (ft)	318		424			135				
Turn Bay Length (ft)				150	220					
Base Capacity (vph)			2906	1583	981	5085				
Starvation Cap Reductn			0	0	0	0				
Spillback Cap Reductn			530	0	0	0				
Storage Cap Reductn			0	0	0	0				
Reduced v/c Ratio			0.77	0.15	0.03	0.36				

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 42 (60%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 50
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Tomesello Way Entrance & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	0	1691	222	26	1665
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			5.0	4.0	5.0	5.0
Lane Util. Factor			0.91	1.00	0.97	0.91
Frt			1.00	0.85	1.00	1.00
Flt Protected			1.00	1.00	0.95	1.00
Satd. Flow (prot)			5085	1583	3433	5085
Flt Permitted			1.00	1.00	0.95	1.00
Satd. Flow (perm)			5085	1583	3433	5085
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	1838	241	28	1810
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	1838	241	28	1810
Turn Type				Free	Prot	
Protected Phases			1 4		2 3	1 2 3 4
Permitted Phases				Free		
Actuated Green, G (s)			40.0	70.0	20.0	70.0
Effective Green, g (s)			40.0	70.0	20.0	70.0
Actuated g/C Ratio			0.57	1.00	0.29	1.00
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)			2906	1583	981	5085
v/s Ratio Prot			c0.36		0.01	c0.36
v/s Ratio Perm				0.15		
v/c Ratio			0.63	0.15	0.03	0.36
Uniform Delay, d1			10.1	0.0	18.0	0.0
Progression Factor			0.48	1.00	0.79	1.00
Incremental Delay, d2			0.4	0.2	0.0	0.0
Delay (s)			5.3	0.2	14.3	0.0
Level of Service			A	A	B	A
Approach Delay (s)	0.0		4.7			0.3
Approach LOS	A		A			A

Intersection Summary

HCM Average Control Delay	2.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	5.0
Intersection Capacity Utilization	46.0%	ICU Level of Service	A
Analysis Period (min)	15		

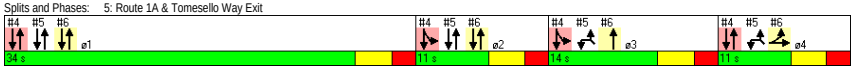
c Critical Lane Group

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR	ø1	ø2	ø3	ø4
Lane Configurations										
Volume (vph)	1691	0	0	1593	98	63				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900				
Right Turn on Red		Yes				Yes				
Link Speed (mph)	40			40	40					
Link Distance (ft)	215			174	388					
Travel Time (s)	3.7			3.0	6.6					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Shared Lane Traffic (%)										
Lane Group Flow (vph)	1838	0	0	1732	107	68				
Turn Type						Prot				
Protected Phases	1 2			1 2	3 4	3 4	1	2	3	4
Permitted Phases										
Detector Phase	1 2			1 2	3 4	3 4				
Switch Phase										
Minimum Initial (s)							10.0	6.0	6.0	6.0
Minimum Split (s)							15.0	11.0	11.0	11.0
Total Split (s)	45.0	0.0	0.0	45.0	25.0	25.0	34.0	11.0	14.0	11.0
Total Split (%)	64.3%	0.0%	0.0%	64.3%	35.7%	35.7%	49%	16%	20%	16%
Maximum Green (s)							29.0	6.0	9.0	6.0
Yellow Time (s)							3.0	3.0	3.0	3.0
All-Red Time (s)							2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	5.0	4.0	4.0	5.0	5.0	5.0				
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes
Vehicle Extension (s)							3.0	3.0	3.0	3.0
Recall Mode							C-Max	None	None	None
v/c Ratio	0.63			0.60	0.11	0.15				
Control Delay	6.9			2.0	19.4	17.3				
Queue Delay	0.5			0.0	0.0	0.0				
Total Delay	7.3			2.0	19.4	17.3				
Queue Length 50th (ft)	254			13	18	18				
Queue Length 95th (ft)	301			15	36	48				
Internal Link Dist (ft)	135			94	308					
Turn Bay Length (ft)										
Base Capacity (vph)	2906			2906	981	462				
Starvation Cap Reductn	531			0	0	0				
Spillback Cap Reductn	0			0	0	0				
Storage Cap Reductn	0			0	0	0				
Reduced v/c Ratio	0.77			0.60	0.11	0.15				

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 42 (60%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 50
Control Type: Actuated-Coordinated

Splits and Phases: 5: Route 1A & Tomesello Way Exit



Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (vph)	1691	0	0	1593	98	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.91			0.91	0.97	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	5085			5085	3433	1583
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	5085			5085	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1838	0	0	1732	107	68
RTOR Reduction (vph)	0	0	0	0	0	9
Lane Group Flow (vph)	1838	0	0	1732	107	59
Turn Type						Prot
Protected Phases	1 2			1 2	3 4	3 4
Permitted Phases						
Actuated Green, G (s)	40.0			40.0	20.0	20.0
Effective Green, g (s)	40.0			40.0	20.0	20.0
Actuated g/C Ratio	0.57			0.57	0.29	0.29
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)	2906			2906	981	452
v/s Ratio Prot	c0.36			0.34	0.03	c0.04
v/s Ratio Perm						
v/c Ratio	0.63			0.60	0.11	0.13
Uniform Delay, d1	10.1			9.7	18.4	18.5
Progression Factor	0.59			0.13	1.03	1.03
Incremental Delay, d2	0.4			0.3	0.0	0.1
Delay (s)	6.3			1.5	19.0	19.3
Level of Service	A			A	B	B
Approach Delay (s)	6.3			1.5	19.1	
Approach LOS	A			A	B	

Intersection Summary

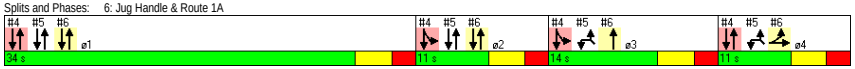
HCM Average Control Delay	4.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	46.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø2	ø3
Lane Configurations															
Volume (vph)	49	8	7	0	0	0	0	1752	2	0	1586	0			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Right Turn on Red			Yes			Yes			Yes			Yes			
Link Speed (mph)		40			40			40			40				
Link Distance (ft)		169			294			174			232				
Travel Time (s)		2.9			5.0			3.0			4.0				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	70	0	0	0	0	0	1906	0	0	1724	0			
Turn Type	Split														
Protected Phases	4	4						1 2 3			1 2		1	2	3
Permitted Phases															
Detector Phase	4	4						1 2 3			1 2				
Switch Phase															
Minimum Initial (s)	6.0	6.0											10.0	6.0	6.0
Minimum Split (s)	11.0	11.0											15.0	11.0	11.0
Total Split (s)	11.0	11.0	0.0	0.0	0.0	0.0	0.0	59.0	0.0	0.0	45.0	0.0	34.0	11.0	14.0
Total Split (%)	15.7%	15.7%	0.0%	0.0%	0.0%	0.0%	0.0%	84.3%	0.0%	0.0%	64.3%	0.0%	49%	16%	20%
Maximum Green (s)	6.0	6.0											29.0	6.0	9.0
Yellow Time (s)	3.0	3.0											3.0	3.0	3.0
All-Red Time (s)	2.0	2.0											2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0			
Lead/Lag	Lag	Lag											Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes											Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0											3.0	3.0	3.0
Recall Mode	None	None											C-Max	None	None
v/c Ratio		0.44						0.49			0.59				
Control Delay		37.4						0.4			10.8				
Queue Delay		0.0						0.1			0.0				
Total Delay		37.4						0.6			10.8				
Queue Length 50th (ft)		26						1			158				
Queue Length 95th (ft)		64						1			200				
Internal Link Dist (ft)		89			214			94			152				
Turn Bay Length (ft)															
Base Capacity (vph)		158						3923			2906				
Starvation Cap Reductn		0						767			0				
Spillback Cap Reductn		0						0			0				
Storage Cap Reductn		0						0			0				
Reduced v/c Ratio		0.44						0.60			0.59				

Intersection Summary	
Area Type:	Other
Cycle Length: 70	
Actuated Cycle Length: 70	
Offset: 42 (60%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	

Splits and Phases: 6: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	49	8	7	0	0	0	0	1752	2	0	1586	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.91	
Frt		0.98						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1767						5084			5085	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1767						5084			5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	53	9	8	0	0	0	0	1904	2	0	1724	0
RTOR Reduction (vph)	0	6	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	64	0	0	0	0	0	1906	0	0	1724	0
Turn Type	Split											
Protected Phases	4	4						1 2 3			1 2	
Permitted Phases												
Actuated Green, G (s)		6.0						54.0			40.0	
Effective Green, g (s)		6.0						54.0			40.0	
Actuated g/C Ratio		0.09						0.77			0.57	
Clearance Time (s)		5.0										
Vehicle Extension (s)		3.0										
Lane Grp Cap (vph)		151						3922			2906	
v/s Ratio Prot		c0.04						c0.37			c0.34	
v/s Ratio Perm												
v/c Ratio		0.42						0.49			0.59	
Uniform Delay, d1		30.4						2.9			9.7	
Progression Factor		1.00						0.03			1.00	
Incremental Delay, d2		1.9						0.1			0.3	
Delay (s)		32.2						0.2			10.1	
Level of Service		C						A			B	
Approach Delay (s)		32.2			0.0			0.2			10.1	
Approach LOS		C			A			A			B	

Intersection Summary					
HCM Average Control Delay	5.4	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.54				
Actuated Cycle Length (s)	70.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	49.2%	ICU Level of Service		A	
Analysis Period (min)	15				
c Critical Lane Group					

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	1626	0	182	0	2926
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		0		200	
Storage Lanes	0	0		0		1	
Taper Length (ft)	25	25		25		25	
Right Turn on Red		Yes		Yes			
Link Speed (mph)	40		40				30
Link Distance (ft)	46		532				359
Travel Time (s)	0.8		9.1				8.2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	0	1767	0	198	0	3180
Turn Type					Prot		
Protected Phases			1		2		1 2
Permitted Phases							
Detector Phase			1		2		1 2
Switch Phase							
Minimum Initial (s)			4.0		4.0		
Minimum Split (s)			20.0		20.0		
Total Split (s)	0.0	0.0	62.0	0.0	28.0	0.0	90.0
Total Split (%)	0.0%	0.0%	68.9%	0.0%	31.1%	0.0%	100.0%
Maximum Green (s)			58.0		24.0		
Yellow Time (s)			3.5		3.5		
All-Red Time (s)			0.5		0.5		
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag			Lead		Lag		
Lead-Lag Optimize?			Yes		Yes		
Vehicle Extension (s)			3.0		3.0		
Recall Mode			C-Max		None		
Walk Time (s)			5.0		5.0		
Flash Dont Walk (s)			11.0		11.0		
Pedestrian Calls (#/hr)			0		0		
v/c Ratio			0.54		0.42		0.64
Control Delay			9.5		23.2		0.3
Queue Delay			0.0		0.0		0.0
Total Delay			9.5		23.2		0.3
Queue Length 50th (ft)			179		94		0
Queue Length 95th (ft)			215		m103		0
Internal Link Dist (ft)	1		452				279
Turn Bay Length (ft)					200		
Base Capacity (vph)			3277		472		4940
Starvation Cap Reductn			0		0		0
Spillback Cap Reductn			0		0		0
Storage Cap Reductn			0		0		0
Reduced v/c Ratio			0.54		0.42		0.64

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 83 (92%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 40	
Control Type: Actuated-Coordinated	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 1: Southern U-turn & Route 1A



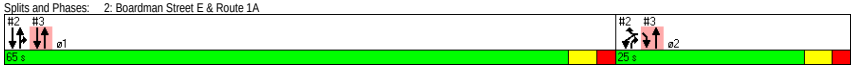
Movement	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	1626	0	182	0	2926
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0		4.0		4.0
Lane Util. Factor			0.91		1.00		0.91
Frt			1.00		1.00		1.00
Flt Protected			1.00		0.95		1.00
Satd. Flow (prot)			5085		1770		4940
Flt Permitted			1.00		0.95		1.00
Satd. Flow (perm)			5085		1770		4940
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	1767	0	198	0	3180
RTOR Reduction (vph)	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	1767	0	198	0	3180
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%
Turn Type					Prot		
Protected Phases			1		2		1 2
Permitted Phases							
Actuated Green, G (s)			58.0		24.0		90.0
Effective Green, g (s)			58.0		24.0		90.0
Actuated g/C Ratio			0.64		0.27		1.00
Clearance Time (s)			4.0		4.0		
Vehicle Extension (s)			3.0		3.0		
Lane Grp Cap (vph)			3277		472		4940
v/s Ratio Prot			0.35		0.11		c0.64
v/s Ratio Perm							
v/c Ratio			0.54		0.42		0.64
Uniform Delay, d1			8.7		27.2		0.0
Progression Factor			1.00		0.79		1.00
Incremental Delay, d2			0.6		0.3		0.1
Delay (s)			9.4		21.7		0.1
Level of Service			A		C		A
Approach Delay (s)	0.0		9.4				1.4
Approach LOS	A		A				A

Intersection Summary			
HCM Average Control Delay	4.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	59.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	404	193	1604	204	0	2704
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250	250		100	330	
Storage Lanes	1	1		1	0	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	40		40			40
Link Distance (ft)	948		410			128
Travel Time (s)	16.2		7.0			2.2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	6%	6%	6%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	439	210	1743	222	0	2939
Turn Type		Prot		pt+ov		
Protected Phases	2	2	1	1 2		1
Permitted Phases						
Detector Phase	2	2	1	1 2		1
Switch Phase						
Minimum Initial (s)	6.0	6.0	10.0			10.0
Minimum Split (s)	15.0	15.0	15.0			15.0
Total Split (s)	25.0	25.0	65.0	90.0	0.0	65.0
Total Split (%)	27.8%	27.8%	72.2%	100.0%	0.0%	72.2%
Maximum Green (s)	20.0	20.0	60.0			60.0
Yellow Time (s)	3.0	3.0	3.0			3.0
All-Red Time (s)	2.0	2.0	2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	-1.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	4.0	4.0	5.0
Lead/Lag	Lag	Lag	Lead			Lead
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Recall Mode	None	None	C-Max			C-Max
v/c Ratio	0.60	0.58	0.53	0.15		0.89
Control Delay	35.4	33.5	3.6	0.2		4.4
Queue Delay	0.0	0.0	0.0	0.0		1.1
Total Delay	35.4	33.5	3.6	0.2		5.6
Queue Length 50th (ft)	115	90	55	0		42
Queue Length 95th (ft)	164	164	62	0		65
Internal Link Dist (ft)	868		330			48
Turn Bay Length (ft)	250	250		100		
Base Capacity (vph)	734	364	3262	1524		3293
Starvation Cap Reductn	0	0	0	0		163
Spillback Cap Reductn	0	0	0	0		0
Storage Cap Reductn	0	0	0	0		0
Reduced v/c Ratio	0.60	0.58	0.53	0.15		0.94

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green, Master Intersection	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	

Splits and Phases: 2: Boardman Street E & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	404	193	1604	204	0	2704
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.0		5.0
Lane Util. Factor	0.97	1.00	0.91	1.00		0.91
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3303	1524	4893	1524		4940
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3303	1524	4893	1524		4940
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	439	210	1743	222	0	2939
RTOR Reduction (vph)	0	25	0	0	0	0
Lane Group Flow (vph)	439	185	1743	222	0	2939
Heavy Vehicles (%)	6%	6%	6%	6%	5%	5%
Turn Type		Prot		pt+ov		
Protected Phases	2	2	1	1 2		1
Permitted Phases						
Actuated Green, G (s)	20.0	20.0	60.0	90.0		60.0
Effective Green, g (s)	20.0	20.0	60.0	90.0		60.0
Actuated g/C Ratio	0.22	0.22	0.67	1.00		0.67
Clearance Time (s)	5.0	5.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	734	339	3262	1524		3293
v/s Ratio Prot	c0.13	0.12	0.36	0.15		c0.59
v/s Ratio Perm						
v/c Ratio	0.60	0.55	0.53	0.15		0.89
Uniform Delay, d1	31.4	31.0	7.8	0.0		12.3
Progression Factor	1.00	1.00	0.39	1.00		0.16
Incremental Delay, d2	1.3	1.8	0.5	0.0		2.1
Delay (s)	32.7	32.8	3.6	0.0		4.1
Level of Service	C	C	A	A		A
Approach Delay (s)	32.7		3.2			4.1
Approach LOS	C		A			A

Intersection Summary			
HCM Average Control Delay	7.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		

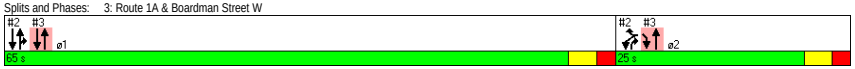
c Critical Lane Group

Lane Group	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (vph)	0	1797	2557	192	0	147
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Right Turn on Red				Yes		Yes
Link Speed (mph)		30	30		40	
Link Distance (ft)		128	896		377	
Travel Time (s)		2.9	20.4		6.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1953	2988	0	0	160
Turn Type						custom
Protected Phases		1 2	1			2
Permitted Phases						
Detector Phase		1 2	1			2
Switch Phase						
Minimum Initial (s)			10.0			6.0
Minimum Split (s)			15.0			15.0
Total Split (s)	0.0	90.0	65.0	0.0	0.0	25.0
Total Split (%)	0.0%	100.0%	72.2%	0.0%	0.0%	27.8%
Maximum Green (s)			60.0			20.0
Yellow Time (s)			3.0			3.0
All-Red Time (s)			2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	4.0	5.0
Lead/Lag			Lead			Lag
Lead-Lag Optimize?						
Vehicle Extension (s)			3.0			3.0
Recall Mode			C-Max			None
v/c Ratio		0.38	0.89			0.44
Control Delay		0.2	9.3			34.2
Queue Delay		0.0	0.0			670.2
Total Delay		0.2	9.3			704.4
Queue Length 50th (ft)		0	78			77
Queue Length 95th (ft)		0	94			138
Internal Link Dist (ft)		48	816		297	
Turn Bay Length (ft)						
Base Capacity (vph)		5085	3365			360
Starvation Cap Reductn		0	0			0
Spillback Cap Reductn		0	6			295
Storage Cap Reductn		0	0			0
Reduced v/c Ratio		0.38	0.89			2.46

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green, Master Intersection
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 3: Route 1A & Boardman Street W



Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (vph)	0	1797	2557	192	0	147
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0			5.0
Lane Util. Factor		0.91	0.91			1.00
Frt		1.00	0.99			0.86
Flt Protected		1.00	1.00			1.00
Satd. Flow (prot)		5085	5032			1611
Flt Permitted		1.00	1.00			1.00
Satd. Flow (perm)		5085	5032			1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1953	2779	209	0	160
RTOR Reduction (vph)	0	0	9	0	0	2
Lane Group Flow (vph)	0	1953	2979	0	0	158
Turn Type						custom
Protected Phases		1 2	1			2
Permitted Phases						
Actuated Green, G (s)		90.0	60.0			20.0
Effective Green, g (s)		90.0	60.0			20.0
Actuated g/C Ratio		1.00	0.67			0.22
Clearance Time (s)			5.0			5.0
Vehicle Extension (s)			3.0			3.0
Lane Grp Cap (vph)		5085	3355			358
v/s Ratio Prot		c0.38	c0.59			0.10
v/s Ratio Perm						
v/c Ratio		0.38	0.89			0.44
Uniform Delay, d1		0.0	12.3			30.2
Progression Factor		1.00	0.47			1.00
Incremental Delay, d2		0.0	3.3			0.9
Delay (s)		0.0	9.0			31.0
Level of Service		A	A			C
Approach Delay (s)		0.0	9.0		31.0	
Approach LOS		A	A		C	

Intersection Summary

HCM Average Control Delay	6.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	5.0
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	ø1	ø2	ø3	ø4
Lane Configurations										
Volume (vph)	0	0	1369	428	58	2710				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900				
Storage Length (ft)	170	170		150	220					
Storage Lanes	0	0		1	2					
Taper Length (ft)	25	25		25	25					
Right Turn on Red		Yes		Yes						
Link Speed (mph)	40		40			40				
Link Distance (ft)	398		504			215				
Travel Time (s)	6.8		8.6			3.7				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Shared Lane Traffic (%)										
Lane Group Flow (vph)	0	0	1488	465	63	2946				
Turn Type				Free	Prot					
Protected Phases			1 4		2 3	1 2 3 4	1	2	3	4
Permitted Phases				Free						
Detector Phase			1 4		2 3	1 2 3 4				
Switch Phase										
Minimum Initial (s)							10.0	6.0	6.0	6.0
Minimum Split (s)							15.0	11.0	11.0	11.0
Total Split (s)	0.0	0.0	68.0	0.0	22.0	90.0	52.0	11.0	11.0	16.0
Total Split (%)	0.0%	0.0%	75.6%	0.0%	24.4%	100.0%	58%	12%	12%	18%
Maximum Green (s)							47.0	6.0	6.0	11.0
Yellow Time (s)							3.0	3.0	3.0	3.0
All-Red Time (s)							2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	4.0	4.0	5.0	4.0	5.0	5.0				
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes
Vehicle Extension (s)							3.0	3.0	3.0	3.0
Recall Mode							C-Max	None	None	None
v/c Ratio			0.42	0.29	0.10	0.58				
Control Delay			3.9	0.4	26.4	0.3				
Queue Delay			0.1	0.0	0.0	0.0				
Total Delay			4.0	0.4	26.4	0.3				
Queue Length 50th (ft)			61	0	17	0				
Queue Length 95th (ft)			103	0	m21	0				
Internal Link Dist (ft)	318		424			135				
Turn Bay Length (ft)				150	220					
Base Capacity (vph)			3560	1583	648	5085				
Starvation Cap Reductn			0	0	0	0				
Spillback Cap Reductn			695	0	0	0				
Storage Cap Reductn			0	0	0	0				
Reduced v/c Ratio			0.52	0.29	0.10	0.58				

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 55 (61%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Tomesello Way Entrance & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	0	1369	428	58	2710
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			5.0	4.0	5.0	5.0
Lane Util. Factor			0.91	1.00	0.97	0.91
Frt			1.00	0.85	1.00	1.00
Flt Protected			1.00	1.00	0.95	1.00
Satd. Flow (prot)			5085	1583	3433	5085
Flt Permitted			1.00	1.00	0.95	1.00
Satd. Flow (perm)			5085	1583	3433	5085
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	1488	465	63	2946
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	1488	465	63	2946
Turn Type				Free	Prot	
Protected Phases			1 4		2 3	1 2 3 4
Permitted Phases				Free		
Actuated Green, G (s)			63.0	90.0	17.0	90.0
Effective Green, g (s)			63.0	90.0	17.0	90.0
Actuated g/C Ratio			0.70	1.00	0.19	1.00
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)			3560	1583	648	5085
v/s Ratio Prot			0.29		0.02	c0.58
v/s Ratio Perm				0.29		
v/c Ratio			0.42	0.29	0.10	0.58
Uniform Delay, d1			5.7	0.0	30.2	0.0
Progression Factor			0.61	1.00	0.86	1.00
Incremental Delay, d2			0.1	0.4	0.0	0.1
Delay (s)			3.6	0.4	26.1	0.1
Level of Service			A	A	C	A
Approach Delay (s)	0.0		2.8			0.6
Approach LOS	A		A			A

Intersection Summary

HCM Average Control Delay	1.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	64.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR	ø1	ø2	ø3	ø4
Lane Configurations										
Volume (vph)	1369	0	0	2450	318	38				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900				
Right Turn on Red		Yes				Yes				
Link Speed (mph)	40			40	40					
Link Distance (ft)	215			174	388					
Travel Time (s)	3.7			3.0	6.6					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Shared Lane Traffic (%)										
Lane Group Flow (vph)	1488	0	0	2663	346	41				
Turn Type						Prot				
Protected Phases	1 2			1 2	3 4	3 4	1	2	3	4
Permitted Phases										
Detector Phase	1 2			1 2	3 4	3 4				
Switch Phase										
Minimum Initial (s)							10.0	6.0	6.0	6.0
Minimum Split (s)							15.0	11.0	11.0	11.0
Total Split (s)	63.0	0.0	0.0	63.0	27.0	27.0	52.0	11.0	11.0	16.0
Total Split (%)	70.0%	0.0%	0.0%	70.0%	30.0%	30.0%	58%	12%	12%	18%
Maximum Green (s)							47.0	6.0	6.0	11.0
Yellow Time (s)							3.0	3.0	3.0	3.0
All-Red Time (s)							2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	5.0	4.0	4.0	5.0	5.0	5.0				
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes
Vehicle Extension (s)							3.0	3.0	3.0	3.0
Recall Mode							C-Max	None	None	None
v/c Ratio	0.45			0.81	0.41	0.10				
Control Delay	9.0			2.4	34.5	12.8				
Queue Delay	0.2			0.0	0.0	0.0				
Total Delay	9.2			2.4	34.5	12.8				
Queue Length 50th (ft)	235			20	86	2				
Queue Length 95th (ft)	291			22	124	26				
Internal Link Dist (ft)	135			94	308					
Turn Bay Length (ft)										
Base Capacity (vph)	3277			3277	839	418				
Starvation Cap Reductn	784			0	0	0				
Spillback Cap Reductn	0			0	0	0				
Storage Cap Reductn	0			0	0	0				
Reduced v/c Ratio	0.60			0.81	0.41	0.10				

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 55 (61%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	

Splits and Phases: 5: Route 1A & Tomesello Way Exit



Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (vph)	1369	0	0	2450	318	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.91			0.91	0.97	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	5085			5085	3433	1583
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	5085			5085	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1488	0	0	2663	346	41
RTOR Reduction (vph)	0	0	0	0	0	31
Lane Group Flow (vph)	1488	0	0	2663	346	10
Turn Type						Prot
Protected Phases	1 2			1 2	3 4	3 4
Permitted Phases						
Actuated Green, G (s)	58.0			58.0	22.0	22.0
Effective Green, g (s)	58.0			58.0	22.0	22.0
Actuated g/C Ratio	0.64			0.64	0.24	0.24
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)	3277			3277	839	387
v/s Ratio Prot	0.29			c0.52	c0.10	0.01
v/s Ratio Perm						
v/c Ratio	0.45			0.81	0.41	0.03
Uniform Delay, d1	8.0			11.9	28.6	25.9
Progression Factor	1.05			0.09	1.14	1.38
Incremental Delay, d2	0.1			0.9	0.3	0.0
Delay (s)	8.6			2.0	33.0	35.7
Level of Service	A			A	C	D
Approach Delay (s)	8.6			2.0	33.3	
Approach LOS	A			A	C	

Intersection Summary			
HCM Average Control Delay	6.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	64.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø2	ø3
Lane Configurations															
Volume (vph)	57	8	7	0	0	0	0	1396	3	0	2443	0			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Right Turn on Red			Yes			Yes			Yes			Yes			
Link Speed (mph)		40			40			40			40				
Link Distance (ft)		169			294			174			232				
Travel Time (s)		2.9			5.0			3.0			4.0				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	79	0	0	0	0	0	1520	0	0	2655	0			
Turn Type	Split														
Protected Phases	4	4						1 2 3			1 2		1	2	3
Permitted Phases															
Detector Phase	4	4						1 2 3			1 2				
Switch Phase															
Minimum Initial (s)	6.0	6.0											10.0	6.0	6.0
Minimum Split (s)	11.0	11.0											15.0	11.0	11.0
Total Split (s)	16.0	16.0	0.0	0.0	0.0	0.0	0.0	74.0	0.0	0.0	63.0	0.0	52.0	11.0	11.0
Total Split (%)	17.8%	17.8%	0.0%	0.0%	0.0%	0.0%	0.0%	82.2%	0.0%	0.0%	70.0%	0.0%	58%	12%	12%
Maximum Green (s)	11.0	11.0											47.0	6.0	6.0
Yellow Time (s)	3.0	3.0											3.0	3.0	3.0
All-Red Time (s)	2.0	2.0											2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0			
Lead/Lag	Lag	Lag											Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes											Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0											3.0	3.0	3.0
Recall Mode	None	None											C-Max	None	None
v/c Ratio		0.36						0.39			0.81				
Control Delay		39.1						0.4			14.5				
Queue Delay		0.0						0.1			0.0				
Total Delay		39.1						0.4			14.5				
Queue Length 50th (ft)		39						1			368				
Queue Length 95th (ft)		82						1			437				
Internal Link Dist (ft)		89			214			94			152				
Turn Bay Length (ft)															
Base Capacity (vph)		220						3899			3277				
Starvation Cap Reductn		0						740			0				
Spillback Cap Reductn		0						0			0				
Storage Cap Reductn		0						0			0				
Reduced v/c Ratio		0.36						0.48			0.81				

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 55 (61%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 6: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	57	8	7	0	0	0	0	1396	3	0	2443	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.91	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1768						5084			5085	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1768						5084			5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	62	9	8	0	0	0	0	1517	3	0	2655	0
RTOR Reduction (vph)	0	4	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	75	0	0	0	0	0	1520	0	0	2655	0
Turn Type	Split											
Protected Phases	4	4						1 2 3			1 2	
Permitted Phases												
Actuated Green, G (s)		11.0						69.0			58.0	
Effective Green, g (s)		11.0						69.0			58.0	
Actuated g/C Ratio		0.12						0.77			0.64	
Clearance Time (s)		5.0										
Vehicle Extension (s)		3.0										
Lane Grp Cap (vph)		216						3898			3277	
v/s Ratio Prot		c0.04						c0.30			c0.52	
v/s Ratio Perm												
v/c Ratio		0.35						0.39			0.81	
Uniform Delay, d1		36.2						3.5			11.9	
Progression Factor		1.00						0.02			1.00	
Incremental Delay, d2		1.0						0.1			1.6	
Delay (s)		37.2						0.1			13.5	
Level of Service		D						A			B	
Approach Delay (s)		37.2			0.0			0.1			13.5	
Approach LOS		D			A			A			B	

Intersection Summary

HCM Average Control Delay	9.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	3001	0	233	0	2694
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		0		200	
Storage Lanes	0	0		0		1	
Taper Length (ft)	25	25		25		25	
Right Turn on Red		Yes		Yes			
Link Speed (mph)	40		40				30
Link Distance (ft)	74		532				359
Travel Time (s)	1.3		9.1				8.2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	0	3262	0	253	0	2928
Turn Type					Prot		
Protected Phases			1		2		1 2
Permitted Phases							
Detector Phase			1		2		1 2
Switch Phase							
Minimum Initial (s)			4.0		4.0		
Minimum Split (s)			20.0		20.0		
Total Split (s)	0.0	0.0	67.0	0.0	23.0	0.0	90.0
Total Split (%)	0.0%	0.0%	74.4%	0.0%	25.6%	0.0%	100.0%
Maximum Green (s)			63.0		19.0		
Yellow Time (s)			3.5		3.5		
All-Red Time (s)			0.5		0.5		
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag			Lead		Lag		
Lead-Lag Optimize?			Yes		Yes		
Vehicle Extension (s)			3.0		3.0		
Recall Mode			C-Max		None		
Walk Time (s)			5.0		5.0		
Flash Dont Walk (s)			11.0		11.0		
Pedestrian Calls (#/hr)			0		0		
v/c Ratio			0.92		0.68		0.59
Control Delay			16.8		29.2		0.3
Queue Delay			0.6		0.0		0.0
Total Delay			17.5		29.2		0.3
Queue Length 50th (ft)			487		131		0
Queue Length 95th (ft)			585		m147		0
Internal Link Dist (ft)	1		452				279
Turn Bay Length (ft)					200		
Base Capacity (vph)			3560		374		4940
Starvation Cap Reductn			0		0		0
Spillback Cap Reductn			84		0		0
Storage Cap Reductn			0		0		0
Reduced v/c Ratio			0.94		0.68		0.59

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 77 (86%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 1: Southern U-turn & Route 1A



Movement	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	3001	0	233	0	2694
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0		4.0		4.0
Lane Util. Factor			0.91		1.00		0.91
Frt			1.00		1.00		1.00
Flt Protected			1.00		0.95		1.00
Satd. Flow (prot)			5085		1770		4940
Flt Permitted			1.00		0.95		1.00
Satd. Flow (perm)			5085		1770		4940
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	3262	0	253	0	2928
RTOR Reduction (vph)	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	3262	0	253	0	2928
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%
Turn Type					Prot		
Protected Phases			1		2		1 2
Permitted Phases							
Actuated Green, G (s)			63.0		19.0		90.0
Effective Green, g (s)			63.0		19.0		90.0
Actuated g/C Ratio			0.70		0.21		1.00
Clearance Time (s)			4.0		4.0		
Vehicle Extension (s)			3.0		3.0		
Lane Grp Cap (vph)			3560		374		4940
v/s Ratio Prot			c0.64		0.14		c0.59
v/s Ratio Perm							
v/c Ratio			0.92		0.68		0.59
Uniform Delay, d1			11.3		32.7		0.0
Progression Factor			1.00		0.72		1.00
Incremental Delay, d2			4.9		2.5		0.1
Delay (s)			16.2		26.0		0.1
Level of Service			B		C		A
Approach Delay (s)	0.0		16.2				2.2
Approach LOS	A		B				A

Intersection Summary			
HCM Average Control Delay	9.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	77.6%	ICU Level of Service	D
Analysis Period (min)	15		

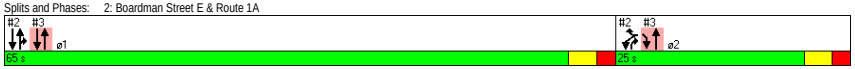
c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	240	265	2958	276	0	2687
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250	250		100	330	
Storage Lanes	1	1		1	0	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	40		40			40
Link Distance (ft)	948		410			128
Travel Time (s)	16.2		7.0			2.2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	6%	6%	6%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	261	288	3215	300	0	2921
Turn Type		Prot		pt+ov		
Protected Phases	2	2	1	1 2		1
Permitted Phases						
Detector Phase	2	2	1	1 2		1
Switch Phase						
Minimum Initial (s)	6.0	6.0	10.0			10.0
Minimum Split (s)	15.0	15.0	15.0			15.0
Total Split (s)	25.0	25.0	65.0	90.0	0.0	65.0
Total Split (%)	27.8%	27.8%	72.2%	100.0%	0.0%	72.2%
Maximum Green (s)	20.0	20.0	60.0			60.0
Yellow Time (s)	3.0	3.0	3.0			3.0
All-Red Time (s)	2.0	2.0	2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	-1.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	4.0	4.0	5.0
Lead/Lag	Lag	Lag	Lead			Lead
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Recall Mode	None	None	C-Max			C-Max
v/c Ratio	0.36	0.85	0.99	0.20		0.89
Control Delay	31.2	57.7	15.0	0.1		3.9
Queue Delay	0.0	0.0	2.5	0.0		0.0
Total Delay	31.2	57.7	17.5	0.1		3.9
Queue Length 50th (ft)	64	157	106	0		32
Queue Length 95th (ft)	100	#300	#775	m0		43
Internal Link Dist (ft)	868		330			48
Turn Bay Length (ft)	250	250		100		
Base Capacity (vph)	734	339	3262	1524		3293
Starvation Cap Reductn	0	0	1	0		5
Spillback Cap Reductn	0	0	43	0		0
Storage Cap Reductn	0	0	0	0		0
Reduced v/c Ratio	0.36	0.85	1.00	0.20		0.89

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green, Master Intersection
Natural Cycle: 80
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Boardman Street E & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	240	265	2958	276	0	2687
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.0		5.0
Lane Util. Factor	0.97	1.00	0.91	1.00		0.91
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3303	1524	4893	1524		4940
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3303	1524	4893	1524		4940
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	261	288	3215	300	0	2921
RTOR Reduction (vph)	0	1	0	0	0	0
Lane Group Flow (vph)	261	287	3215	300	0	2921
Heavy Vehicles (%)	6%	6%	6%	6%	5%	5%
Turn Type		Prot		pt+ov		
Protected Phases	2	2	1	1 2		1
Permitted Phases						
Actuated Green, G (s)	20.0	20.0	60.0	90.0		60.0
Effective Green, g (s)	20.0	20.0	60.0	90.0		60.0
Actuated g/C Ratio	0.22	0.22	0.67	1.00		0.67
Clearance Time (s)	5.0	5.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	734	339	3262	1524		3293
v/s Ratio Prot	0.08	c0.19	c0.66	0.20		0.59
v/s Ratio Perm						
v/c Ratio	0.36	0.85	0.99	0.20		0.89
Uniform Delay, d1	29.6	33.5	14.6	0.0		12.2
Progression Factor	1.00	1.00	0.42	1.00		0.12
Incremental Delay, d2	0.3	17.5	7.4	0.0		2.1
Delay (s)	29.9	51.0	13.4	0.0		3.6
Level of Service	C	D	B	A		A
Approach Delay (s)	41.0		12.3			3.6
Approach LOS	D		B			A

Intersection Summary

HCM Average Control Delay	10.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	81.9%	ICU Level of Service	D
Analysis Period (min)	15		

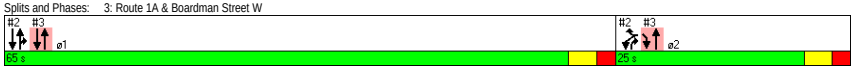
c Critical Lane Group

Lane Group	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (vph)	0	3223	2597	70	0	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Right Turn on Red				Yes		Yes
Link Speed (mph)		30	30		40	
Link Distance (ft)		128	896		377	
Travel Time (s)		2.9	20.4		6.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	3503	2899	0	0	98
Turn Type						custom
Protected Phases		1 2	1			2
Permitted Phases						
Detector Phase		1 2	1			2
Switch Phase						
Minimum Initial (s)			10.0			6.0
Minimum Split (s)			15.0			15.0
Total Split (s)	0.0	90.0	65.0	0.0	0.0	25.0
Total Split (%)	0.0%	100.0%	72.2%	0.0%	0.0%	27.8%
Maximum Green (s)			60.0			20.0
Yellow Time (s)			3.0			3.0
All-Red Time (s)			2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	4.0	5.0
Lead/Lag			Lead			Lag
Lead-Lag Optimize?						
Vehicle Extension (s)			3.0			3.0
Recall Mode			C-Max			None
v/c Ratio		0.69	0.86			0.27
Control Delay		0.7	7.5			30.5
Queue Delay		0.0	0.0			186.5
Total Delay		0.7	7.5			217.0
Queue Length 50th (ft)		0	147			45
Queue Length 95th (ft)		m0	158			89
Internal Link Dist (ft)		48	816		297	
Turn Bay Length (ft)						
Base Capacity (vph)		5085	3380			360
Starvation Cap Reductn		0	0			0
Spillback Cap Reductn		0	2			288
Storage Cap Reductn		0	0			0
Reduced v/c Ratio		0.69	0.86			1.36

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green, Master Intersection
Natural Cycle: 80
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Route 1A & Boardman Street W



Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (vph)	0	3223	2597	70	0	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0			5.0
Lane Util. Factor		0.91	0.91			1.00
Frt		1.00	1.00			0.86
Flt Protected		1.00	1.00			1.00
Satd. Flow (prot)		5085	5065			1611
Flt Permitted		1.00	1.00			1.00
Satd. Flow (perm)		5085	5065			1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	3503	2823	76	0	98
RTOR Reduction (vph)	0	0	3	0	0	2
Lane Group Flow (vph)	0	3503	2896	0	0	96
Turn Type						custom
Protected Phases		1 2	1			2
Permitted Phases						
Actuated Green, G (s)		90.0	60.0			20.0
Effective Green, g (s)		90.0	60.0			20.0
Actuated g/C Ratio		1.00	0.67			0.22
Clearance Time (s)			5.0			5.0
Vehicle Extension (s)			3.0			3.0
Lane Grp Cap (vph)		5085	3377			358
v/s Ratio Prot		c0.69	c0.57			0.06
v/s Ratio Perm						
v/c Ratio		0.69	0.86			0.27
Uniform Delay, d1		0.0	11.7			28.9
Progression Factor		1.00	0.41			1.00
Incremental Delay, d2		0.1	2.6			0.4
Delay (s)		0.1	7.4			29.3
Level of Service		A	A			C
Approach Delay (s)		0.1	7.4		29.3	
Approach LOS		A	A		C	

Intersection Summary

HCM Average Control Delay	3.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	5.0
Intersection Capacity Utilization	66.4%	ICU Level of Service	C
Analysis Period (min)	15		

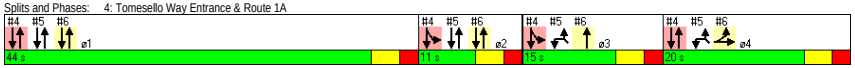
c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	ø1	ø2	ø3	ø4
Lane Configurations										
Volume (vph)	0	0	2280	973	194	2664				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900				
Storage Length (ft)	170	170		150	220					
Storage Lanes	0	0		1	2					
Taper Length (ft)	25	25		25	25					
Right Turn on Red		Yes		Yes						
Link Speed (mph)	40		40			40				
Link Distance (ft)	398		504			215				
Travel Time (s)	6.8		8.6			3.7				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Shared Lane Traffic (%)										
Lane Group Flow (vph)	0	0	2478	1058	211	2896				
Turn Type				Free	Prot					
Protected Phases			1 4		2 3	1 2 3 4	1	2	3	4
Permitted Phases				Free						
Detector Phase			1 4		2 3	1 2 3 4				
Switch Phase										
Minimum Initial (s)							10.0	6.0	6.0	6.0
Minimum Split (s)							15.0	11.0	11.0	11.0
Total Split (s)	0.0	0.0	64.0	0.0	26.0	90.0	44.0	11.0	15.0	20.0
Total Split (%)	0.0%	0.0%	71.1%	0.0%	28.9%	100.0%	49%	12%	17%	22%
Maximum Green (s)							39.0	6.0	10.0	15.0
Yellow Time (s)							3.0	3.0	3.0	3.0
All-Red Time (s)							2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	4.0	4.0	5.0	4.0	5.0	5.0				
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes
Vehicle Extension (s)							3.0	3.0	3.0	3.0
Recall Mode							C-Max	None	None	None
v/c Ratio			0.74	0.67	0.26	0.57				
Control Delay			7.9	2.1	25.1	0.3				
Queue Delay			17.4	0.0	1.1	0.0				
Total Delay			25.3	2.1	26.2	0.3				
Queue Length 50th (ft)			266	0	56	0				
Queue Length 95th (ft)			282	1	m66	0				
Internal Link Dist (ft)	318		424			135				
Turn Bay Length (ft)				150	220					
Base Capacity (vph)			3334	1583	801	5085				
Starvation Cap Reductn			0	0	384	0				
Spillback Cap Reductn			921	0	0	0				
Storage Cap Reductn			0	0	0	0				
Reduced v/c Ratio			1.03	0.67	0.51	0.57				

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 64 (71%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Tomesello Way Entrance & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	0	2280	973	194	2664
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			5.0	4.0	5.0	5.0
Lane Util. Factor			0.91	1.00	0.97	0.91
Frt			1.00	0.85	1.00	1.00
Flt Protected			1.00	1.00	0.95	1.00
Satd. Flow (prot)			5085	1583	3433	5085
Flt Permitted			1.00	1.00	0.95	1.00
Satd. Flow (perm)			5085	1583	3433	5085
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	2478	1058	211	2896
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	2478	1058	211	2896
Turn Type				Free	Prot	
Protected Phases			1 4		2 3	1 2 3 4
Permitted Phases				Free		
Actuated Green, G (s)			59.0	90.0	21.0	90.0
Effective Green, g (s)			59.0	90.0	21.0	90.0
Actuated g/C Ratio			0.66	1.00	0.23	1.00
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)			3334	1583	801	5085
v/s Ratio Prot			c0.49		0.06	0.57
v/s Ratio Perm				c0.67		
v/c Ratio			0.74	0.67	0.26	0.57
Uniform Delay, d1			10.4	0.0	28.2	0.0
Progression Factor			0.63	1.00	0.87	1.00
Incremental Delay, d2			0.7	1.7	0.1	0.1
Delay (s)			7.3	1.7	24.5	0.1
Level of Service			A	A	C	A
Approach Delay (s)	0.0		5.6			1.7
Approach LOS	A		A			A

Intersection Summary

HCM Average Control Delay	3.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	117.6%	ICU Level of Service	H
Analysis Period (min)	15		

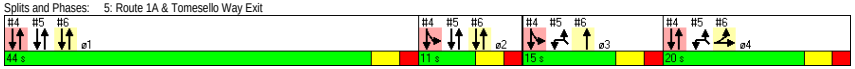
c Critical Lane Group

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR	ø1	ø2	ø3	ø4
Lane Configurations										
Volume (vph)	2280	0	0	2221	636	163				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900				
Right Turn on Red		Yes				Yes				
Link Speed (mph)	40			40	40					
Link Distance (ft)	215			174	388					
Travel Time (s)	3.7			3.0	6.6					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Shared Lane Traffic (%)										
Lane Group Flow (vph)	2478	0	0	2414	691	177				
Turn Type						Prot				
Protected Phases	1 2			1 2	3 4	3 4	1	2	3	4
Permitted Phases										
Detector Phase	1 2			1 2	3 4	3 4				
Switch Phase										
Minimum Initial (s)							10.0	6.0	6.0	6.0
Minimum Split (s)							15.0	11.0	11.0	11.0
Total Split (s)	55.0	0.0	0.0	55.0	35.0	35.0	44.0	11.0	15.0	20.0
Total Split (%)	61.1%	0.0%	0.0%	61.1%	38.9%	38.9%	49%	12%	17%	22%
Maximum Green (s)							39.0	6.0	10.0	15.0
Yellow Time (s)							3.0	3.0	3.0	3.0
All-Red Time (s)							2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	5.0	4.0	4.0	5.0	5.0	5.0				
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes
Vehicle Extension (s)							3.0	3.0	3.0	3.0
Recall Mode							C-Max	None	None	None
v/c Ratio	0.88			0.85	0.60	0.33				
Control Delay	18.2			3.4	28.0	24.7				
Queue Delay	16.6			0.0	0.0	0.0				
Total Delay	34.8			3.4	28.0	24.7				
Queue Length 50th (ft)	549			19	167	73				
Queue Length 95th (ft)	614			32	226	m127				
Internal Link Dist (ft)	135			94	308					
Turn Bay Length (ft)										
Base Capacity (vph)	2825			2825	1144	529				
Starvation Cap Reductn	412			0	0	0				
Spillback Cap Reductn	0			0	0	0				
Storage Cap Reductn	0			0	0	0				
Reduced v/c Ratio	1.03			0.85	0.60	0.33				

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 64 (71%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Route 1A & Tomesello Way Exit



Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (vph)	2280	0	0	2221	636	163
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.91			0.91	0.97	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	5085			5085	3433	1583
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	5085			5085	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2478	0	0	2414	691	177
RTOR Reduction (vph)	0	0	0	0	0	1
Lane Group Flow (vph)	2478	0	0	2414	691	176
Turn Type						Prot
Protected Phases	1 2			1 2	3 4	3 4
Permitted Phases						
Actuated Green, G (s)	50.0			50.0	30.0	30.0
Effective Green, g (s)	50.0			50.0	30.0	30.0
Actuated g/C Ratio	0.56			0.56	0.33	0.33
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)	2825			2825	1144	528
v/s Ratio Prot	c0.49			0.47	c0.20	0.11
v/s Ratio Perm						
v/c Ratio	0.88			0.85	0.60	0.33
Uniform Delay, d1	17.3			16.9	25.0	22.5
Progression Factor	0.86			0.09	1.01	1.01
Incremental Delay, d2	2.2			1.4	0.9	0.4
Delay (s)	17.2			2.9	26.2	23.1
Level of Service	B			A	C	C
Approach Delay (s)	17.2			2.9	25.6	
Approach LOS	B			A	C	

Intersection Summary

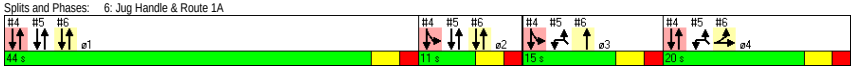
HCM Average Control Delay	12.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	117.6%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø2	ø3
Lane Configurations															
Volume (vph)	105	7	8	0	0	0	0	2442	0	0	2213	0			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Right Turn on Red			Yes			Yes			Yes			Yes			
Link Speed (mph)		40			40			40			40				
Link Distance (ft)		169			294			174			232				
Travel Time (s)		2.9			5.0			3.0			4.0				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	131	0	0	0	0	0	2654	0	0	2405	0			
Turn Type	Split														
Protected Phases	4	4						1 2 3			1 2		1	2	3
Permitted Phases															
Detector Phase	4	4						1 2 3			1 2				
Switch Phase															
Minimum Initial (s)	6.0	6.0											10.0	6.0	6.0
Minimum Split (s)	11.0	11.0											15.0	11.0	11.0
Total Split (s)	20.0	20.0	0.0	0.0	0.0	0.0	0.0	70.0	0.0	0.0	55.0	0.0	44.0	11.0	15.0
Total Split (%)	22.2%	22.2%	0.0%	0.0%	0.0%	0.0%	0.0%	77.8%	0.0%	0.0%	61.1%	0.0%	49%	12%	17%
Maximum Green (s)	15.0	15.0											39.0	6.0	10.0
Yellow Time (s)	3.0	3.0											3.0	3.0	3.0
All-Red Time (s)	2.0	2.0											2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0			
Lead/Lag	Lag	Lag											Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes											Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0											3.0	3.0	3.0
Recall Mode	None	None											C-Max	None	None
v/c Ratio		0.44						0.72			0.85				
Control Delay		38.0						1.2			20.7				
Queue Delay		0.0						0.7			0.0				
Total Delay		38.0						1.9			20.7				
Queue Length 50th (ft)		66						10			394				
Queue Length 95th (ft)		121						23			469				
Internal Link Dist (ft)		89			214			94			152				
Turn Bay Length (ft)															
Base Capacity (vph)		298						3673			2825				
Starvation Cap Reductn		0						608			0				
Spillback Cap Reductn		0						0			0				
Storage Cap Reductn		0						0			0				
Reduced v/c Ratio		0.44						0.87			0.85				

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 64 (71%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	

Splits and Phases: 6: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	105	7	8	0	0	0	0	2442	0	0	2213	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.91	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1769						5085			5085	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1769						5085			5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	114	8	9	0	0	0	0	2654	0	0	2405	0
RTOR Reduction (vph)	0	3	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	128	0	0	0	0	0	2654	0	0	2405	0
Turn Type	Split											
Protected Phases	4	4						1 2 3			1 2	
Permitted Phases												
Actuated Green, G (s)		15.0						65.0			50.0	
Effective Green, g (s)		15.0						65.0			50.0	
Actuated g/C Ratio		0.17						0.72			0.56	
Clearance Time (s)		5.0										
Vehicle Extension (s)		3.0										
Lane Grp Cap (vph)		295						3673			2825	
v/s Ratio Prot		c0.07						c0.52			c0.47	
v/s Ratio Perm												
v/c Ratio		0.43						0.72			0.85	
Uniform Delay, d1		33.7						7.3			16.9	
Progression Factor		1.00						0.07			1.00	
Incremental Delay, d2		1.0						0.4			2.7	
Delay (s)		34.7						0.9			19.5	
Level of Service		C						A			B	
Approach Delay (s)		34.7			0.0			0.9			19.5	
Approach LOS		C			A			A			B	

Intersection Summary					
HCM Average Control Delay	10.4	HCM Level of Service	B		
HCM Volume to Capacity ratio	0.74				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0		
Intersection Capacity Utilization	68.4%	ICU Level of Service	C		
Analysis Period (min)	15				
c Critical Lane Group					



Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	2805	0	219	0	2493
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		0		200	
Storage Lanes	0	0		0		1	
Taper Length (ft)	25	25		25		25	
Right Turn on Red		Yes		Yes			
Link Speed (mph)	40		40				30
Link Distance (ft)	67		532				359
Travel Time (s)	1.1		9.1				8.2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	0	3049	0	238	0	2710
Turn Type					Prot		
Protected Phases			1		2		1 2
Permitted Phases							
Detector Phase			1		2		1 2
Switch Phase							
Minimum Initial (s)			4.0		4.0		
Minimum Split (s)			20.0		20.0		
Total Split (s)	0.0	0.0	50.0	0.0	20.0	0.0	70.0
Total Split (%)	0.0%	0.0%	71.4%	0.0%	28.6%	0.0%	100.0%
Maximum Green (s)			46.0		16.0		
Yellow Time (s)			3.5		3.5		
All-Red Time (s)			0.5		0.5		
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag			Lead		Lag		
Lead-Lag Optimize?			Yes		Yes		
Vehicle Extension (s)			3.0		3.0		
Recall Mode			C-Max		None		
Walk Time (s)			5.0		5.0		
Flash Dont Walk (s)			11.0		11.0		
Pedestrian Calls (#/hr)			0		0		
v/c Ratio			0.91		0.59		0.55
Control Delay			16.1		20.8		0.2
Queue Delay			0.0		0.0		0.0
Total Delay			16.1		20.8		0.2
Queue Length 50th (ft)			350		71		0
Queue Length 95th (ft)			443		m95		0
Internal Link Dist (ft)	1		452				279
Turn Bay Length (ft)					200		
Base Capacity (vph)			3342		405		4940
Starvation Cap Reductn			0		0		0
Spillback Cap Reductn			0		0		0
Storage Cap Reductn			0		0		0
Reduced v/c Ratio			0.91		0.59		0.55

Intersection Summary	
Area Type:	Other
Cycle Length: 70	
Actuated Cycle Length: 70	
Offset: 54 (77%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 1: Southern U-turn & Route 1A



Movement	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	2805	0	219	0	2493
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0		4.0		4.0
Lane Util. Factor			0.91		1.00		0.91
Frt			1.00		1.00		1.00
Flt Protected			1.00		0.95		1.00
Satd. Flow (prot)			5085		1770		4940
Flt Permitted			1.00		0.95		1.00
Satd. Flow (perm)			5085		1770		4940
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	3049	0	238	0	2710
RTOR Reduction (vph)	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	3049	0	238	0	2710
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%
Turn Type					Prot		
Protected Phases			1		2		1 2
Permitted Phases							
Actuated Green, G (s)			46.0		16.0		70.0
Effective Green, g (s)			46.0		16.0		70.0
Actuated g/C Ratio			0.66		0.23		1.00
Clearance Time (s)			4.0		4.0		
Vehicle Extension (s)			3.0		3.0		
Lane Grp Cap (vph)			3342		405		4940
v/s Ratio Prot			c0.60		0.13		c0.55
v/s Ratio Perm							
v/c Ratio			0.91		0.59		0.55
Uniform Delay, d1			10.3		24.1		0.0
Progression Factor			1.00		0.71		1.00
Incremental Delay, d2			5.0		1.1		0.1
Delay (s)			15.3		18.2		0.1
Level of Service			B		B		A
Approach Delay (s)	0.0		15.3				1.5
Approach LOS	A		B				A

Intersection Summary			
HCM Average Control Delay	8.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	73.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	242	328	2556	468	0	2470
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250	250		100	330	
Storage Lanes	1	1		1	0	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	40		40			40
Link Distance (ft)	948		410			128
Travel Time (s)	16.2		7.0			2.2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	6%	6%	6%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	263	357	2778	509	0	2685
Turn Type		Prot		pt+ov		
Protected Phases	2	2	1	1 2		1
Permitted Phases						
Detector Phase	2	2	1	1 2		1
Switch Phase						
Minimum Initial (s)	6.0	6.0	10.0			10.0
Minimum Split (s)	15.0	15.0	15.0			15.0
Total Split (s)	22.0	22.0	48.0	70.0	0.0	48.0
Total Split (%)	31.4%	31.4%	68.6%	100.0%	0.0%	68.6%
Maximum Green (s)	17.0	17.0	43.0			43.0
Yellow Time (s)	3.0	3.0	3.0			3.0
All-Red Time (s)	2.0	2.0	2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	-1.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	4.0	4.0	5.0
Lead/Lag	Lag	Lag	Lead			Lead
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Recall Mode	None	None	C-Max			C-Max
v/c Ratio	0.33	0.96	0.92	0.33		0.88
Control Delay	23.2	67.2	8.2	0.3		4.4
Queue Delay	0.0	0.0	0.0	0.0		0.0
Total Delay	23.2	67.2	8.2	0.3		4.4
Queue Length 50th (ft)	47	151	36	0		26
Queue Length 95th (ft)	78	#312	m#119	m0		43
Internal Link Dist (ft)	868		330			48
Turn Bay Length (ft)	250	250		100		
Base Capacity (vph)	802	372	3006	1524		3035
Starvation Cap Reductn	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0		0
Storage Cap Reductn	0	0	0	0		0
Reduced v/c Ratio	0.33	0.96	0.92	0.33		0.88

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green, Master Intersection
Natural Cycle: 65
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Boardman Street E & Route 1A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	242	328	2556	468	0	2470
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.0		5.0
Lane Util. Factor	0.97	1.00	0.91	1.00		0.91
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3303	1524	4893	1524		4940
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3303	1524	4893	1524		4940
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	263	357	2778	509	0	2685
RTOR Reduction (vph)	0	2	0	0	0	0
Lane Group Flow (vph)	263	355	2778	509	0	2685
Heavy Vehicles (%)	6%	6%	6%	6%	5%	5%
Turn Type		Prot		pt+ov		
Protected Phases	2	2	1	1 2		1
Permitted Phases						
Actuated Green, G (s)	17.0	17.0	43.0	70.0		43.0
Effective Green, g (s)	17.0	17.0	43.0	70.0		43.0
Actuated g/C Ratio	0.24	0.24	0.61	1.00		0.61
Clearance Time (s)	5.0	5.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	802	370	3006	1524		3035
v/s Ratio Prot	0.08	c0.23	c0.57	0.33		0.54
v/s Ratio Perm						
v/c Ratio	0.33	0.96	0.92	0.33		0.88
Uniform Delay, d1	21.8	26.2	12.0	0.0		11.4
Progression Factor	1.00	1.00	0.35	1.00		0.13
Incremental Delay, d2	0.2	36.4	2.9	0.1		2.3
Delay (s)	22.0	62.6	7.2	0.1		3.8
Level of Service	C	E	A	A		A
Approach Delay (s)	45.4		6.1			3.8
Approach LOS	D		A			A

Intersection Summary

HCM Average Control Delay	8.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	78.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (vph)	0	2884	2389	51	0	81
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Right Turn on Red				Yes		Yes
Link Speed (mph)		30	30		40	
Link Distance (ft)		128	896		377	
Travel Time (s)		2.9	20.4		6.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	3135	2652	0	0	88
Turn Type						custom
Protected Phases		1 2	1			2
Permitted Phases						
Detector Phase		1 2	1			2
Switch Phase						
Minimum Initial (s)			10.0			6.0
Minimum Split (s)			15.0			15.0
Total Split (s)	0.0	70.0	48.0	0.0	0.0	22.0
Total Split (%)	0.0%	100.0%	68.6%	0.0%	0.0%	31.4%
Maximum Green (s)			43.0			17.0
Yellow Time (s)			3.0			3.0
All-Red Time (s)			2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	4.0	5.0
Lead/Lag			Lead			Lag
Lead-Lag Optimize?						
Vehicle Extension (s)			3.0			3.0
Recall Mode			C-Max			None
v/c Ratio		0.62	0.85			0.22
Control Delay		0.4	8.1			22.4
Queue Delay		0.0	0.0			0.6
Total Delay		0.4	8.1			23.0
Queue Length 50th (ft)		0	128			29
Queue Length 95th (ft)		m0	145			65
Internal Link Dist (ft)		48	816		297	
Turn Bay Length (ft)						
Base Capacity (vph)		5085	3118			394
Starvation Cap Reductn		0	0			0
Spillback Cap Reductn		0	8			130
Storage Cap Reductn		0	0			0
Reduced v/c Ratio		0.62	0.85			0.33

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green, Master Intersection
Natural Cycle: 65
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Route 1A & Boardman Street W

Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (vph)	0	2884	2389	51	0	81
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0			5.0
Lane Util. Factor		0.91	0.91			1.00
Frt		1.00	1.00			0.86
Flt Protected		1.00	1.00			1.00
Satd. Flow (prot)		5085	5069			1611
Flt Permitted		1.00	1.00			1.00
Satd. Flow (perm)		5085	5069			1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	3135	2597	55	0	88
RTOR Reduction (vph)	0	0	3	0	0	2
Lane Group Flow (vph)	0	3135	2649	0	0	86
Turn Type						custom
Protected Phases		1 2	1			2
Permitted Phases						
Actuated Green, G (s)		70.0	43.0			17.0
Effective Green, g (s)		70.0	43.0			17.0
Actuated g/C Ratio		1.00	0.61			0.24
Clearance Time (s)			5.0			5.0
Vehicle Extension (s)			3.0			3.0
Lane Grp Cap (vph)		5085	3114			391
v/s Ratio Prot		c0.62	c0.52			0.05
v/s Ratio Perm						
v/c Ratio		0.62	0.85			0.22
Uniform Delay, d1		0.0	10.9			21.2
Progression Factor		1.00	0.48			1.00
Incremental Delay, d2		0.1	2.7			0.3
Delay (s)		0.1	7.9			21.5
Level of Service		A	A			C
Approach Delay (s)		0.1	7.9		21.5	
Approach LOS		A	A		C	

Intersection Summary

HCM Average Control Delay	3.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	5.0
Intersection Capacity Utilization	60.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	ø1	ø2	ø3	ø4
Lane Configurations										
Volume (vph)	0	0	1940	934	208	2437				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900				
Storage Length (ft)	170	170		150	220					
Storage Lanes	0	0		1	2					
Taper Length (ft)	25	25		25	25					
Right Turn on Red		Yes		Yes						
Link Speed (mph)	40		40			40				
Link Distance (ft)	398		504			215				
Travel Time (s)	6.8		8.6			3.7				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Shared Lane Traffic (%)										
Lane Group Flow (vph)	0	0	2109	1015	226	2649				
Turn Type				Free	Prot					
Protected Phases			1 4		2 3	1 2 3 4	1	2	3	4
Permitted Phases				Free						
Detector Phase			1 4		2 3	1 2 3 4				
Switch Phase										
Minimum Initial (s)							10.0	6.0	6.0	6.0
Minimum Split (s)							15.0	11.0	11.0	11.0
Total Split (s)	0.0	0.0	45.0	0.0	25.0	70.0	34.0	11.0	14.0	11.0
Total Split (%)	0.0%	0.0%	64.3%	0.0%	35.7%	100.0%	49%	16%	20%	16%
Maximum Green (s)							29.0	6.0	9.0	6.0
Yellow Time (s)							3.0	3.0	3.0	3.0
All-Red Time (s)							2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	4.0	4.0	5.0	4.0	5.0	5.0				
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes
Vehicle Extension (s)							3.0	3.0	3.0	3.0
Recall Mode							C-Max	None	None	None
v/c Ratio			0.73	0.64	0.23	0.52				
Control Delay			6.2	2.5	18.2	0.2				
Queue Delay			1.2	0.0	0.0	0.0				
Total Delay			7.4	2.5	18.2	0.2				
Queue Length 50th (ft)			63	0	43	0				
Queue Length 95th (ft)			115	32	m56	0				
Internal Link Dist (ft)	318		424			135				
Turn Bay Length (ft)				150	220					
Base Capacity (vph)			2906	1583	981	5085				
Starvation Cap Reductn			0	0	0	0				
Spillback Cap Reductn			530	0	0	0				
Storage Cap Reductn			0	0	0	0				
Reduced v/c Ratio			0.89	0.64	0.23	0.52				

Intersection Summary	
Area Type:	Other
Cycle Length: 70	
Actuated Cycle Length: 70	
Offset: 42 (60%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 4: Tomesello Way Entrance & Route 1A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	0	1940	934	208	2437
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			5.0	4.0	5.0	5.0
Lane Util. Factor			0.91	1.00	0.97	0.91
Frt			1.00	0.85	1.00	1.00
Flt Protected			1.00	1.00	0.95	1.00
Satd. Flow (prot)			5085	1583	3433	5085
Flt Permitted			1.00	1.00	0.95	1.00
Satd. Flow (perm)			5085	1583	3433	5085
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	2109	1015	226	2649
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	2109	1015	226	2649
Turn Type				Free	Prot	
Protected Phases			1 4		2 3	1 2 3 4
Permitted Phases				Free		
Actuated Green, G (s)			40.0	70.0	20.0	70.0
Effective Green, g (s)			40.0	70.0	20.0	70.0
Actuated g/C Ratio			0.57	1.00	0.29	1.00
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)			2906	1583	981	5085
v/s Ratio Prot			c0.41		0.07	0.52
v/s Ratio Perm				c0.64		
v/c Ratio			0.73	0.64	0.23	0.52
Uniform Delay, d1			11.0	0.0	19.1	0.0
Progression Factor			0.43	1.00	0.92	1.00
Incremental Delay, d2			0.7	1.6	0.1	0.1
Delay (s)			5.5	1.6	17.7	0.1
Level of Service			A	A	B	A
Approach Delay (s)	0.0		4.2			1.4
Approach LOS	A		A			A

Intersection Summary			
HCM Average Control Delay	2.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	106.5%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR	ø1	ø2	ø3	ø4
Lane Configurations										
Volume (vph)	1940	0	0	2058	587	197				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900				
Right Turn on Red		Yes				Yes				
Link Speed (mph)	40			40	40					
Link Distance (ft)	215			174	388					
Travel Time (s)	3.7			3.0	6.6					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Shared Lane Traffic (%)										
Lane Group Flow (vph)	2109	0	0	2237	638	214				
Turn Type						Prot				
Protected Phases	1 2			1 2	3 4	3 4	1	2	3	4
Permitted Phases										
Detector Phase	1 2			1 2	3 4	3 4				
Switch Phase										
Minimum Initial (s)							10.0	6.0	6.0	6.0
Minimum Split (s)							15.0	11.0	11.0	11.0
Total Split (s)	45.0	0.0	0.0	45.0	25.0	25.0	34.0	11.0	14.0	11.0
Total Split (%)	64.3%	0.0%	0.0%	64.3%	35.7%	35.7%	49%	16%	20%	16%
Maximum Green (s)							29.0	6.0	9.0	6.0
Yellow Time (s)							3.0	3.0	3.0	3.0
All-Red Time (s)							2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	5.0	4.0	4.0	5.0	5.0	5.0				
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes
Vehicle Extension (s)							3.0	3.0	3.0	3.0
Recall Mode							C-Max	None	None	None
v/c Ratio	0.73			0.77	0.65	0.47				
Control Delay	6.3			2.6	25.4	23.7				
Queue Delay	1.3			0.0	0.0	0.0				
Total Delay	7.5			2.6	25.4	23.7				
Queue Length 50th (ft)	187			17	123	73				
Queue Length 95th (ft)	287			19	175	m131				
Internal Link Dist (ft)	135			94	308					
Turn Bay Length (ft)										
Base Capacity (vph)	2906			2906	981	457				
Starvation Cap Reductn	531			0	0	0				
Spillback Cap Reductn	0			0	0	0				
Storage Cap Reductn	0			0	0	0				
Reduced v/c Ratio	0.89			0.77	0.65	0.47				

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 42 (60%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Route 1A & Tomesello Way Exit

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (vph)	1940	0	0	2058	587	197
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.91			0.91	0.97	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	5085			5085	3433	1583
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	5085			5085	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2109	0	0	2237	638	214
RTOR Reduction (vph)	0	0	0	0	0	5
Lane Group Flow (vph)	2109	0	0	2237	638	209
Turn Type						Prot
Protected Phases	1 2			1 2	3 4	3 4
Permitted Phases						
Actuated Green, G (s)	40.0			40.0	20.0	20.0
Effective Green, g (s)	40.0			40.0	20.0	20.0
Actuated g/C Ratio	0.57			0.57	0.29	0.29
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)	2906			2906	981	452
v/s Ratio Prot	0.41			c0.44	c0.19	0.13
v/s Ratio Perm						
v/c Ratio	0.73			0.77	0.65	0.46
Uniform Delay, d1	11.0			11.5	21.9	20.6
Progression Factor	0.46			0.11	0.99	0.99
Incremental Delay, d2	0.6			0.8	1.6	0.8
Delay (s)	5.7			2.1	23.3	21.1
Level of Service	A			A	C	C
Approach Delay (s)	5.7			2.1	22.7	
Approach LOS	A			A	C	

Intersection Summary

HCM Average Control Delay	6.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	106.5%	ICU Level of Service	G
Analysis Period (min)	15		

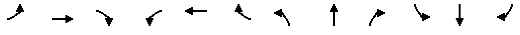
c Critical Lane Group



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø2	ø3
Lane Configurations															
Volume (vph)	52	8	7	0	0	0	0	2137	3	0	2050	0			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Right Turn on Red			Yes			Yes			Yes			Yes			
Link Speed (mph)		40			40			40			40				
Link Distance (ft)		169			294			174			232				
Travel Time (s)		2.9			5.0			3.0			4.0				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	74	0	0	0	0	0	2326	0	0	2228	0			
Turn Type	Split														
Protected Phases	4	4						1 2 3			1 2		1	2	3
Permitted Phases															
Detector Phase	4	4						1 2 3			1 2				
Switch Phase															
Minimum Initial (s)	6.0	6.0											10.0	6.0	6.0
Minimum Split (s)	11.0	11.0											15.0	11.0	11.0
Total Split (s)	11.0	11.0	0.0	0.0	0.0	0.0	0.0	59.0	0.0	0.0	45.0	0.0	34.0	11.0	14.0
Total Split (%)	15.7%	15.7%	0.0%	0.0%	0.0%	0.0%	0.0%	84.3%	0.0%	0.0%	64.3%	0.0%	49%	16%	20%
Maximum Green (s)	6.0	6.0											29.0	6.0	9.0
Yellow Time (s)	3.0	3.0											3.0	3.0	3.0
All-Red Time (s)	2.0	2.0											2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0			
Lead/Lag	Lag	Lag											Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes											Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0											3.0	3.0	3.0
Recall Mode	None	None											C-Max	None	None
v/c Ratio		0.47						0.59			0.77				
Control Delay		38.4						0.9			13.7				
Queue Delay		0.0						0.2			0.0				
Total Delay		38.4						1.1			13.7				
Queue Length 50th (ft)		28						10			242				
Queue Length 95th (ft)		#67						24			301				
Internal Link Dist (ft)		89			214			94			152				
Turn Bay Length (ft)															
Base Capacity (vph)		158						3923			2906				
Starvation Cap Reductn		0						688			0				
Spillback Cap Reductn		0						0			0				
Storage Cap Reductn		0						0			0				
Reduced v/c Ratio		0.47						0.72			0.77				

Intersection Summary	
Area Type:	Other
Cycle Length: 70	
Actuated Cycle Length: 70	
Offset: 42 (60%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 6: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	52	8	7	0	0	0	0	2137	3	0	2050	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.91	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1767						5084			5085	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1767						5084			5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	57	9	8	0	0	0	0	2323	3	0	2228	0
RTOR Reduction (vph)	0	6	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	68	0	0	0	0	0	2326	0	0	2228	0
Turn Type	Split											
Protected Phases	4	4						1 2 3			1 2	
Permitted Phases												
Actuated Green, G (s)		6.0						54.0			40.0	
Effective Green, g (s)		6.0						54.0			40.0	
Actuated g/C Ratio		0.09						0.77			0.57	
Clearance Time (s)		5.0										
Vehicle Extension (s)		3.0										
Lane Grp Cap (vph)		151						3922			2906	
v/s Ratio Prot		c0.04						c0.46			c0.44	
v/s Ratio Perm												
v/c Ratio		0.45						0.59			0.77	
Uniform Delay, d1		30.4						3.4			11.4	
Progression Factor		1.00						0.13			1.00	
Incremental Delay, d2		2.1						0.2			1.3	
Delay (s)		32.5						0.6			12.7	
Level of Service		C						A			B	
Approach Delay (s)		32.5			0.0			0.6			12.7	
Approach LOS		C			A			A			B	

Intersection Summary					
HCM Average Control Delay	6.9	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.67				
Actuated Cycle Length (s)	70.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	62.2%	ICU Level of Service		B	
Analysis Period (min)	15				
c Critical Lane Group					

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	1694	0	191	0	3060
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		0		200	
Storage Lanes	0	0		0		1	
Taper Length (ft)	25	25		25		25	
Right Turn on Red		Yes		Yes			
Link Speed (mph)	40		40				30
Link Distance (ft)	59		532				359
Travel Time (s)	1.0		9.1				8.2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	0	1841	0	208	0	3326
Turn Type					Prot		
Protected Phases			1		2		1 2
Permitted Phases							
Detector Phase			1		2		1 2
Switch Phase							
Minimum Initial (s)			4.0		4.0		
Minimum Split (s)			20.0		20.0		
Total Split (s)	0.0	0.0	62.0	0.0	28.0	0.0	90.0
Total Split (%)	0.0%	0.0%	68.9%	0.0%	31.1%	0.0%	100.0%
Maximum Green (s)			58.0		24.0		
Yellow Time (s)			3.5		3.5		
All-Red Time (s)			0.5		0.5		
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag			Lead		Lag		
Lead-Lag Optimize?			Yes		Yes		
Vehicle Extension (s)			3.0		3.0		
Recall Mode			C-Max		None		
Walk Time (s)			5.0		5.0		
Flash Dont Walk (s)			11.0		11.0		
Pedestrian Calls (#/hr)			0		0		
v/c Ratio			0.56		0.44		0.67
Control Delay			9.7		22.9		0.3
Queue Delay			0.0		0.0		0.0
Total Delay			9.7		22.9		0.3
Queue Length 50th (ft)			190		95		0
Queue Length 95th (ft)			228		m105		0
Internal Link Dist (ft)	1		452				279
Turn Bay Length (ft)					200		
Base Capacity (vph)			3277		472		4940
Starvation Cap Reductn			0		0		0
Spillback Cap Reductn			0		0		0
Storage Cap Reductn			0		0		0
Reduced v/c Ratio			0.56		0.44		0.67

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 83 (92%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 40	
Control Type: Actuated-Coordinated	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 1: Southern U-turn & Route 1A



Movement	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	1694	0	191	0	3060
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0		4.0		4.0
Lane Util. Factor			0.91		1.00		0.91
Frt			1.00		1.00		1.00
Flt Protected			1.00		0.95		1.00
Satd. Flow (prot)			5085		1770		4940
Flt Permitted			1.00		0.95		1.00
Satd. Flow (perm)			5085		1770		4940
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	1841	0	208	0	3326
RTOR Reduction (vph)	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	1841	0	208	0	3326
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%
Turn Type					Prot		
Protected Phases			1		2		1 2
Permitted Phases							
Actuated Green, G (s)			58.0		24.0		90.0
Effective Green, g (s)			58.0		24.0		90.0
Actuated g/C Ratio			0.64		0.27		1.00
Clearance Time (s)			4.0		4.0		
Vehicle Extension (s)			3.0		3.0		
Lane Grp Cap (vph)			3277		472		4940
v/s Ratio Prot			0.36		0.12		c0.67
v/s Ratio Perm							
v/c Ratio			0.56		0.44		0.67
Uniform Delay, d1			8.9		27.4		0.0
Progression Factor			1.00		0.77		1.00
Incremental Delay, d2			0.7		0.3		0.2
Delay (s)			9.6		21.4		0.2
Level of Service			A		C		A
Approach Delay (s)	0.0		9.6				1.4
Approach LOS	A		A				A

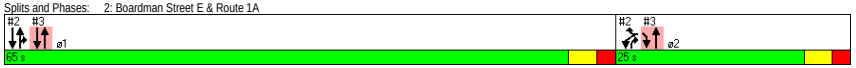
Intersection Summary			
HCM Average Control Delay	4.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	62.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	424	203	1671	214	0	2827
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250	250		100	330	
Storage Lanes	1	1		1	0	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	40		40			40
Link Distance (ft)	948		410			128
Travel Time (s)	16.2		7.0			2.2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	6%	6%	6%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	461	221	1816	233	0	3073
Turn Type		Prot		pt+ov		
Protected Phases	2	2	1	1 2		1
Permitted Phases						
Detector Phase	2	2	1	1 2		1
Switch Phase						
Minimum Initial (s)	6.0	6.0	10.0			10.0
Minimum Split (s)	15.0	15.0	15.0			15.0
Total Split (s)	25.0	25.0	65.0	90.0	0.0	65.0
Total Split (%)	27.8%	27.8%	72.2%	100.0%	0.0%	72.2%
Maximum Green (s)	20.0	20.0	60.0			60.0
Yellow Time (s)	3.0	3.0	3.0			3.0
All-Red Time (s)	2.0	2.0	2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	-1.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	4.0	4.0	5.0
Lead/Lag	Lag	Lag	Lead			Lead
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Recall Mode	None	None	C-Max			C-Max
v/c Ratio	0.63	0.61	0.56	0.15		0.93
Control Delay	36.1	35.9	3.6	0.2		5.9
Queue Delay	0.0	0.0	0.0	0.0		3.4
Total Delay	36.1	35.9	3.6	0.2		9.3
Queue Length 50th (ft)	122	100	58	0		44
Queue Length 95th (ft)	173	176	65	0		67
Internal Link Dist (ft)	868		330			48
Turn Bay Length (ft)	250	250		100		
Base Capacity (vph)	734	360	3262	1524		3293
Starvation Cap Reductn	0	0	0	0		163
Spillback Cap Reductn	0	0	0	0		0
Storage Cap Reductn	0	0	0	0		0
Reduced v/c Ratio	0.63	0.61	0.56	0.15		0.98

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green, Master Intersection
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 2: Boardman Street E & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	424	203	1671	214	0	2827
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.0		5.0
Lane Util. Factor	0.97	1.00	0.91	1.00		0.91
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3303	1524	4893	1524		4940
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3303	1524	4893	1524		4940
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	461	221	1816	233	0	3073
RTOR Reduction (vph)	0	21	0	0	0	0
Lane Group Flow (vph)	461	200	1816	233	0	3073
Heavy Vehicles (%)	6%	6%	6%	6%	5%	5%
Turn Type		Prot		pt+ov		
Protected Phases	2	2	1	1 2		1
Permitted Phases						
Actuated Green, G (s)	20.0	20.0	60.0	90.0		60.0
Effective Green, g (s)	20.0	20.0	60.0	90.0		60.0
Actuated g/C Ratio	0.22	0.22	0.67	1.00		0.67
Clearance Time (s)	5.0	5.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	734	339	3262	1524		3293
v/s Ratio Prot	c0.14	0.13	0.37	0.15		c0.62
v/s Ratio Perm						
v/c Ratio	0.63	0.59	0.56	0.15		0.93
Uniform Delay, d1	31.6	31.3	8.0	0.0		13.2
Progression Factor	1.00	1.00	0.38	1.00		0.17
Incremental Delay, d2	1.7	2.6	0.6	0.0		2.8
Delay (s)	33.3	34.0	3.6	0.0		5.0
Level of Service	C	C	A	A		A
Approach Delay (s)	33.5		3.2			5.0
Approach LOS	C		A			A

Intersection Summary

HCM Average Control Delay	7.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	75.1%	ICU Level of Service	D
Analysis Period (min)	15		

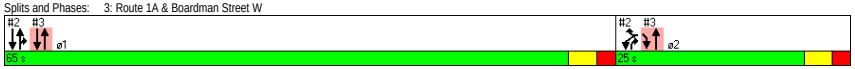
c Critical Lane Group

Lane Group	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (vph)	0	1874	2674	201	0	153
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Right Turn on Red				Yes		Yes
Link Speed (mph)		30	30		40	
Link Distance (ft)		128	896		377	
Travel Time (s)		2.9	20.4		6.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	2037	3125	0	0	166
Turn Type						custom
Protected Phases		1 2	1			2
Permitted Phases						
Detector Phase		1 2	1			2
Switch Phase						
Minimum Initial (s)			10.0			6.0
Minimum Split (s)			15.0			15.0
Total Split (s)	0.0	90.0	65.0	0.0	0.0	25.0
Total Split (%)	0.0%	100.0%	72.2%	0.0%	0.0%	27.8%
Maximum Green (s)			60.0			20.0
Yellow Time (s)			3.0			3.0
All-Red Time (s)			2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	4.0	5.0
Lead/Lag			Lead			Lag
Lead-Lag Optimize?						
Vehicle Extension (s)			3.0			3.0
Recall Mode			C-Max			None
v/c Ratio		0.40	0.93			0.46
Control Delay		0.2	11.4			34.8
Queue Delay		0.0	0.2			673.7
Total Delay		0.2	11.6			708.6
Queue Length 50th (ft)		0	80			81
Queue Length 95th (ft)		0	109			143
Internal Link Dist (ft)		48	816		297	
Turn Bay Length (ft)						
Base Capacity (vph)		5085	3365			360
Starvation Cap Reductn		0	0			0
Spillback Cap Reductn		0	20			296
Storage Cap Reductn		0	0			0
Reduced v/c Ratio		0.40	0.93			2.59

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green, Master Intersection
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 3: Route 1A & Boardman Street W



Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (vph)	0	1874	2674	201	0	153
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0			5.0
Lane Util. Factor		0.91	0.91			1.00
Frt		1.00	0.99			0.86
Flt Protected		1.00	1.00			1.00
Satd. Flow (prot)		5085	5032			1611
Flt Permitted		1.00	1.00			1.00
Satd. Flow (perm)		5085	5032			1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	2037	2907	218	0	166
RTOR Reduction (vph)	0	0	9	0	0	2
Lane Group Flow (vph)	0	2037	3116	0	0	164
Turn Type						custom
Protected Phases		1 2	1			2
Permitted Phases						
Actuated Green, G (s)		90.0	60.0			20.0
Effective Green, g (s)		90.0	60.0			20.0
Actuated g/C Ratio		1.00	0.67			0.22
Clearance Time (s)			5.0			5.0
Vehicle Extension (s)			3.0			3.0
Lane Grp Cap (vph)		5085	3355			358
v/s Ratio Prot		c0.40	c0.62			0.10
v/s Ratio Perm						
v/c Ratio		0.40	0.93			0.46
Uniform Delay, d1		0.0	13.1			30.3
Progression Factor		1.00	0.44			1.00
Incremental Delay, d2		0.0	4.9			0.9
Delay (s)		0.0	10.7			31.3
Level of Service		A	B			C
Approach Delay (s)		0.0	10.7		31.3	
Approach LOS		A	B		C	

Intersection Summary

HCM Average Control Delay	7.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	5.0
Intersection Capacity Utilization	73.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	ø1	ø2	ø3	ø4
Lane Configurations										
Volume (vph)	0	0	1433	441	59	2841				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900				
Storage Length (ft)	170	170		150	220					
Storage Lanes	0	0		1	2					
Taper Length (ft)	25	25		25	25					
Right Turn on Red		Yes		Yes						
Link Speed (mph)	40		40			40				
Link Distance (ft)	398		504			215				
Travel Time (s)	6.8		8.6			3.7				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Shared Lane Traffic (%)										
Lane Group Flow (vph)	0	0	1558	479	64	3088				
Turn Type				Free	Prot					
Protected Phases			1 4		2 3	1 2 3 4	1	2	3	4
Permitted Phases				Free						
Detector Phase			1 4		2 3	1 2 3 4				
Switch Phase										
Minimum Initial (s)							10.0	6.0	6.0	6.0
Minimum Split (s)							15.0	11.0	11.0	11.0
Total Split (s)	0.0	0.0	68.0	0.0	22.0	90.0	52.0	11.0	11.0	16.0
Total Split (%)	0.0%	0.0%	75.6%	0.0%	24.4%	100.0%	58%	12%	12%	18%
Maximum Green (s)							47.0	6.0	6.0	11.0
Yellow Time (s)							3.0	3.0	3.0	3.0
All-Red Time (s)							2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	4.0	4.0	5.0	4.0	5.0	5.0				
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes
Vehicle Extension (s)							3.0	3.0	3.0	3.0
Recall Mode							C-Max	None	None	None
v/c Ratio			0.44	0.30	0.10	0.61				
Control Delay			4.1	0.5	25.7	0.3				
Queue Delay			0.1	0.0	0.0	0.0				
Total Delay			4.2	0.5	25.7	0.3				
Queue Length 50th (ft)			71	0	17	0				
Queue Length 95th (ft)			116	0	m20	0				
Internal Link Dist (ft)	318		424			135				
Turn Bay Length (ft)				150	220					
Base Capacity (vph)			3560	1583	648	5085				
Starvation Cap Reductn			0	0	0	0				
Spillback Cap Reductn			695	0	0	0				
Storage Cap Reductn			0	0	0	0				
Reduced v/c Ratio			0.54	0.30	0.10	0.61				

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 55 (61%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Tomesello Way Entrance & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	0	1433	441	59	2841
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			5.0	4.0	5.0	5.0
Lane Util. Factor			0.91	1.00	0.97	0.91
Frt			1.00	0.85	1.00	1.00
Flt Protected			1.00	1.00	0.95	1.00
Satd. Flow (prot)			5085	1583	3433	5085
Flt Permitted			1.00	1.00	0.95	1.00
Satd. Flow (perm)			5085	1583	3433	5085
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	1558	479	64	3088
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	1558	479	64	3088
Turn Type				Free	Prot	
Protected Phases			1 4		2 3	1 2 3 4
Permitted Phases				Free		
Actuated Green, G (s)			63.0	90.0	17.0	90.0
Effective Green, g (s)			63.0	90.0	17.0	90.0
Actuated g/C Ratio			0.70	1.00	0.19	1.00
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)			3560	1583	648	5085
v/s Ratio Prot			0.31		0.02	c0.61
v/s Ratio Perm				0.30		
v/c Ratio			0.44	0.30	0.10	0.61
Uniform Delay, d1			5.8	0.0	30.2	0.0
Progression Factor			0.64	1.00	0.84	1.00
Incremental Delay, d2			0.1	0.5	0.0	0.1
Delay (s)			3.8	0.5	25.3	0.1
Level of Service			A	A	C	A
Approach Delay (s)	0.0		3.0			0.6
Approach LOS	A		A			A

Intersection Summary

HCM Average Control Delay	1.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	67.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR	ø1	ø2	ø3	ø4
Lane Configurations										
Volume (vph)	1433	0	0	2572	328	39				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900				
Right Turn on Red		Yes				Yes				
Link Speed (mph)	40			40	40					
Link Distance (ft)	215			174	388					
Travel Time (s)	3.7			3.0	6.6					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Shared Lane Traffic (%)										
Lane Group Flow (vph)	1558	0	0	2796	357	42				
Turn Type						Prot				
Protected Phases	1 2			1 2	3 4	3 4	1	2	3	4
Permitted Phases										
Detector Phase	1 2			1 2	3 4	3 4				
Switch Phase										
Minimum Initial (s)							10.0	6.0	6.0	6.0
Minimum Split (s)							15.0	11.0	11.0	11.0
Total Split (s)	63.0	0.0	0.0	63.0	27.0	27.0	52.0	11.0	11.0	16.0
Total Split (%)	70.0%	0.0%	0.0%	70.0%	30.0%	30.0%	58%	12%	12%	18%
Maximum Green (s)							47.0	6.0	6.0	11.0
Yellow Time (s)							3.0	3.0	3.0	3.0
All-Red Time (s)							2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	5.0	4.0	4.0	5.0	5.0	5.0				
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes
Vehicle Extension (s)							3.0	3.0	3.0	3.0
Recall Mode							C-Max	None	None	None
v/c Ratio	0.48			0.85	0.43	0.10				
Control Delay	9.2			2.7	34.7	12.9				
Queue Delay	0.2			0.0	0.0	0.0				
Total Delay	9.3			2.7	34.7	12.9				
Queue Length 50th (ft)	251			21	89	2				
Queue Length 95th (ft)	309			23	127	26				
Internal Link Dist (ft)	135			94	308					
Turn Bay Length (ft)										
Base Capacity (vph)	3277			3277	839	419				
Starvation Cap Reductn	695			0	0	0				
Spillback Cap Reductn	0			0	0	0				
Storage Cap Reductn	0			0	0	0				
Reduced v/c Ratio	0.60			0.85	0.43	0.10				

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 55 (61%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Splits and Phases: 5: Route 1A & Tomesello Way Exit



Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (vph)	1433	0	0	2572	328	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.91			0.91	0.97	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	5085			5085	3433	1583
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	5085			5085	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1558	0	0	2796	357	42
RTOR Reduction (vph)	0	0	0	0	0	32
Lane Group Flow (vph)	1558	0	0	2796	357	10
Turn Type						Prot
Protected Phases	1 2			1 2	3 4	3 4
Permitted Phases						
Actuated Green, G (s)	58.0			58.0	22.0	22.0
Effective Green, g (s)	58.0			58.0	22.0	22.0
Actuated g/C Ratio	0.64			0.64	0.24	0.24
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)	3277			3277	839	387
v/s Ratio Prot	0.31			c0.55	c0.10	0.01
v/s Ratio Perm						
v/c Ratio	0.48			0.85	0.43	0.03
Uniform Delay, d1	8.2			12.6	28.7	25.9
Progression Factor	1.05			0.09	1.14	1.39
Incremental Delay, d2	0.1			1.2	0.3	0.0
Delay (s)	8.7			2.3	33.2	35.9
Level of Service	A			A	C	D
Approach Delay (s)	8.7			2.3	33.5	
Approach LOS	A			A	C	

Intersection Summary

HCM Average Control Delay	7.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	67.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø2	ø3
Lane Configurations															
Volume (vph)	60	9	8	0	0	0	0	1469	3	0	2564	0			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Right Turn on Red			Yes			Yes			Yes			Yes			
Link Speed (mph)		40			40			40			40				
Link Distance (ft)		169			294			174			232				
Travel Time (s)		2.9			5.0			3.0			4.0				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	84	0	0	0	0	0	1600	0	0	2787	0			
Turn Type	Split														
Protected Phases	4	4						1 2 3			1 2		1	2	3
Permitted Phases															
Detector Phase	4	4						1 2 3			1 2				
Switch Phase															
Minimum Initial (s)	6.0	6.0											10.0	6.0	6.0
Minimum Split (s)	11.0	11.0											15.0	11.0	11.0
Total Split (s)	16.0	16.0	0.0	0.0	0.0	0.0	0.0	74.0	0.0	0.0	63.0	0.0	52.0	11.0	11.0
Total Split (%)	17.8%	17.8%	0.0%	0.0%	0.0%	0.0%	0.0%	82.2%	0.0%	0.0%	70.0%	0.0%	58%	12%	12%
Maximum Green (s)	11.0	11.0											47.0	6.0	6.0
Yellow Time (s)	3.0	3.0											3.0	3.0	3.0
All-Red Time (s)	2.0	2.0											2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0			
Lead/Lag	Lag	Lag											Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes											Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0											3.0	3.0	3.0
Recall Mode	None	None											C-Max	None	None
v/c Ratio		0.38						0.41			0.85				
Control Delay		39.7						0.4			16.0				
Queue Delay		0.0						0.1			0.0				
Total Delay		39.7						0.5			16.0				
Queue Length 50th (ft)		42						2			408				
Queue Length 95th (ft)		87						1			486				
Internal Link Dist (ft)		89			214			94			152				
Turn Bay Length (ft)															
Base Capacity (vph)		221						3899			3277				
Starvation Cap Reductn		0						592			0				
Spillback Cap Reductn		0						0			0				
Storage Cap Reductn		0						0			0				
Reduced v/c Ratio		0.38						0.48			0.85				

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 55 (61%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	

Splits and Phases: 6: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	9	8	0	0	0	0	1469	3	0	2564	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.91	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1767						5084			5085	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1767						5084			5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	10	9	0	0	0	0	1597	3	0	2787	0
RTOR Reduction (vph)	0	4	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	80	0	0	0	0	0	1600	0	0	2787	0
Turn Type	Split											
Protected Phases	4	4						1 2 3			1 2	
Permitted Phases												
Actuated Green, G (s)		11.0						69.0			58.0	
Effective Green, g (s)		11.0						69.0			58.0	
Actuated g/C Ratio		0.12						0.77			0.64	
Clearance Time (s)		5.0										
Vehicle Extension (s)		3.0										
Lane Grp Cap (vph)		216						3898			3277	
v/s Ratio Prot		c0.05						c0.31			c0.55	
v/s Ratio Perm												
v/c Ratio		0.37						0.41			0.85	
Uniform Delay, d1		36.3						3.6			12.6	
Progression Factor		1.00						0.04			1.00	
Incremental Delay, d2		1.1						0.1			2.3	
Delay (s)		37.4						0.2			14.9	
Level of Service		D						A			B	
Approach Delay (s)		37.4			0.0			0.2			14.9	
Approach LOS		D			A			A			B	

Intersection Summary					
HCM Average Control Delay		10.0	HCM Level of Service		B
HCM Volume to Capacity ratio		0.71			
Actuated Cycle Length (s)		90.0	Sum of lost time (s)		10.0
Intersection Capacity Utilization		76.7%	ICU Level of Service		D
Analysis Period (min)		15			
c Critical Lane Group					

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	3112	0	243	0	2784
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		0		200	
Storage Lanes	0	0		0		1	
Taper Length (ft)	25	25		25		25	
Right Turn on Red		Yes		Yes			
Link Speed (mph)	40		40				30
Link Distance (ft)	65		532				359
Travel Time (s)	1.1		9.1				8.2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	0	3383	0	264	0	3026
Turn Type					Prot		
Protected Phases			1		2		1 2
Permitted Phases							
Detector Phase			1		2		1 2
Switch Phase							
Minimum Initial (s)			4.0		4.0		
Minimum Split (s)			20.0		20.0		
Total Split (s)	0.0	0.0	67.0	0.0	23.0	0.0	90.0
Total Split (%)	0.0%	0.0%	74.4%	0.0%	25.6%	0.0%	100.0%
Maximum Green (s)			63.0		19.0		
Yellow Time (s)			3.5		3.5		
All-Red Time (s)			0.5		0.5		
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag			Lead		Lag		
Lead-Lag Optimize?			Yes		Yes		
Vehicle Extension (s)			3.0		3.0		
Recall Mode			C-Max		None		
Walk Time (s)			5.0		5.0		
Flash Dont Walk (s)			11.0		11.0		
Pedestrian Calls (#/hr)			0		0		
v/c Ratio			0.95		0.71		0.61
Control Delay			20.2		29.5		0.3
Queue Delay			0.0		0.0		0.0
Total Delay			20.2		29.5		0.3
Queue Length 50th (ft)			541		133		0
Queue Length 95th (ft)			#672		m147		0
Internal Link Dist (ft)	1		452				279
Turn Bay Length (ft)					200		
Base Capacity (vph)			3560		374		4940
Starvation Cap Reductn			0		0		0
Spillback Cap Reductn			0		0		0
Storage Cap Reductn			0		0		0
Reduced v/c Ratio			0.95		0.71		0.61

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 77 (86%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 1: Southern U-turn & Route 1A



Movement	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	3112	0	243	0	2784
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0		4.0		4.0
Lane Util. Factor			0.91		1.00		0.91
Frt			1.00		1.00		1.00
Flt Protected			1.00		0.95		1.00
Satd. Flow (prot)			5085		1770		4940
Flt Permitted			1.00		0.95		1.00
Satd. Flow (perm)			5085		1770		4940
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	3383	0	264	0	3026
RTOR Reduction (vph)	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	3383	0	264	0	3026
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%
Turn Type					Prot		
Protected Phases			1		2		1 2
Permitted Phases							
Actuated Green, G (s)			63.0		19.0		90.0
Effective Green, g (s)			63.0		19.0		90.0
Actuated g/C Ratio			0.70		0.21		1.00
Clearance Time (s)			4.0		4.0		
Vehicle Extension (s)			3.0		3.0		
Lane Grp Cap (vph)			3560		374		4940
v/s Ratio Prot			c0.67		0.15		c0.61
v/s Ratio Perm							
v/c Ratio			0.95		0.71		0.61
Uniform Delay, d1			12.1		32.9		0.0
Progression Factor			1.00		0.71		1.00
Incremental Delay, d2			7.3		2.8		0.1
Delay (s)			19.4		26.2		0.1
Level of Service			B		C		A
Approach Delay (s)	0.0		19.4				2.2
Approach LOS	A		B				A

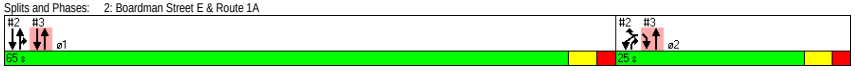
Intersection Summary			
HCM Average Control Delay	10.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	80.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	240	265	3069	286	0	2787
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250	250		100	330	
Storage Lanes	1	1		1	0	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	40		40			40
Link Distance (ft)	948		410			128
Travel Time (s)	16.2		7.0			2.2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	6%	6%	6%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	261	288	3336	311	0	3029
Turn Type		Prot		pt+ov		
Protected Phases	2	2	1	1 2		1
Permitted Phases						
Detector Phase	2	2	1	1 2		1
Switch Phase						
Minimum Initial (s)	6.0	6.0	10.0			10.0
Minimum Split (s)	15.0	15.0	15.0			15.0
Total Split (s)	25.0	25.0	65.0	90.0	0.0	65.0
Total Split (%)	27.8%	27.8%	72.2%	100.0%	0.0%	72.2%
Maximum Green (s)	20.0	20.0	60.0			60.0
Yellow Time (s)	3.0	3.0	3.0			3.0
All-Red Time (s)	2.0	2.0	2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	-1.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	4.0	4.0	5.0
Lead/Lag	Lag	Lag	Lead			Lead
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Recall Mode	None	None	C-Max			C-Max
v/c Ratio	0.36	0.85	1.02	0.20		0.92
Control Delay	31.2	57.7	24.5	0.1		5.1
Queue Delay	0.0	0.0	9.9	0.0		0.0
Total Delay	31.2	57.7	34.4	0.1		5.1
Queue Length 50th (ft)	64	157	~749	0		34
Queue Length 95th (ft)	100	#300	m#815	m0		51
Internal Link Dist (ft)	868		330			48
Turn Bay Length (ft)	250	250		100		
Base Capacity (vph)	734	339	3262	1524		3293
Starvation Cap Reductn	0	0	1	0		6
Spillback Cap Reductn	0	0	81	0		0
Storage Cap Reductn	0	0	0	0		0
Reduced v/c Ratio	0.36	0.85	1.05	0.20		0.92

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green, Master Intersection
Natural Cycle: 75
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Boardman Street E & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	240	265	3069	286	0	2787
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.0		5.0
Lane Util. Factor	0.97	1.00	0.91	1.00		0.91
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3303	1524	4893	1524		4940
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3303	1524	4893	1524		4940
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	261	288	3336	311	0	3029
RTOR Reduction (vph)	0	1	0	0	0	0
Lane Group Flow (vph)	261	287	3336	311	0	3029
Heavy Vehicles (%)	6%	6%	6%	6%	5%	5%
Turn Type		Prot		pt+ov		
Protected Phases	2	2	1	1 2		1
Permitted Phases						
Actuated Green, G (s)	20.0	20.0	60.0	90.0		60.0
Effective Green, g (s)	20.0	20.0	60.0	90.0		60.0
Actuated g/C Ratio	0.22	0.22	0.67	1.00		0.67
Clearance Time (s)	5.0	5.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	734	339	3262	1524		3293
v/s Ratio Prot	0.08	c0.19	c0.68	0.20		0.61
v/s Ratio Perm						
v/c Ratio	0.36	0.85	1.02	0.20		0.92
Uniform Delay, d1	29.6	33.5	15.0	0.0		12.9
Progression Factor	1.00	1.00	0.41	1.00		0.13
Incremental Delay, d2	0.3	17.5	15.9	0.0		2.7
Delay (s)	29.9	51.0	22.1	0.0		4.4
Level of Service	C	D	C	A		A
Approach Delay (s)	41.0		20.2			4.4
Approach LOS	D		C			A

Intersection Summary

HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	84.0%	ICU Level of Service	E
Analysis Period (min)	15		

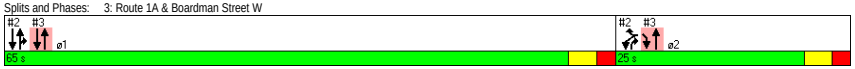
c Critical Lane Group

Lane Group	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (vph)	0	3334	2692	74	0	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Right Turn on Red				Yes		Yes
Link Speed (mph)		30	30		40	
Link Distance (ft)		128	896		377	
Travel Time (s)		2.9	20.4		6.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	3624	3006	0	0	103
Turn Type						custom
Protected Phases		1 2	1			2
Permitted Phases						
Detector Phase		1 2	1			2
Switch Phase						
Minimum Initial (s)			10.0			6.0
Minimum Split (s)			15.0			15.0
Total Split (s)	0.0	90.0	65.0	0.0	0.0	25.0
Total Split (%)	0.0%	100.0%	72.2%	0.0%	0.0%	27.8%
Maximum Green (s)			60.0			20.0
Yellow Time (s)			3.0			3.0
All-Red Time (s)			2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	4.0	5.0
Lead/Lag			Lead			Lag
Lead-Lag Optimize?						
Vehicle Extension (s)			3.0			3.0
Recall Mode			C-Max			None
v/c Ratio		0.71	0.89			0.29
Control Delay		1.0	8.5			31.1
Queue Delay		0.0	0.1			478.3
Total Delay		1.0	8.6			509.4
Queue Length 50th (ft)		0	149			48
Queue Length 95th (ft)		m0	160			94
Internal Link Dist (ft)		48	816		297	
Turn Bay Length (ft)						
Base Capacity (vph)		5085	3380			360
Starvation Cap Reductn		0	0			0
Spillback Cap Reductn		0	23			309
Storage Cap Reductn		0	0			0
Reduced v/c Ratio		0.71	0.90			2.02

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green, Master Intersection
Natural Cycle: 75
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Route 1A & Boardman Street W



Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (vph)	0	3334	2692	74	0	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0			5.0
Lane Util. Factor		0.91	0.91			1.00
Frt		1.00	1.00			0.86
Flt Protected		1.00	1.00			1.00
Satd. Flow (prot)		5085	5065			1611
Flt Permitted		1.00	1.00			1.00
Satd. Flow (perm)		5085	5065			1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	3624	2926	80	0	103
RTOR Reduction (vph)	0	0	3	0	0	2
Lane Group Flow (vph)	0	3624	3003	0	0	101
Turn Type						custom
Protected Phases		1 2	1			2
Permitted Phases						
Actuated Green, G (s)		90.0	60.0			20.0
Effective Green, g (s)		90.0	60.0			20.0
Actuated g/C Ratio		1.00	0.67			0.22
Clearance Time (s)			5.0			5.0
Vehicle Extension (s)			3.0			3.0
Lane Grp Cap (vph)		5085	3377			358
v/s Ratio Prot		c0.71	c0.59			0.06
v/s Ratio Perm						
v/c Ratio		0.71	0.89			0.28
Uniform Delay, d1		0.0	12.3			29.1
Progression Factor		1.00	0.40			1.00
Incremental Delay, d2		0.0	3.3			0.4
Delay (s)		0.0	8.1			29.5
Level of Service		A	A			C
Approach Delay (s)		0.0	8.1		29.5	
Approach LOS		A	A		C	

Intersection Summary

HCM Average Control Delay	4.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	5.0
Intersection Capacity Utilization	68.6%	ICU Level of Service	C
Analysis Period (min)	15		

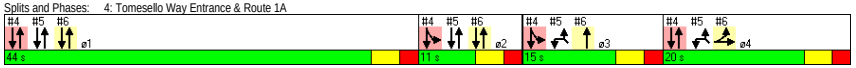
c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	ø1	ø2	ø3	ø4
Lane Configurations										
Volume (vph)	0	0	2388	990	183	2764				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900				
Storage Length (ft)	170	170		150	220					
Storage Lanes	0	0		1	2					
Taper Length (ft)	25	25		25	25					
Right Turn on Red		Yes		Yes						
Link Speed (mph)	40		40			40				
Link Distance (ft)	398		504			215				
Travel Time (s)	6.8		8.6			3.7				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Shared Lane Traffic (%)										
Lane Group Flow (vph)	0	0	2596	1076	199	3004				
Turn Type				Free	Prot					
Protected Phases			1 4		2 3	1 2 3 4	1	2	3	4
Permitted Phases				Free						
Detector Phase			1 4		2 3	1 2 3 4				
Switch Phase										
Minimum Initial (s)							10.0	6.0	6.0	6.0
Minimum Split (s)							15.0	11.0	11.0	11.0
Total Split (s)	0.0	0.0	64.0	0.0	26.0	90.0	44.0	11.0	15.0	20.0
Total Split (%)	0.0%	0.0%	71.1%	0.0%	28.9%	100.0%	49%	12%	17%	22%
Maximum Green (s)							39.0	6.0	10.0	15.0
Yellow Time (s)							3.0	3.0	3.0	3.0
All-Red Time (s)							2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	4.0	4.0	5.0	4.0	5.0	5.0				
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes
Vehicle Extension (s)							3.0	3.0	3.0	3.0
Recall Mode							C-Max	None	None	None
v/c Ratio			0.78	0.68	0.25	0.59				
Control Delay			8.2	2.0	24.7	0.3				
Queue Delay			36.5	0.0	0.0	0.0				
Total Delay			44.7	2.0	24.7	0.3				
Queue Length 50th (ft)			297	0	51	0				
Queue Length 95th (ft)			292	0	m60	0				
Internal Link Dist (ft)	318		424			135				
Turn Bay Length (ft)				150	220					
Base Capacity (vph)			3334	1583	801	5085				
Starvation Cap Reductn			0	0	0	0				
Spillback Cap Reductn			921	0	0	0				
Storage Cap Reductn			0	0	0	0				
Reduced v/c Ratio			1.08	0.68	0.25	0.59				

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 64 (71%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Tomesello Way Entrance & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	0	2388	990	183	2764
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			5.0	4.0	5.0	5.0
Lane Util. Factor			0.91	1.00	0.97	0.91
Frt			1.00	0.85	1.00	1.00
Flt Protected			1.00	1.00	0.95	1.00
Satd. Flow (prot)			5085	1583	3433	5085
Flt Permitted			1.00	1.00	0.95	1.00
Satd. Flow (perm)			5085	1583	3433	5085
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	2596	1076	199	3004
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	2596	1076	199	3004
Turn Type				Free	Prot	
Protected Phases			1 4		2 3	1 2 3 4
Permitted Phases				Free		
Actuated Green, G (s)			59.0	90.0	21.0	90.0
Effective Green, g (s)			59.0	90.0	21.0	90.0
Actuated g/C Ratio			0.66	1.00	0.23	1.00
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)			3334	1583	801	5085
v/s Ratio Prot			c0.51		0.06	0.59
v/s Ratio Perm				c0.68		
v/c Ratio			0.78	0.68	0.25	0.59
Uniform Delay, d1			10.9	0.0	28.1	0.0
Progression Factor			0.61	1.00	0.86	1.00
Incremental Delay, d2			0.9	1.7	0.1	0.1
Delay (s)			7.5	1.7	24.1	0.1
Level of Service			A	A	C	A
Approach Delay (s)	0.0		5.8			1.6
Approach LOS	A		A			A

Intersection Summary

HCM Average Control Delay	3.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	5.0
Intersection Capacity Utilization	121.5%	ICU Level of Service	H
Analysis Period (min)	15		

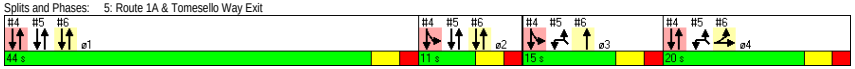
c Critical Lane Group

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR	ø1	ø2	ø3	ø4
Lane Configurations										
Volume (vph)	2388	0	0	2304	643	151				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900				
Right Turn on Red		Yes				Yes				
Link Speed (mph)	40			40	40					
Link Distance (ft)	215			174	388					
Travel Time (s)	3.7			3.0	6.6					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Shared Lane Traffic (%)										
Lane Group Flow (vph)	2596	0	0	2504	699	164				
Turn Type						Prot				
Protected Phases	1 2			1 2	3 4	3 4	1	2	3	4
Permitted Phases										
Detector Phase	1 2			1 2	3 4	3 4				
Switch Phase										
Minimum Initial (s)							10.0	6.0	6.0	6.0
Minimum Split (s)							15.0	11.0	11.0	11.0
Total Split (s)	55.0	0.0	0.0	55.0	35.0	35.0	44.0	11.0	15.0	20.0
Total Split (%)	61.1%	0.0%	0.0%	61.1%	38.9%	38.9%	49%	12%	17%	22%
Maximum Green (s)							39.0	6.0	10.0	15.0
Yellow Time (s)							3.0	3.0	3.0	3.0
All-Red Time (s)							2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	5.0	4.0	4.0	5.0	5.0	5.0				
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes
Vehicle Extension (s)							3.0	3.0	3.0	3.0
Recall Mode							C-Max	None	None	None
v/c Ratio	0.92			0.89	0.61	0.31				
Control Delay	19.7			4.2	28.1	24.2				
Queue Delay	35.0			0.0	0.0	0.0				
Total Delay	54.7			4.2	28.1	24.2				
Queue Length 50th (ft)	583			20	170	68				
Queue Length 95th (ft)	643			38	229	m117				
Internal Link Dist (ft)	135			94	308					
Turn Bay Length (ft)										
Base Capacity (vph)	2825			2825	1144	529				
Starvation Cap Reductn	412			0	0	0				
Spillback Cap Reductn	0			0	0	0				
Storage Cap Reductn	0			0	0	0				
Reduced v/c Ratio	1.08			0.89	0.61	0.31				

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 64 (71%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Route 1A & Tomesello Way Exit



Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (vph)	2388	0	0	2304	643	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.91			0.91	0.97	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	5085			5085	3433	1583
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	5085			5085	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2596	0	0	2504	699	164
RTOR Reduction (vph)	0	0	0	0	0	1
Lane Group Flow (vph)	2596	0	0	2504	699	163
Turn Type						Prot
Protected Phases	1 2			1 2	3 4	3 4
Permitted Phases						
Actuated Green, G (s)	50.0			50.0	30.0	30.0
Effective Green, g (s)	50.0			50.0	30.0	30.0
Actuated g/C Ratio	0.56			0.56	0.33	0.33
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)	2825			2825	1144	528
v/s Ratio Prot	c0.51			0.49	c0.20	0.10
v/s Ratio Perm						
v/c Ratio	0.92			0.89	0.61	0.31
Uniform Delay, d1	18.2			17.5	25.1	22.3
Progression Factor	0.83			0.09	1.01	1.01
Incremental Delay, d2	3.4			1.7	1.0	0.3
Delay (s)	18.5			3.3	26.3	22.8
Level of Service	B			A	C	C
Approach Delay (s)	18.5			3.3	25.6	
Approach LOS	B			A	C	

Intersection Summary

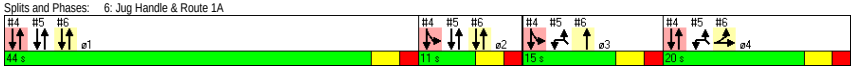
HCM Average Control Delay	13.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	121.5%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø2	ø3
Lane Configurations															
Volume (vph)	122	8	9	0	0	0	0	2540	0	0	2295	0			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Right Turn on Red			Yes			Yes			Yes			Yes			
Link Speed (mph)		40			40			40			40				
Link Distance (ft)		169			294			174			232				
Travel Time (s)		2.9			5.0			3.0			4.0				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	152	0	0	0	0	0	2761	0	0	2495	0			
Turn Type	Split														
Protected Phases	4	4						1 2 3			1 2		1	2	3
Permitted Phases															
Detector Phase	4	4						1 2 3			1 2				
Switch Phase															
Minimum Initial (s)	6.0	6.0											10.0	6.0	6.0
Minimum Split (s)	11.0	11.0											15.0	11.0	11.0
Total Split (s)	20.0	20.0	0.0	0.0	0.0	0.0	0.0	70.0	0.0	0.0	55.0	0.0	44.0	11.0	15.0
Total Split (%)	22.2%	22.2%	0.0%	0.0%	0.0%	0.0%	0.0%	77.8%	0.0%	0.0%	61.1%	0.0%	49%	12%	17%
Maximum Green (s)	15.0	15.0											39.0	6.0	10.0
Yellow Time (s)	3.0	3.0											3.0	3.0	3.0
All-Red Time (s)	2.0	2.0											2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0			
Lead/Lag	Lag	Lag											Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes											Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0											3.0	3.0	3.0
Recall Mode	None	None											C-Max	None	None
v/c Ratio		0.51						0.75			0.88				
Control Delay		40.3						1.4			22.4				
Queue Delay		0.0						1.1			0.0				
Total Delay		40.3						2.5			22.4				
Queue Length 50th (ft)		78						8			424				
Queue Length 95th (ft)		139						20			503				
Internal Link Dist (ft)		89			214			94			152				
Turn Bay Length (ft)															
Base Capacity (vph)		297						3673			2825				
Starvation Cap Reductn		0						612			0				
Spillback Cap Reductn		0						0			0				
Storage Cap Reductn		0						0			0				
Reduced v/c Ratio		0.51						0.90			0.88				

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 64 (71%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	

Splits and Phases: 6: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	122	8	9	0	0	0	0	2540	0	0	2295	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.91	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1769						5085			5085	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1769						5085			5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	133	9	10	0	0	0	0	2761	0	0	2495	0
RTOR Reduction (vph)	0	3	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	150	0	0	0	0	0	2761	0	0	2495	0
Turn Type	Split											
Protected Phases	4	4						1 2 3			1 2	
Permitted Phases												
Actuated Green, G (s)		15.0						65.0			50.0	
Effective Green, g (s)		15.0						65.0			50.0	
Actuated g/C Ratio		0.17						0.72			0.56	
Clearance Time (s)		5.0										
Vehicle Extension (s)		3.0										
Lane Grp Cap (vph)		295						3673			2825	
v/s Ratio Prot		c0.08						c0.54			c0.49	
v/s Ratio Perm												
v/c Ratio		0.51						0.75			0.88	
Uniform Delay, d1		34.1						7.6			17.5	
Progression Factor		1.00						0.09			1.00	
Incremental Delay, d2		1.4						0.4			3.6	
Delay (s)		35.5						1.1			21.1	
Level of Service		D						A			C	
Approach Delay (s)		35.5			0.0			1.1			21.1	
Approach LOS		D			A			A			C	

Intersection Summary					
HCM Average Control Delay	11.3	HCM Level of Service	B		
HCM Volume to Capacity ratio	0.77				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0		
Intersection Capacity Utilization	71.2%	ICU Level of Service	C		
Analysis Period (min)	15				
c Critical Lane Group					

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	2901	0	228	0	2585
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		0		200	
Storage Lanes	0	0		0		1	
Taper Length (ft)	25	25		25		25	
Right Turn on Red		Yes		Yes			
Link Speed (mph)	40		40				30
Link Distance (ft)	61		532				359
Travel Time (s)	1.0		9.1				8.2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	0	3153	0	248	0	2810
Turn Type					Prot		
Protected Phases			1		2		1 2
Permitted Phases							
Detector Phase			1		2		1 2
Switch Phase							
Minimum Initial (s)			4.0		4.0		
Minimum Split (s)			20.0		20.0		
Total Split (s)	0.0	0.0	50.0	0.0	20.0	0.0	70.0
Total Split (%)	0.0%	0.0%	71.4%	0.0%	28.6%	0.0%	100.0%
Maximum Green (s)			46.0		16.0		
Yellow Time (s)			3.5		3.5		
All-Red Time (s)			0.5		0.5		
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag			Lead		Lag		
Lead-Lag Optimize?			Yes		Yes		
Vehicle Extension (s)			3.0		3.0		
Recall Mode			C-Max		None		
Walk Time (s)			5.0		5.0		
Flash Dont Walk (s)			11.0		11.0		
Pedestrian Calls (#/hr)			0		0		
v/c Ratio			0.94		0.61		0.57
Control Delay			18.9		21.5		0.2
Queue Delay			0.0		0.0		0.0
Total Delay			18.9		21.5		0.2
Queue Length 50th (ft)			380		77		0
Queue Length 95th (ft)			#528		m96		m0
Internal Link Dist (ft)	1		452				279
Turn Bay Length (ft)					200		
Base Capacity (vph)			3342		405		4940
Starvation Cap Reductn			0		0		0
Spillback Cap Reductn			0		0		0
Storage Cap Reductn			0		0		0
Reduced v/c Ratio			0.94		0.61		0.57

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 54 (77%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Southern U-turn & Route 1A



Movement	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Volume (vph)	0	0	2901	0	228	0	2585
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0		4.0		4.0
Lane Util. Factor			0.91		1.00		0.91
Frt			1.00		1.00		1.00
Flt Protected			1.00		0.95		1.00
Satd. Flow (prot)			5085		1770		4940
Flt Permitted			1.00		0.95		1.00
Satd. Flow (perm)			5085		1770		4940
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	3153	0	248	0	2810
RTOR Reduction (vph)	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	3153	0	248	0	2810
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%
Turn Type					Prot		
Protected Phases			1		2		1 2
Permitted Phases							
Actuated Green, G (s)			46.0		16.0		70.0
Effective Green, g (s)			46.0		16.0		70.0
Actuated g/C Ratio			0.66		0.23		1.00
Clearance Time (s)			4.0		4.0		
Vehicle Extension (s)			3.0		3.0		
Lane Grp Cap (vph)			3342		405		4940
v/s Ratio Prot			c0.62		0.14		c0.57
v/s Ratio Perm							
v/c Ratio			0.94		0.61		0.57
Uniform Delay, d1			10.8		24.2		0.0
Progression Factor			1.00		0.73		1.00
Incremental Delay, d2			7.0		1.3		0.1
Delay (s)			17.9		19.0		0.1
Level of Service			B		B		A
Approach Delay (s)	0.0		17.9				1.6
Approach LOS	A		B				A

Intersection Summary

HCM Average Control Delay	9.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	75.3%	ICU Level of Service	D
Analysis Period (min)	15		

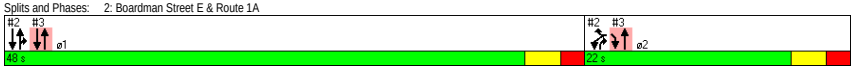
c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	252	342	2644	485	0	2561
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250	250		100	330	
Storage Lanes	1	1		1	0	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	40		40			40
Link Distance (ft)	948		410			128
Travel Time (s)	16.2		7.0			2.2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	6%	6%	6%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	274	372	2874	527	0	2784
Turn Type		Prot		pt+ov		
Protected Phases	2	2	1	1 2		1
Permitted Phases						
Detector Phase	2	2	1	1 2		1
Switch Phase						
Minimum Initial (s)	6.0	6.0	10.0			10.0
Minimum Split (s)	15.0	15.0	15.0			15.0
Total Split (s)	22.0	22.0	48.0	70.0	0.0	48.0
Total Split (%)	31.4%	31.4%	68.6%	100.0%	0.0%	68.6%
Maximum Green (s)	17.0	17.0	43.0			43.0
Yellow Time (s)	3.0	3.0	3.0			3.0
All-Red Time (s)	2.0	2.0	2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	-1.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	4.0	4.0	5.0
Lead/Lag	Lag	Lag	Lead			Lead
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Recall Mode	None	None	C-Max			C-Max
v/c Ratio	0.34	1.00	0.96	0.35		0.92
Control Delay	23.3	76.9	10.0	0.2		5.5
Queue Delay	0.0	0.0	0.4	0.0		0.0
Total Delay	23.3	76.9	10.5	0.2		5.5
Queue Length 50th (ft)	50	~160	40	0		28
Queue Length 95th (ft)	81	#329	m#135	m0		#50
Internal Link Dist (ft)	868		330			48
Turn Bay Length (ft)	250	250		100		
Base Capacity (vph)	802	372	3006	1524		3035
Starvation Cap Reductn	0	0	0	0		0
Spillback Cap Reductn	0	0	20	0		0
Storage Cap Reductn	0	0	0	0		0
Reduced v/c Ratio	0.34	1.00	0.96	0.35		0.92

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green, Master Intersection
Natural Cycle: 75
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Boardman Street E & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	252	342	2644	485	0	2561
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.0		5.0
Lane Util. Factor	0.97	1.00	0.91	1.00		0.91
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3303	1524	4893	1524		4940
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3303	1524	4893	1524		4940
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	274	372	2874	527	0	2784
RTOR Reduction (vph)	0	2	0	0	0	0
Lane Group Flow (vph)	274	370	2874	527	0	2784
Heavy Vehicles (%)	6%	6%	6%	6%	5%	5%
Turn Type		Prot		pt+ov		
Protected Phases	2	2	1	1 2		1
Permitted Phases						
Actuated Green, G (s)	17.0	17.0	43.0	70.0		43.0
Effective Green, g (s)	17.0	17.0	43.0	70.0		43.0
Actuated g/C Ratio	0.24	0.24	0.61	1.00		0.61
Clearance Time (s)	5.0	5.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	802	370	3006	1524		3035
v/s Ratio Prot	0.08	c0.24	c0.59	0.35		0.56
v/s Ratio Perm						
v/c Ratio	0.34	1.00	0.96	0.35		0.92
Uniform Delay, d1	21.9	26.5	12.6	0.0		11.9
Progression Factor	1.00	1.00	0.34	1.00		0.13
Incremental Delay, d2	0.3	47.1	4.1	0.1		2.9
Delay (s)	22.1	73.6	8.4	0.1		4.5
Level of Service	C	E	A	A		A
Approach Delay (s)	51.8		7.1			4.5
Approach LOS	D		A			A

Intersection Summary

HCM Average Control Delay	10.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	80.6%	ICU Level of Service	D
Analysis Period (min)	15		

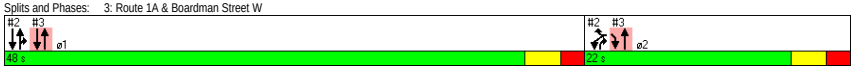
c Critical Lane Group

Lane Group	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (vph)	0	2986	2476	52	0	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Right Turn on Red				Yes		Yes
Link Speed (mph)		30	30		40	
Link Distance (ft)		128	896		377	
Travel Time (s)		2.9	20.4		6.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	3246	2748	0	0	92
Turn Type						custom
Protected Phases		1 2	1			2
Permitted Phases						
Detector Phase		1 2	1			2
Switch Phase						
Minimum Initial (s)			10.0			6.0
Minimum Split (s)			15.0			15.0
Total Split (s)	0.0	70.0	48.0	0.0	0.0	22.0
Total Split (%)	0.0%	100.0%	68.6%	0.0%	0.0%	31.4%
Maximum Green (s)			43.0			17.0
Yellow Time (s)			3.0			3.0
All-Red Time (s)			2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	4.0	5.0
Lead/Lag			Lead			Lag
Lead-Lag Optimize?						
Vehicle Extension (s)			3.0			3.0
Recall Mode			C-Max			None
v/c Ratio		0.64	0.88			0.23
Control Delay		0.5	9.5			22.8
Queue Delay		0.0	0.2			1.8
Total Delay		0.5	9.6			24.5
Queue Length 50th (ft)		0	130			31
Queue Length 95th (ft)		m0	160			67
Internal Link Dist (ft)		48	816		297	
Turn Bay Length (ft)						
Base Capacity (vph)		5085	3118			393
Starvation Cap Reductn		0	0			0
Spillback Cap Reductn		0	42			190
Storage Cap Reductn		0	0			0
Reduced v/c Ratio		0.64	0.89			0.45

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green, Master Intersection
Natural Cycle: 75
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Route 1A & Boardman Street W



Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (vph)	0	2986	2476	52	0	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0			5.0
Lane Util. Factor		0.91	0.91			1.00
Frt		1.00	1.00			0.86
Flt Protected		1.00	1.00			1.00
Satd. Flow (prot)		5085	5069			1611
Flt Permitted		1.00	1.00			1.00
Satd. Flow (perm)		5085	5069			1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	3246	2691	57	0	92
RTOR Reduction (vph)	0	0	3	0	0	2
Lane Group Flow (vph)	0	3246	2745	0	0	90
Turn Type						custom
Protected Phases		1 2	1			2
Permitted Phases						
Actuated Green, G (s)		70.0	43.0			17.0
Effective Green, g (s)		70.0	43.0			17.0
Actuated g/C Ratio		1.00	0.61			0.24
Clearance Time (s)			5.0			5.0
Vehicle Extension (s)			3.0			3.0
Lane Grp Cap (vph)		5085	3114			391
v/s Ratio Prot		c0.64	c0.54			0.06
v/s Ratio Perm						
v/c Ratio		0.64	0.88			0.23
Uniform Delay, d1		0.0	11.4			21.3
Progression Factor		1.00	0.48			1.00
Incremental Delay, d2		0.1	3.4			0.3
Delay (s)		0.1	8.9			21.6
Level of Service		A	A			C
Approach Delay (s)		0.1	8.9		21.6	
Approach LOS		A	A		C	

Intersection Summary

HCM Average Control Delay	4.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	5.0
Intersection Capacity Utilization	62.6%	ICU Level of Service	B
Analysis Period (min)	15		

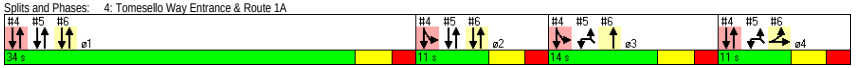
c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	ø1	ø2	ø3	ø4
Lane Configurations										
Volume (vph)	0	0	2031	945	205	2526				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900				
Storage Length (ft)	170	170		150	220					
Storage Lanes	0	0		1	2					
Taper Length (ft)	25	25		25	25					
Right Turn on Red		Yes		Yes						
Link Speed (mph)	40		40			40				
Link Distance (ft)	398		504			215				
Travel Time (s)	6.8		8.6			3.7				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Shared Lane Traffic (%)										
Lane Group Flow (vph)	0	0	2208	1027	223	2746				
Turn Type				Free	Prot					
Protected Phases			1 4		2 3	1 2 3 4	1	2	3	4
Permitted Phases				Free						
Detector Phase			1 4		2 3	1 2 3 4				
Switch Phase										
Minimum Initial (s)							10.0	6.0	6.0	6.0
Minimum Split (s)							15.0	11.0	11.0	11.0
Total Split (s)	0.0	0.0	45.0	0.0	25.0	70.0	34.0	11.0	14.0	11.0
Total Split (%)	0.0%	0.0%	64.3%	0.0%	35.7%	100.0%	49%	16%	20%	16%
Maximum Green (s)							29.0	6.0	9.0	6.0
Yellow Time (s)							3.0	3.0	3.0	3.0
All-Red Time (s)							2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	4.0	4.0	5.0	4.0	5.0	5.0				
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes
Vehicle Extension (s)							3.0	3.0	3.0	3.0
Recall Mode							C-Max	None	None	None
v/c Ratio			0.76	0.65	0.23	0.54				
Control Delay			6.9	2.4	17.7	0.3				
Queue Delay			2.2	0.0	0.0	0.0				
Total Delay			9.0	2.4	17.7	0.3				
Queue Length 50th (ft)			67	0	43	0				
Queue Length 95th (ft)			156	24	m52	0				
Internal Link Dist (ft)	318		424			135				
Turn Bay Length (ft)				150	220					
Base Capacity (vph)			2906	1583	981	5085				
Starvation Cap Reductn			0	0	0	0				
Spillback Cap Reductn			530	0	0	0				
Storage Cap Reductn			0	0	0	0				
Reduced v/c Ratio			0.93	0.65	0.23	0.54				

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 42 (60%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Tomesello Way Entrance & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	0	2031	945	205	2526
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			5.0	4.0	5.0	5.0
Lane Util. Factor			0.91	1.00	0.97	0.91
Frt			1.00	0.85	1.00	1.00
Flt Protected			1.00	1.00	0.95	1.00
Satd. Flow (prot)			5085	1583	3433	5085
Flt Permitted			1.00	1.00	0.95	1.00
Satd. Flow (perm)			5085	1583	3433	5085
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	2208	1027	223	2746
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	2208	1027	223	2746
Turn Type				Free	Prot	
Protected Phases			1 4		2 3	1 2 3 4
Permitted Phases				Free		
Actuated Green, G (s)			40.0	70.0	20.0	70.0
Effective Green, g (s)			40.0	70.0	20.0	70.0
Actuated g/C Ratio			0.57	1.00	0.29	1.00
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)			2906	1583	981	5085
v/s Ratio Prot			c0.43		0.06	0.54
v/s Ratio Perm				c0.65		
v/c Ratio			0.76	0.65	0.23	0.54
Uniform Delay, d1			11.4	0.0	19.1	0.0
Progression Factor			0.46	1.00	0.90	1.00
Incremental Delay, d2			0.9	1.6	0.1	0.1
Delay (s)			6.1	1.6	17.3	0.1
Level of Service			A	A	B	A
Approach Delay (s)	0.0		4.7			1.4
Approach LOS	A		A			A

Intersection Summary

HCM Average Control Delay	3.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	110.0%	ICU Level of Service	H
Analysis Period (min)	15		

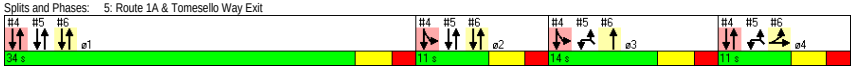
c Critical Lane Group

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR	ø1	ø2	ø3	ø4
Lane Configurations										
Volume (vph)	2031	0	0	2139	592	196				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900				
Right Turn on Red		Yes				Yes				
Link Speed (mph)	40			40	40					
Link Distance (ft)	215			174	388					
Travel Time (s)	3.7			3.0	6.6					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Shared Lane Traffic (%)										
Lane Group Flow (vph)	2208	0	0	2325	643	213				
Turn Type						Prot				
Protected Phases	1 2			1 2	3 4	3 4	1	2	3	4
Permitted Phases										
Detector Phase	1 2			1 2	3 4	3 4				
Switch Phase										
Minimum Initial (s)							10.0	6.0	6.0	6.0
Minimum Split (s)							15.0	11.0	11.0	11.0
Total Split (s)	45.0	0.0	0.0	45.0	25.0	25.0	34.0	11.0	14.0	11.0
Total Split (%)	64.3%	0.0%	0.0%	64.3%	35.7%	35.7%	49%	16%	20%	16%
Maximum Green (s)							29.0	6.0	9.0	6.0
Yellow Time (s)							3.0	3.0	3.0	3.0
All-Red Time (s)							2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	5.0	4.0	4.0	5.0	5.0	5.0				
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes
Vehicle Extension (s)							3.0	3.0	3.0	3.0
Recall Mode							C-Max	None	None	None
v/c Ratio	0.76			0.80	0.66	0.47				
Control Delay	6.7			2.7	25.8	24.2				
Queue Delay	2.2			0.0	0.0	0.0				
Total Delay	8.8			2.7	25.8	24.2				
Queue Length 50th (ft)	200			18	125	74				
Queue Length 95th (ft)	286			20	177	m133				
Internal Link Dist (ft)	135			94	308					
Turn Bay Length (ft)										
Base Capacity (vph)	2906			2906	981	456				
Starvation Cap Reductn	531			0	0	0				
Spillback Cap Reductn	0			0	0	0				
Storage Cap Reductn	0			0	0	0				
Reduced v/c Ratio	0.93			0.80	0.66	0.47				

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 42 (60%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Route 1A & Tomesello Way Exit



Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (vph)	2031	0	0	2139	592	196
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.91			0.91	0.97	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	5085			5085	3433	1583
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	5085			5085	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2208	0	0	2325	643	213
RTOR Reduction (vph)	0	0	0	0	0	4
Lane Group Flow (vph)	2208	0	0	2325	643	209
Turn Type						Prot
Protected Phases	1 2			1 2	3 4	3 4
Permitted Phases						
Actuated Green, G (s)	40.0			40.0	20.0	20.0
Effective Green, g (s)	40.0			40.0	20.0	20.0
Actuated g/C Ratio	0.57			0.57	0.29	0.29
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)	2906			2906	981	452
v/s Ratio Prot	0.43			c0.46	c0.19	0.13
v/s Ratio Perm						
v/c Ratio	0.76			0.80	0.66	0.46
Uniform Delay, d1	11.4			11.8	22.0	20.6
Progression Factor	0.47			0.11	1.00	1.00
Incremental Delay, d2	0.7			1.0	1.6	0.8
Delay (s)	6.1			2.2	23.6	21.4
Level of Service	A			A	C	C
Approach Delay (s)	6.1			2.2	23.1	
Approach LOS	A			A	C	

Intersection Summary

HCM Average Control Delay	7.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	110.0%	ICU Level of Service	H
Analysis Period (min)	15		

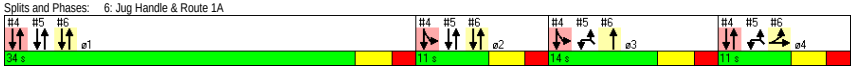
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø2	ø3
Lane Configurations															
Volume (vph)	59	9	8	0	0	0	0	2227	2	0	2132	0			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Right Turn on Red			Yes			Yes			Yes			Yes			
Link Speed (mph)		40			40			40			40				
Link Distance (ft)		169			294			174			232				
Travel Time (s)		2.9			5.0			3.0			4.0				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	83	0	0	0	0	0	2423	0	0	2317	0			
Turn Type	Split														
Protected Phases	4	4						1 2 3			1 2		1	2	3
Permitted Phases															
Detector Phase	4	4						1 2 3			1 2				
Switch Phase															
Minimum Initial (s)	6.0	6.0											10.0	6.0	6.0
Minimum Split (s)	11.0	11.0											15.0	11.0	11.0
Total Split (s)	11.0	11.0	0.0	0.0	0.0	0.0	0.0	59.0	0.0	0.0	45.0	0.0	34.0	11.0	14.0
Total Split (%)	15.7%	15.7%	0.0%	0.0%	0.0%	0.0%	0.0%	84.3%	0.0%	0.0%	64.3%	0.0%	49%	16%	20%
Maximum Green (s)	6.0	6.0											29.0	6.0	9.0
Yellow Time (s)	3.0	3.0											3.0	3.0	3.0
All-Red Time (s)	2.0	2.0											2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0			
Lead/Lag	Lag	Lag											Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes											Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0											3.0	3.0	3.0
Recall Mode	None	None											C-Max	None	None
v/c Ratio		0.53						0.62			0.80				
Control Delay		41.7						0.9			14.5				
Queue Delay		0.0						0.3			0.0				
Total Delay		41.7						1.2			14.5				
Queue Length 50th (ft)		32						11			260				
Queue Length 95th (ft)		#82						24			324				
Internal Link Dist (ft)		89			214			94			152				
Turn Bay Length (ft)															
Base Capacity (vph)		158						3923			2906				
Starvation Cap Reductn		0						688			0				
Spillback Cap Reductn		0						0			0				
Storage Cap Reductn		0						0			0				
Reduced v/c Ratio		0.53						0.75			0.80				

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 42 (60%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	59	9	8	0	0	0	0	2227	2	0	2132	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.91	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1767						5085			5085	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1767						5085			5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	64	10	9	0	0	0	0	2421	2	0	2317	0
RTOR Reduction (vph)	0	6	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	77	0	0	0	0	0	2423	0	0	2317	0
Turn Type	Split											
Protected Phases	4	4						1 2 3			1 2	
Permitted Phases												
Actuated Green, G (s)		6.0						54.0			40.0	
Effective Green, g (s)		6.0						54.0			40.0	
Actuated g/C Ratio		0.09						0.77			0.57	
Clearance Time (s)		5.0										
Vehicle Extension (s)		3.0										
Lane Grp Cap (vph)		151						3923			2906	
v/s Ratio Prot		c0.04						c0.48			c0.46	
v/s Ratio Perm												
v/c Ratio		0.51						0.62			0.80	
Uniform Delay, d1		30.6						3.5			11.8	
Progression Factor		1.00						0.12			1.00	
Incremental Delay, d2		2.7						0.2			1.6	
Delay (s)		33.3						0.6			13.4	
Level of Service		C						A			B	
Approach Delay (s)		33.3			0.0			0.6			13.4	
Approach LOS		C			A			A			B	

Intersection Summary

HCM Average Control Delay	7.3	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.70				
Actuated Cycle Length (s)	70.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	64.7%	ICU Level of Service		C	
Analysis Period (min)	15				

c Critical Lane Group

Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

Synchro 7 Capacity Analysis
Option 12-1 - Left turn Flyover at Route 1A SB to Boardman Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	39	10	90	384	34	149	134	1086	60	0	2052	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	420		200	475		0
Storage Lanes	0		1	1		0	1		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		521			531			1411			1005	
Travel Time (s)		11.8			12.1			32.1			22.8	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Shared Lane Traffic (%)				24%								
Lane Group Flow (vph)	0	52	96	311	293	0	146	1245	0	0	2087	0
Turn Type	Split		pt+ov	Split			Prot					
Protected Phases	8	8	1 8	7	7		1	6			2	
Permitted Phases												
Detector Phase	8	8	1 8	7	7		1	6			2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		11.0	32.0			32.0	
Total Split (s)	11.0	11.0	28.0	29.0	29.0	0.0	17.0	80.0	0.0	0.0	63.0	0.0
Total Split (%)	9.2%	9.2%	23.3%	24.2%	24.2%	0.0%	14.2%	66.7%	0.0%	0.0%	52.5%	0.0%
Maximum Green (s)	6.0	6.0		24.0	24.0		12.0	75.0			58.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag	Lag	Lag		Lead	Lead		Lead				Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Recall Mode	None	None		None	None		None	C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.60	0.33	0.93	0.85		0.94	0.41			0.85	
Control Delay		83.0	35.3	83.1	61.9		111.0	11.6			31.3	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Delay		83.0	35.3	83.1	61.9		111.0	11.6			31.3	
Queue Length 50th (ft)		40	49	250	198		114	165			508	
Queue Length 95th (ft)		#98	101	#429	#353		#245	195			579	
Internal Link Dist (ft)		441			451			1331			925	
Turn Bay Length (ft)			100	200			420					
Base Capacity (vph)		88	278	340	352		156	3005			2453	
Starvation Cap Reductn		0	0	0	0		0	0			0	
Spillback Cap Reductn		0	0	0	0		0	0			0	
Storage Cap Reductn		0	0	0	0		0	0			0	
Reduced v/c Ratio		0.59	0.35	0.91	0.83		0.94	0.41			0.85	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	39	10	90	384	34	149	134	1086	60	0	2052	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0		5.0	5.0			5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95		1.00	0.91			0.91	
Frt		1.00	0.85	1.00	0.92		1.00	0.99			1.00	
Flt Protected		0.96	1.00	0.95	0.98		0.95	1.00			1.00	
Satd. Flow (prot)		1759	1417	1698	1583		1556	4767			5027	
Flt Permitted		0.96	1.00	0.95	0.98		0.95	1.00			1.00	
Satd. Flow (perm)		1759	1417	1698	1583		1556	4767			5027	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	41	11	96	409	36	159	146	1180	65	0	2073	14
RTOR Reduction (vph)	0	0	19	0	35	0	0	5	0	0	1	0
Lane Group Flow (vph)	0	52	77	311	258	0	146	1240	0	0	2086	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split			Prot					
Protected Phases	8	8	1 8	7	7		1	6			2	
Permitted Phases												
Actuated Green, G (s)		6.0	23.0	23.5	23.5		12.0	75.5			58.5	
Effective Green, g (s)		6.0	23.0	23.5	23.5		12.0	75.5			58.5	
Actuated g/C Ratio		0.05	0.19	0.20	0.20		0.10	0.63			0.49	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0			5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		88	272	333	310		156	2999			2451	
v/s Ratio Prot		c0.03	0.05	c0.18	0.16		c0.09	0.26			c0.42	
v/s Ratio Perm												
v/c Ratio		0.59	0.28	0.93	0.83		0.94	0.41			0.85	
Uniform Delay, d1		55.8	41.5	47.5	46.3		53.6	11.2			26.9	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2		10.2	0.6	32.4	17.0		52.8	0.4			4.0	
Delay (s)		66.0	42.0	79.9	63.3		106.5	11.6			30.9	
Level of Service		E	D	E	E		F	B			C	
Approach Delay (s)		50.5			71.9			21.5			30.9	
Approach LOS		D			E			C			C	

Intersection Summary

HCM Average Control Delay	34.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	83.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	3	48	182	15	201	66	1961	23	0	1591	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	420		200	475		0
Storage Lanes	0		1	1		0	1		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		521			531			1411			1005	
Travel Time (s)		11.8			12.1			32.1			22.8	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	39	51	194	230	0	72	2157	0	0	1618	0
Turn Type	Split		pt+ov	Split			Prot					
Protected Phases	8	8	1 8	7	7		1	6			2	
Permitted Phases												
Detector Phase	8	8	1 8	7	7		1	6			2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		11.0	32.0			32.0	
Total Split (s)	11.0	11.0	25.0	26.0	26.0	0.0	14.0	83.0	0.0	0.0	69.0	0.0
Total Split (%)	9.2%	9.2%	20.8%	21.7%	21.7%	0.0%	11.7%	69.2%	0.0%	0.0%	57.5%	0.0%
Maximum Green (s)	6.0	6.0		21.0	21.0		9.0	78.0			64.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag	Lag	Lag		Lead	Lead		Lead				Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Recall Mode	None	None		None	None		None	C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.45	0.21	0.71	0.84		0.65	0.65			0.54	
Control Delay		72.6	13.8	62.6	64.4		80.6	12.6			17.1	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Delay		72.6	13.8	62.6	64.4		80.6	12.6			17.1	
Queue Length 50th (ft)		30	0	142	140		55	353			299	
Queue Length 95th (ft)		68	36	221	#253		#120	410			350	
Internal Link Dist (ft)		441			451			1331			925	
Turn Bay Length (ft)			100	200			420					
Base Capacity (vph)		87	254	313	309		117	3312			3003	
Starvation Cap Reductn		0	0	0	0		0	0			0	
Spillback Cap Reductn		0	0	0	0		0	0			0	
Storage Cap Reductn		0	0	0	0		0	0			0	
Reduced v/c Ratio		0.45	0.20	0.62	0.74		0.62	0.65			0.54	

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	3	48	182	15	201	66	1961	23	0	1591	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0		5.0	5.0			5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.91			0.91	
Frt		1.00	0.85	1.00	0.86		1.00	1.00			1.00	
Flt Protected		0.96	1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)		1736	1417	1787	1562		1556	4795			5027	
Flt Permitted		0.96	1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (perm)		1736	1417	1787	1562		1556	4795			5027	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	36	3	51	194	16	214	72	2132	25	0	1607	11
RTOR Reduction (vph)	0	0	44	0	37	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	39	7	194	193	0	72	2156	0	0	1618	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split			Prot					
Protected Phases	8	8	1 8	7	7		1	6			2	
Permitted Phases												
Actuated Green, G (s)		4.8	17.0	18.3	18.3		7.2	81.9			69.7	
Effective Green, g (s)		4.8	17.0	18.3	18.3		7.2	81.9			69.7	
Actuated g/C Ratio		0.04	0.14	0.15	0.15		0.06	0.68			0.58	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0			5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		69	201	273	238		93	3273			2920	
v/s Ratio Prot		c0.02	0.01	0.11	c0.12		0.05	c0.45			0.32	
v/s Ratio Perm												
v/c Ratio		0.57	0.04	0.71	0.81		0.77	0.66			0.55	
Uniform Delay, d1		56.6	44.4	48.3	49.2		55.6	11.0			15.5	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2		10.2	0.1	8.4	18.1		32.2	1.1			0.8	
Delay (s)		66.8	44.5	56.8	67.2		87.8	12.0			16.3	
Level of Service		E	D	E	E		F	B			B	
Approach Delay (s)		54.1			62.4			14.5			16.3	
Approach LOS		D			E			B			B	

Intersection Summary					
HCM Average Control Delay	20.6	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.68				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		15.0	
Intersection Capacity Utilization	67.9%	ICU Level of Service		C	
Analysis Period (min)	15				

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	9	33	184	11	256	29	1627	239	0	1474	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	420		200	475		0
Storage Lanes	0		1	1		0	1		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		521			531			1411			1005	
Travel Time (s)		11.8			12.1			32.1			22.8	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Shared Lane Traffic (%)				10%								
Lane Group Flow (vph)	0	46	35	176	304	0	32	2028	0	0	1514	0
Turn Type	Split		pt+ov	Split			Prot					
Protected Phases	8	8	1 8	7	7		1	6			2	
Permitted Phases												
Detector Phase	8	8	1 8	7	7		1	6			2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		11.0	32.0			32.0	
Total Split (s)	11.0	11.0	22.0	31.0	31.0	0.0	11.0	78.0	0.0	0.0	67.0	0.0
Total Split (%)	9.2%	9.2%	18.3%	25.8%	25.8%	0.0%	9.2%	65.0%	0.0%	0.0%	55.8%	0.0%
Maximum Green (s)	6.0	6.0		26.0	26.0		6.0	73.0			62.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag	Lag	Lag		Lead	Lead		Lead				Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Recall Mode	None	None		None	None		None	C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.53	0.17	0.52	0.90		0.42	0.66			0.53	
Control Delay		77.6	16.5	48.6	67.7		71.9	15.2			18.2	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Delay		77.6	16.5	48.6	67.7		71.9	15.2			18.2	
Queue Length 50th (ft)		35	0	126	198		25	363			286	
Queue Length 95th (ft)		#84	31	203	#358		59	417			333	
Internal Link Dist (ft)		441			451			1331			925	
Turn Bay Length (ft)			100	200			420					
Base Capacity (vph)		88	206	368	365		78	3060			2873	
Starvation Cap Reductn		0	0	0	0		0	0			0	
Spillback Cap Reductn		0	0	0	0		0	0			0	
Storage Cap Reductn		0	0	0	0		0	0			0	
Reduced v/c Ratio		0.52	0.17	0.48	0.83		0.41	0.66			0.53	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection
Natural Cycle: 70
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	9	33	184	11	256	29	1627	239	0	1474	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0		5.0	5.0			5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95		1.00	0.91			0.91	
Frt		1.00	0.85	1.00	0.87		1.00	0.98			1.00	
Flt Protected		0.96	1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)		1760	1417	1698	1490		1556	4716			5015	
Flt Permitted		0.96	1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (perm)		1760	1417	1698	1490		1556	4716			5015	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	36	10	35	196	12	272	32	1768	260	0	1489	25
RTOR Reduction (vph)	0	0	31	0	43	0	0	15	0	0	1	0
Lane Group Flow (vph)	0	46	4	176	261	0	32	2013	0	0	1513	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split			Prot					
Protected Phases	8	8	1 8	7	7		1	6			2	
Permitted Phases												
Actuated Green, G (s)		4.8	14.6	23.7	23.7		4.8	76.5			66.7	
Effective Green, g (s)		4.8	14.6	23.7	23.7		4.8	76.5			66.7	
Actuated g/C Ratio		0.04	0.12	0.20	0.20		0.04	0.64			0.56	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0			5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		70	172	335	294		62	3006			2788	
v/s Ratio Prot		c0.03	0.00	0.10	c0.17		0.02	c0.43			0.30	
v/s Ratio Perm												
v/c Ratio		0.66	0.02	0.53	0.89		0.52	0.67			0.54	
Uniform Delay, d1		56.8	46.4	43.1	46.8		56.5	13.8			16.9	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2		20.1	0.1	1.5	25.7		7.1	1.2			0.8	
Delay (s)		76.9	46.5	44.6	72.6		63.5	15.0			17.7	
Level of Service		E	D	D	E		E	B			B	
Approach Delay (s)		63.7			62.3			15.7			17.7	
Approach LOS		E			E			B			B	

Intersection Summary

HCM Average Control Delay	22.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	65.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	11	95	404	36	157	141	1422	63	0	2427	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	420		200	475		0
Storage Lanes	0		1	1		0	1		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		521			531			1411			1005	
Travel Time (s)		11.8			12.1			32.1			22.8	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Shared Lane Traffic (%)				24%								
Lane Group Flow (vph)	0	56	101	327	308	0	153	1614	0	0	2467	0
Turn Type	Split		pt+ov	Split			Prot					
Protected Phases	8	8	1 8	7	7		1	6			2	
Permitted Phases												
Detector Phase	8	8	1 8	7	7		1	6			2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		11.0	32.0			32.0	
Total Split (s)	11.0	11.0	28.0	29.0	29.0	0.0	17.0	80.0	0.0	0.0	63.0	0.0
Total Split (%)	9.2%	9.2%	23.3%	24.2%	24.2%	0.0%	14.2%	66.7%	0.0%	0.0%	52.5%	0.0%
Maximum Green (s)	6.0	6.0		24.0	24.0		12.0	75.0			58.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag	Lag	Lag		Lead	Lead		Lead				Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Recall Mode	None	None		None	None		None	C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.64	0.35	0.96	0.88		0.98	0.54			1.01	
Control Delay		86.9	37.9	88.1	65.3		121.6	13.5			53.2	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Delay		86.9	37.9	88.1	65.3		121.6	13.5			53.2	
Queue Length 50th (ft)		43	55	266	213		120	239			~712	
Queue Length 95th (ft)		#108	110	#460	#383		#258	279			#833	
Internal Link Dist (ft)		441			451			1331			925	
Turn Bay Length (ft)			100	200			420					
Base Capacity (vph)		88	287	340	352		156	2989			2431	
Starvation Cap Reductn		0	0	0	0		0	0			0	
Spillback Cap Reductn		0	0	0	0		0	0			0	
Storage Cap Reductn		0	0	0	0		0	0			0	
Reduced v/c Ratio		0.64	0.35	0.96	0.88		0.98	0.54			1.01	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection
Natural Cycle: 110
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	11	95	404	36	157	141	1422	63	0	2427	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0		5.0	5.0			5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95		1.00	0.91			0.91	
Frt		1.00	0.85	1.00	0.92		1.00	0.99			1.00	
Flt Protected		0.96	1.00	0.95	0.98		0.95	1.00			1.00	
Satd. Flow (prot)		1759	1417	1698	1583		1556	4774			5028	
Flt Permitted		0.96	1.00	0.95	0.98		0.95	1.00			1.00	
Satd. Flow (perm)		1759	1417	1698	1583		1556	4774			5028	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	44	12	101	430	38	167	153	1546	68	0	2452	15
RTOR Reduction (vph)	0	0	15	0	35	0	0	4	0	0	1	0
Lane Group Flow (vph)	0	56	86	327	273	0	153	1610	0	0	2466	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split			Prot					
Protected Phases	8	8	1 8	7	7		1	6			2	
Permitted Phases												
Actuated Green, G (s)		6.0	23.0	24.0	24.0		12.0	75.0			58.0	
Effective Green, g (s)		6.0	23.0	24.0	24.0		12.0	75.0			58.0	
Actuated g/C Ratio		0.05	0.19	0.20	0.20		0.10	0.62			0.48	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0			5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		88	272	340	317		156	2984			2430	
v/s Ratio Prot		c0.03	0.06	c0.19	0.17		c0.10	0.34			c0.49	
v/s Ratio Perm												
v/c Ratio		0.64	0.31	0.96	0.86		0.98	0.54			1.02	
Uniform Delay, d1		55.9	41.7	47.5	46.4		53.9	12.7			31.0	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2		14.1	0.7	38.5	20.5		66.0	0.7			22.1	
Delay (s)		70.0	42.4	86.0	66.9		119.9	13.4			53.1	
Level of Service		E	D	F	E		F	B			D	
Approach Delay (s)		52.3			76.8			22.7			53.1	
Approach LOS		D			E			C			D	

Intersection Summary

HCM Average Control Delay	45.3	HCM Level of Service		D	
HCM Volume to Capacity ratio	0.98				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		20.0	
Intersection Capacity Utilization	92.0%	ICU Level of Service		F	
Analysis Period (min)	15				

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	3	51	240	16	249	70	2852	79	0	2375	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	420		200	475		0
Storage Lanes	0		1	1		0	1		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		521			531			1411			1005	
Travel Time (s)		11.8			12.1			32.1			22.8	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	41	54	255	282	0	76	3186	0	0	2411	0
Turn Type	Split		pt+ov	Split			Prot					
Protected Phases	8	8	1 8	7	7		1	6			2	
Permitted Phases												
Detector Phase	8	8	1 8	7	7		1	6			2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		11.0	32.0			32.0	
Total Split (s)	11.0	11.0	25.0	26.0	26.0	0.0	14.0	83.0	0.0	0.0	69.0	0.0
Total Split (%)	9.2%	9.2%	20.8%	21.7%	21.7%	0.0%	11.7%	69.2%	0.0%	0.0%	57.5%	0.0%
Maximum Green (s)	6.0	6.0		21.0	21.0		9.0	78.0			64.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag	Lag	Lag		Lead	Lead		Lead				Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Recall Mode	None	None		None	None		None	C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.48	0.23	0.82	0.95		0.68	0.99			0.86	
Control Delay		74.1	20.1	69.6	84.9		83.4	34.9			27.6	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Delay		74.1	20.1	69.6	84.9		83.4	34.9			27.6	
Queue Length 50th (ft)		32	9	192	196		58	~962			589	
Queue Length 95th (ft)		#74	46	#327	#368		#132	#1046			667	
Internal Link Dist (ft)		441			451			1331			925	
Turn Bay Length (ft)			100	200			420					
Base Capacity (vph)		87	245	313	299		117	3208			2798	
Starvation Cap Reductn		0	0	0	0		0	0			0	
Spillback Cap Reductn		0	0	0	0		0	0			0	
Storage Cap Reductn		0	0	0	0		0	0			0	
Reduced v/c Ratio		0.47	0.22	0.81	0.94		0.65	0.99			0.86	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection
Natural Cycle: 110
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	3	51	240	16	249	70	2852	79	0	2375	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0		5.0	5.0			5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.91			0.91	
Frt		1.00	0.85	1.00	0.86		1.00	1.00			1.00	
Flt Protected		0.96	1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)		1735	1417	1787	1559		1556	4785			5029	
Flt Permitted		0.96	1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (perm)		1735	1417	1787	1559		1556	4785			5029	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	38	3	54	255	17	265	76	3100	86	0	2399	12
RTOR Reduction (vph)	0	0	35	0	26	0	0	2	0	0	0	0
Lane Group Flow (vph)	0	41	19	255	256	0	76	3184	0	0	2411	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split			Prot					
Protected Phases	8	8	1 8	7	7		1	6			2	
Permitted Phases												
Actuated Green, G (s)		4.8	18.4	20.8	20.8		8.6	79.4			65.8	
Effective Green, g (s)		4.8	18.4	20.8	20.8		8.6	79.4			65.8	
Actuated g/C Ratio		0.04	0.15	0.17	0.17		0.07	0.66			0.55	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0			5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		69	217	310	270		112	3166			2758	
v/s Ratio Prot		c0.02	0.01	0.14	c0.16		0.05	c0.67			0.48	
v/s Ratio Perm												
v/c Ratio		0.59	0.09	0.82	0.95		0.68	1.01			0.87	
Uniform Delay, d1		56.6	43.6	47.8	49.0		54.4	20.3			23.5	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2		13.0	0.2	16.0	40.0		15.1	17.3			4.2	
Delay (s)		69.6	43.8	63.8	89.1		69.5	37.6			27.7	
Level of Service		E	D	E	F		E	D			C	
Approach Delay (s)		54.9			77.1			38.4			27.7	
Approach LOS		D			E			D			C	

Intersection Summary

HCM Average Control Delay	37.8	HCM Level of Service		D	
HCM Volume to Capacity ratio	0.97				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		15.0	
Intersection Capacity Utilization	88.9%	ICU Level of Service		E	
Analysis Period (min)	15				

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	10	35	242	12	316	31	2451	323	0	2197	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	420		200	475		0
Storage Lanes	0		1	1		0	1		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		521			531			1411			1005	
Travel Time (s)		11.8			12.1			32.1			22.8	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	49	37	257	349	0	34	3015	0	0	2246	0
Turn Type	Split		pt+ov	Split			Prot					
Protected Phases	8	8	1 8	7	7		1	6			2	
Permitted Phases												
Detector Phase	8	8	1 8	7	7		1	6			2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		11.0	32.0			32.0	
Total Split (s)	11.0	11.0	22.0	31.0	31.0	0.0	11.0	78.0	0.0	0.0	67.0	0.0
Total Split (%)	9.2%	9.2%	18.3%	25.8%	25.8%	0.0%	9.2%	65.0%	0.0%	0.0%	55.8%	0.0%
Maximum Green (s)	6.0	6.0		26.0	26.0		6.0	73.0			62.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag	Lag	Lag		Lead	Lead		Lead				Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Recall Mode	None	None		None	None		None	C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.56	0.18	0.67	0.96		0.44	1.01			0.81	
Control Delay		80.4	16.1	52.7	81.6		73.6	42.4			25.9	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Delay		80.4	16.1	52.7	81.6		73.6	42.4			25.9	
Queue Length 50th (ft)		38	0	183	246		26	~924			537	
Queue Length 95th (ft)		#92	32	276	#436		#62	#1010			610	
Internal Link Dist (ft)		441			451			1331			925	
Turn Bay Length (ft)			100	200			420					
Base Capacity (vph)		88	208	387	364		78	2981			2785	
Starvation Cap Reductn		0	0	0	0		0	0			0	
Spillback Cap Reductn		0	0	0	0		0	0			0	
Storage Cap Reductn		0	0	0	0		0	0			0	
Reduced v/c Ratio		0.56	0.18	0.66	0.96		0.44	1.01			0.81	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection
Natural Cycle: 120
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	10	35	242	12	316	31	2451	323	0	2197	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0		5.0	5.0			5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.91			0.91	
Frt		1.00	0.85	1.00	0.86		1.00	0.98			1.00	
Flt Protected		0.96	1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)		1761	1417	1787	1551		1556	4724			5020	
Flt Permitted		0.96	1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (perm)		1761	1417	1787	1551		1556	4724			5020	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	38	11	37	257	13	336	34	2664	351	0	2219	27
RTOR Reduction (vph)	0	0	32	0	27	0	0	14	0	0	1	0
Lane Group Flow (vph)	0	49	5	257	322	0	34	3001	0	0	2245	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split			Prot					
Protected Phases	8	8	1 8	7	7		1	6			2	
Permitted Phases												
Actuated Green, G (s)		4.8	14.6	25.8	25.8		4.8	74.4			64.6	
Effective Green, g (s)		4.8	14.6	25.8	25.8		4.8	74.4			64.6	
Actuated g/C Ratio		0.04	0.12	0.22	0.22		0.04	0.62			0.54	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0			5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		70	172	384	333		62	2929			2702	
v/s Ratio Prot		c0.03	0.00	0.14	c0.21		0.02	c0.64			0.45	
v/s Ratio Perm												
v/c Ratio		0.70	0.03	0.67	0.97		0.55	1.02			0.83	
Uniform Delay, d1		56.9	46.4	43.2	46.7		56.5	22.8			23.1	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2		26.3	0.1	4.4	39.8		9.6	23.3			3.1	
Delay (s)		83.2	46.5	47.6	86.4		66.1	46.1			26.3	
Level of Service		F	D	D	F		E	D			C	
Approach Delay (s)		67.4			70.0			46.3			26.3	
Approach LOS		E			E			D			C	

Intersection Summary

HCM Average Control Delay	41.5	HCM Level of Service		D	
HCM Volume to Capacity ratio	0.99				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		15.0	
Intersection Capacity Utilization	90.6%	ICU Level of Service		E	
Analysis Period (min)	15				

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	43	11	99	424	38	165	148	1480	66	0	2537	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	420		200	475		0
Storage Lanes	0		1	1		0	1		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		521			531			1411			1005	
Travel Time (s)		11.8			12.1			32.1			22.8	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Shared Lane Traffic (%)				24%								
Lane Group Flow (vph)	0	58	105	343	324	0	161	1681	0	0	2578	0
Turn Type	Split		pt+ov	Split			Prot					
Protected Phases	8	8	1 8	7	7		1	6			2	
Permitted Phases												
Detector Phase	8	8	1 8	7	7		1	6			2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		11.0	32.0			32.0	
Total Split (s)	11.0	11.0	28.0	29.0	29.0	0.0	17.0	80.0	0.0	0.0	63.0	0.0
Total Split (%)	9.2%	9.2%	23.3%	24.2%	24.2%	0.0%	14.2%	66.7%	0.0%	0.0%	52.5%	0.0%
Maximum Green (s)	6.0	6.0		24.0	24.0		12.0	75.0			58.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag	Lag	Lag		Lead	Lead		Lead				Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Recall Mode	None	None		None	None		None	C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.66	0.37	1.01	0.92		1.03	0.56			1.06	
Control Delay		89.3	39.9	99.2	72.1		133.7	13.8			67.7	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Delay		89.3	39.9	99.2	72.1		133.7	13.8			67.7	
Queue Length 50th (ft)		45	60	~286	228		~134	255			~805	
Queue Length 95th (ft)		#113	116	#490	#412		#274	296			#898	
Internal Link Dist (ft)		441			451			1331			925	
Turn Bay Length (ft)			100	200			420					
Base Capacity (vph)		88	285	340	353		156	2989			2431	
Starvation Cap Reductn		0	0	0	0		0	0			0	
Spillback Cap Reductn		0	0	0	0		0	0			0	
Storage Cap Reductn		0	0	0	0		0	0			0	
Reduced v/c Ratio		0.66	0.37	1.01	0.92		1.03	0.56			1.06	

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection	
Natural Cycle: 130	
Control Type: Actuated-Coordinated	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	43	11	99	424	38	165	148	1480	66	0	2537	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0		5.0	5.0			5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95		1.00	0.91			0.91	
Frt		1.00	0.85	1.00	0.92		1.00	0.99			1.00	
Flt Protected		0.96	1.00	0.95	0.98		0.95	1.00			1.00	
Satd. Flow (prot)		1758	1417	1698	1582		1556	4774			5028	
Flt Permitted		0.96	1.00	0.95	0.98		0.95	1.00			1.00	
Satd. Flow (perm)		1758	1417	1698	1582		1556	4774			5028	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	46	12	105	451	40	176	161	1609	72	0	2563	15
RTOR Reduction (vph)	0	0	13	0	36	0	0	4	0	0	1	0
Lane Group Flow (vph)	0	58	92	343	288	0	161	1677	0	0	2577	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split			Prot					
Protected Phases	8	8	1 8	7	7		1	6			2	
Permitted Phases												
Actuated Green, G (s)		6.0	23.0	24.0	24.0		12.0	75.0			58.0	
Effective Green, g (s)		6.0	23.0	24.0	24.0		12.0	75.0			58.0	
Actuated g/C Ratio		0.05	0.19	0.20	0.20		0.10	0.62			0.48	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0			5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		88	272	340	316		156	2984			2430	
v/s Ratio Prot		c0.03	0.06	c0.20	0.18		c0.10	0.35			c0.51	
v/s Ratio Perm												
v/c Ratio		0.66	0.34	1.01	0.91		1.03	0.56			1.06	
Uniform Delay, d1		56.0	41.9	48.0	47.0		54.0	13.0			31.0	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2		16.4	0.7	51.0	29.0		80.8	0.8			36.9	
Delay (s)		72.4	42.7	99.0	76.0		134.8	13.8			67.9	
Level of Service		E	D	F	E		F	B			E	
Approach Delay (s)		53.3			87.8			24.4			67.9	
Approach LOS		D			F			C			E	

Intersection Summary					
HCM Average Control Delay	54.7	HCM Level of Service		D	
HCM Volume to Capacity ratio	1.02				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		20.0	
Intersection Capacity Utilization	95.3%	ICU Level of Service		F	
Analysis Period (min)	15				
c Critical Lane Group					

Lanes, Volumes, Timings
7: Boardman Street & Route 1A Southbound

Option 12A
2032 Build Friday PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	3	54	250	17	260	74	2957	81	0	2461	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	420		200	475		0
Storage Lanes	0		1	1		0	1		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		521			531			1411			1005	
Travel Time (s)		11.8			12.1			32.1			22.8	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Shared Lane Traffic (%)				10%								
Lane Group Flow (vph)	0	43	57	239	322	0	80	3302	0	0	2498	0
Turn Type	Split		pt+ov	Split			Prot					
Protected Phases	8	8	1 8	7	7		1	6			2	
Permitted Phases												
Detector Phase	8	8	1 8	7	7		1	6			2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		11.0	32.0			32.0	
Total Split (s)	11.0	11.0	25.0	26.0	26.0	0.0	14.0	83.0	0.0	0.0	69.0	0.0
Total Split (%)	9.2%	9.2%	20.8%	21.7%	21.7%	0.0%	11.7%	69.2%	0.0%	0.0%	57.5%	0.0%
Maximum Green (s)	6.0	6.0		21.0	21.0		9.0	78.0			64.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag	Lag	Lag		Lead	Lead		Lead				Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Recall Mode	None	None		None	None		None	C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.50	0.24	0.80	1.12		0.71	1.03			0.90	
Control Delay		75.8	22.4	68.6	131.3		87.0	45.9			29.8	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Delay		75.8	22.4	68.6	131.3		87.0	45.9			29.8	
Queue Length 50th (ft)		33	13	189	~282		62	~1031			631	
Queue Length 95th (ft)		#78	52	#325	#478		#140	#1113			715	
Internal Link Dist (ft)		441			451			1331			925	
Turn Bay Length (ft)			100	200			420					
Base Capacity (vph)		87	243	297	287		117	3201			2789	
Starvation Cap Reductn		0	0	0	0		0	0			0	
Spillback Cap Reductn		0	0	0	0		0	0			0	
Storage Cap Reductn		0	0	0	0		0	0			0	
Reduced v/c Ratio		0.49	0.23	0.80	1.12		0.68	1.03			0.90	

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection	
Natural Cycle: 150	
Control Type: Actuated-Coordinated	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 7: Boardman Street & Route 1A Southbound



HCM Signalized Intersection Capacity Analysis
7: Boardman Street & Route 1A Southbound

Option 12A
2032 Build Friday PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	3	54	250	17	260	74	2957	81	0	2461	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0		5.0	5.0			5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95		1.00	0.91			0.91	
Frt		1.00	0.85	1.00	0.87		1.00	1.00			1.00	
Flt Protected		0.96	1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)		1735	1417	1698	1500		1556	4785			5030	
Flt Permitted		0.96	1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (perm)		1735	1417	1698	1500		1556	4785			5030	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	40	3	57	266	18	277	80	3214	88	0	2486	12
RTOR Reduction (vph)	0	0	32	0	25	0	0	2	0	0	0	0
Lane Group Flow (vph)	0	43	25	239	297	0	80	3300	0	0	2498	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split			Prot					
Protected Phases	8	8	1 8	7	7		1	6			2	
Permitted Phases												
Actuated Green, G (s)		4.8	18.4	21.0	21.0		8.6	79.2			65.6	
Effective Green, g (s)		4.8	18.4	21.0	21.0		8.6	79.2			65.6	
Actuated g/C Ratio		0.04	0.15	0.18	0.18		0.07	0.66			0.55	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0			5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		69	217	297	263		112	3158			2750	
v/s Ratio Prot		c0.02	0.02	0.14	c0.20		0.05	c0.69			0.50	
v/s Ratio Perm												
v/c Ratio		0.62	0.11	0.80	1.13		0.71	1.04			0.91	
Uniform Delay, d1		56.7	43.8	47.5	49.5		54.5	20.4			24.5	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2		16.2	0.2	14.6	95.2		19.3	29.3			5.7	
Delay (s)		72.9	44.0	62.1	144.7		73.8	49.7			30.2	
Level of Service		E	D	E	F		E	D			C	
Approach Delay (s)		56.4			109.5			50.3			30.2	
Approach LOS		E			F			D			C	

Intersection Summary					
HCM Average Control Delay	47.8	HCM Level of Service		D	
HCM Volume to Capacity ratio	1.04				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		15.0	
Intersection Capacity Utilization	90.1%	ICU Level of Service		E	
Analysis Period (min)	15				
c Critical Lane Group					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	10	37	252	12	330	32	2534	335	0	2276	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	420		200	475		0
Storage Lanes	0		1	1		0	1		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		521			531			1411			1005	
Travel Time (s)		11.8			12.1			32.1			22.8	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Shared Lane Traffic (%)				10%								
Lane Group Flow (vph)	0	51	39	241	391	0	35	3118	0	0	2327	0
Turn Type	Split		pt+ov	Split			Prot					
Protected Phases	8	8	1 8	7	7		1	6			2	
Permitted Phases												
Detector Phase	8	8	1 8	7	7		1	6			2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		11.0	32.0			32.0	
Total Split (s)	11.0	11.0	22.0	31.0	31.0	0.0	11.0	78.0	0.0	0.0	67.0	0.0
Total Split (%)	9.2%	9.2%	18.3%	25.8%	25.8%	0.0%	9.2%	65.0%	0.0%	0.0%	55.8%	0.0%
Maximum Green (s)	6.0	6.0		26.0	26.0		6.0	73.0			62.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag	Lag	Lag		Lead	Lead		Lead				Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Recall Mode	None	None		None	None		None	C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.59	0.19	0.65	1.12		0.45	1.05			0.84	
Control Delay		82.1	16.1	52.5	125.8		74.5	54.5			27.3	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Delay		82.1	16.1	52.5	125.8		74.5	54.5			27.3	
Queue Length 50th (ft)		39	0	181	~346		27	~986			573	
Queue Length 95th (ft)		#97	33	276	#554		#64	#1071			650	
Internal Link Dist (ft)		441			451			1331			925	
Turn Bay Length (ft)			100	200			420					
Base Capacity (vph)		88	209	368	348		78	2972			2778	
Starvation Cap Reductn		0	0	0	0		0	0			0	
Spillback Cap Reductn		0	0	0	0		0	0			0	
Storage Cap Reductn		0	0	0	0		0	0			0	
Reduced v/c Ratio		0.58	0.19	0.65	1.12		0.45	1.05			0.84	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection
Natural Cycle: 140
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	10	37	252	12	330	32	2534	335	0	2276	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0		5.0	5.0			5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95		1.00	0.91			0.91	
Frt		1.00	0.85	1.00	0.87		1.00	0.98			1.00	
Flt Protected		0.96	1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)		1759	1417	1698	1489		1556	4724			5020	
Flt Permitted		0.96	1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (perm)		1759	1417	1698	1489		1556	4724			5020	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	40	11	39	268	13	351	35	2754	364	0	2299	28
RTOR Reduction (vph)	0	0	34	0	26	0	0	14	0	0	1	0
Lane Group Flow (vph)	0	51	5	241	365	0	35	3104	0	0	2326	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		pt+ov	Split			Prot					
Protected Phases	8	8	1 8	7	7		1	6			2	
Permitted Phases												
Actuated Green, G (s)		4.8	14.6	26.0	26.0		4.8	74.2			64.4	
Effective Green, g (s)		4.8	14.6	26.0	26.0		4.8	74.2			64.4	
Actuated g/C Ratio		0.04	0.12	0.22	0.22		0.04	0.62			0.54	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0			5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		70	172	368	323		62	2921			2694	
v/s Ratio Prot		c0.03	0.00	0.14	c0.25		0.02	c0.66			0.46	
v/s Ratio Perm												
v/c Ratio		0.73	0.03	0.65	1.13		0.56	1.06			0.86	
Uniform Delay, d1		57.0	46.4	42.9	47.0		56.6	22.9			24.0	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2		31.2	0.1	4.2	90.2		11.2	36.3			4.0	
Delay (s)		88.2	46.5	47.1	137.2		67.8	59.2			28.0	
Level of Service		F	D	D	F		E	E			C	
Approach Delay (s)		70.1			102.8			59.3			28.0	
Approach LOS		E			F			E			C	

Intersection Summary

HCM Average Control Delay	52.2	HCM Level of Service		D	
HCM Volume to Capacity ratio	1.06				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		15.0	
Intersection Capacity Utilization	89.7%	ICU Level of Service		E	
Analysis Period (min)	15				

c Critical Lane Group

Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

Synchro 7 Capacity Analysis
Option 12-2 - Left Turn Flyover at Route 1A SB and Boardman Street WB

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	39	10	90	50	34	149	134	1086	60	0	2052	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	420		200	475		0
Storage Lanes	0		1	0		1	1		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		521			531			1411			1005	
Travel Time (s)		11.8			12.1			32.1			22.8	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	52	96	0	89	159	146	1245	0	0	2087	0
Turn Type	Perm		pt+ov	Perm		Perm	Prot					
Protected Phases		8	1 8		4		1	6			2	
Permitted Phases	8			4		4						
Detector Phase	8	8	1 8	4	4	4	1	6			2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0			4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0	11.0	11.0	32.0			32.0	
Total Split (s)	40.0	40.0	70.0	40.0	40.0	40.0	30.0	69.0	0.0	0.0	39.0	0.0
Total Split (%)	36.7%	36.7%	64.2%	36.7%	36.7%	36.7%	27.5%	63.3%	0.0%	0.0%	35.8%	0.0%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?												
Recall Mode	None	None		None	None	None	None	C-Max			C-Max	
v/c Ratio		0.36	0.23		0.53	0.66	0.66	0.33			0.68	
Control Delay		49.7	27.4		56.1	37.5	57.8	3.6			17.4	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0			0.0	
Total Delay		49.7	27.4		56.1	37.5	57.8	3.6			17.4	
Queue Length 50th (ft)		34	51		60	56	98	65			327	
Queue Length 95th (ft)		69	78		105	119	156	115			516	
Internal Link Dist (ft)		441			451			1331			925	
Turn Bay Length (ft)			100			200	420					
Base Capacity (vph)		417	550		477	545	357	3796			3055	
Starvation Cap Reductn		0	0		0	0	0	0			0	
Spillback Cap Reductn		0	0		0	0	0	0			0	
Storage Cap Reductn		0	0		0	0	0	0			0	
Reduced v/c Ratio		0.12	0.17		0.19	0.29	0.41	0.33			0.68	

Intersection Summary	
Area Type:	Other
Cycle Length: 109	
Actuated Cycle Length: 109	
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	39	10	90	50	34	149	134	1086	60	0	2052	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0			5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.91			0.91	
Frt		1.00	0.85		1.00	0.85	1.00	0.99			1.00	
Flt Protected		0.96	1.00		0.97	1.00	0.95	1.00			1.00	
Satd. Flow (prot)		1759	1417		1834	1538	1556	4767			5027	
Flt Permitted		0.71	1.00		0.79	1.00	0.95	1.00			1.00	
Satd. Flow (perm)		1299	1417		1487	1538	1556	4767			5027	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	41	11	96	53	36	159	146	1180	65	0	2073	14
RTOR Reduction (vph)	0	0	0	0	0	67	0	3	0	0	0	0
Lane Group Flow (vph)	0	52	96	0	89	92	146	1242	0	0	2087	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Perm		pt+ov	Perm		Perm	Prot					
Protected Phases		8	1 8		4		1	6			2	
Permitted Phases	8			4		4						
Actuated Green, G (s)		12.3	32.8		12.3	12.3	15.5	86.7			66.2	
Effective Green, g (s)		12.3	32.8		12.3	12.3	15.5	86.7			66.2	
Actuated g/C Ratio		0.11	0.30		0.11	0.11	0.14	0.80			0.61	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0			5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)		147	426		168	174	221	3792			3053	
v/s Ratio Prot			0.07				c0.09	0.26			c0.42	
v/s Ratio Perm		0.04			0.06	c0.06						
v/c Ratio		0.35	0.23		0.53	0.53	0.66	0.33			0.68	
Uniform Delay, d1		44.7	28.6		45.6	45.6	44.3	3.1			14.4	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2		1.5	0.3		3.0	3.1	7.2	0.2			1.3	
Delay (s)		46.1	28.8		48.6	48.7	51.5	3.3			15.6	
Level of Service		D	C		D	D	D	A			B	
Approach Delay (s)		34.9			48.7			8.4			15.6	
Approach LOS		C			D			A			B	

Intersection Summary					
HCM Average Control Delay		15.9	HCM Level of Service		B
HCM Volume to Capacity ratio		0.66			
Actuated Cycle Length (s)		109.0	Sum of lost time (s)		15.0
Intersection Capacity Utilization		71.1%	ICU Level of Service		C
Analysis Period (min)		15			

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	3	48	50	15	201	66	1961	23	0	1591	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	420		200	475		0
Storage Lanes	0		1	0		1	1		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		521			531			1411			1005	
Travel Time (s)		11.8			12.1			32.1			22.8	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	39	51	0	69	214	72	2157	0	0	1618	0
Turn Type	Perm		pt+ov	Perm		Perm	Prot					
Protected Phases		8	1 8		4		1	6			2	
Permitted Phases	8			4		4						
Detector Phase	8	8	1 8	4	4	4	1	6			2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0			4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0	11.0	11.0	32.0			32.0	
Total Split (s)	27.0	27.0	42.0	27.0	27.0	27.0	15.0	73.0	0.0	0.0	58.0	0.0
Total Split (%)	27.0%	27.0%	42.0%	27.0%	27.0%	27.0%	15.0%	73.0%	0.0%	0.0%	58.0%	0.0%
Maximum Green (s)	22.0	22.0		22.0	22.0	22.0	10.0	68.0			53.0	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0			3.0	
Recall Mode	None	None		None	None	None	None	C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.17	0.11		0.27	0.76	0.53	0.62			0.53	
Control Delay		34.8	16.6		37.0	53.2	57.1	8.4			13.6	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0			0.0	
Total Delay		34.8	16.6		37.0	53.2	57.1	8.4			13.6	
Queue Length 50th (ft)		21	15		38	121	44	221			225	
Queue Length 95th (ft)		49	39		75	193	90	305			296	
Internal Link Dist (ft)		441			451			1331			925	
Turn Bay Length (ft)			100			200	420					
Base Capacity (vph)		294	457		316	350	156	3476			3059	
Starvation Cap Reductn		0	0		0	0	0	0			0	
Spillback Cap Reductn		0	0		0	0	0	0			0	
Storage Cap Reductn		0	0		0	0	0	0			0	
Reduced v/c Ratio		0.13	0.11		0.22	0.61	0.46	0.62			0.53	

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	3	48	50	15	201	66	1961	23	0	1591	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0			5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.91			0.91	
Frt		1.00	0.85		1.00	0.85	1.00	1.00			1.00	
Flt Protected		0.96	1.00		0.96	1.00	0.95	1.00			1.00	
Satd. Flow (prot)		1736	1417		1816	1538	1556	4795			5027	
Flt Permitted		0.74	1.00		0.76	1.00	0.95	1.00			1.00	
Satd. Flow (perm)		1335	1417		1437	1538	1556	4795			5027	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	36	3	51	53	16	214	72	2132	25	0	1607	11
RTOR Reduction (vph)	0	0	12	0	0	12	0	1	0	0	0	0
Lane Group Flow (vph)	0	39	39	0	69	202	72	2156	0	0	1618	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Perm		pt+ov	Perm		Perm	Prot					
Protected Phases		8	1 8		4		1	6			2	
Permitted Phases	8			4		4						
Actuated Green, G (s)		17.5	30.1		17.5	17.5	7.6	72.5			59.9	
Effective Green, g (s)		17.5	30.1		17.5	17.5	7.6	72.5			59.9	
Actuated g/C Ratio		0.18	0.30		0.18	0.18	0.08	0.72			0.60	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0			5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)		234	427		251	269	118	3476			3011	
v/s Ratio Prot			0.03				0.05	c0.45			0.32	
v/s Ratio Perm		0.03			0.05	c0.13						
v/c Ratio		0.17	0.09		0.27	0.75	0.61	0.62			0.54	
Uniform Delay, d1		35.1	25.1		35.8	39.2	44.8	6.9			11.9	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2		0.3	0.1		0.6	10.9	9.0	0.8			0.7	
Delay (s)		35.4	25.2		36.3	50.1	53.8	7.7			12.5	
Level of Service		D	C		D	D	D	A			B	
Approach Delay (s)		29.6			46.7			9.2			12.5	
Approach LOS		C			D			A			B	

Intersection Summary					
HCM Average Control Delay		13.4	HCM Level of Service		B
HCM Volume to Capacity ratio		0.65			
Actuated Cycle Length (s)		100.0	Sum of lost time (s)		10.0
Intersection Capacity Utilization		66.7%	ICU Level of Service		C
Analysis Period (min)		15			

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	9	33	50	11	256	29	1627	239	0	1474	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	420		200	475		0
Storage Lanes	0		1	0		1	1		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		521			531			1411			1005	
Travel Time (s)		11.8			12.1			32.1			22.8	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	46	35	0	65	272	32	2028	0	0	1514	0
Turn Type	Perm		pt+ov	Perm		Perm	Prot					
Protected Phases		8	1 8		4		1	6			2	
Permitted Phases	8			4		4						
Detector Phase	8	8	1 8	4	4	4	1	6			2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0			4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0	11.0	11.0	32.0			32.0	
Total Split (s)	30.0	30.0	41.0	30.0	30.0	30.0	11.0	70.0	0.0	0.0	59.0	0.0
Total Split (%)	30.0%	30.0%	41.0%	30.0%	30.0%	30.0%	11.0%	70.0%	0.0%	0.0%	59.0%	0.0%
Maximum Green (s)	25.0	25.0		25.0	25.0	25.0	6.0	65.0			54.0	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0			3.0	
Recall Mode	None	None		None	None	None	None	C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.16	0.08		0.22	0.81	0.35	0.61			0.50	
Control Delay		32.0	10.9		33.3	52.4	56.0	9.4			12.9	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0			0.0	
Total Delay		32.0	10.9		33.3	52.4	56.0	9.4			12.9	
Queue Length 50th (ft)		24	4		34	149	20	221			200	
Queue Length 95th (ft)		53	24		69	233	51	301			262	
Internal Link Dist (ft)		441			451			1331			925	
Turn Bay Length (ft)			100			200	420					
Base Capacity (vph)		356	449		357	405	93	3300			3052	
Starvation Cap Reductn		0	0		0	0	0	0			0	
Spillback Cap Reductn		0	0		0	0	0	0			0	
Storage Cap Reductn		0	0		0	0	0	0			0	
Reduced v/c Ratio		0.13	0.08		0.18	0.67	0.34	0.61			0.50	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	9	33	50	11	256	29	1627	239	0	1474	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0			5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.91			0.91	
Frt		1.00	0.85		1.00	0.85	1.00	0.98			1.00	
Flt Protected		0.96	1.00		0.96	1.00	0.95	1.00			1.00	
Satd. Flow (prot)		1760	1417		1811	1538	1556	4716			5015	
Flt Permitted		0.78	1.00		0.76	1.00	0.95	1.00			1.00	
Satd. Flow (perm)		1422	1417		1428	1538	1556	4716			5015	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	36	10	35	53	12	272	32	1768	260	0	1489	25
RTOR Reduction (vph)	0	0	18	0	0	21	0	17	0	0	2	0
Lane Group Flow (vph)	0	46	17	0	65	251	32	2011	0	0	1512	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Perm		pt+ov	Perm		Perm	Prot					
Protected Phases		8	1 8		4		1	6			2	
Permitted Phases	8			4		4						
Actuated Green, G (s)		20.4	30.2		20.4	20.4	4.8	69.6			59.8	
Effective Green, g (s)		20.4	30.2		20.4	20.4	4.8	69.6			59.8	
Actuated g/C Ratio		0.20	0.30		0.20	0.20	0.05	0.70			0.60	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0			5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)		290	428		291	314	75	3282			2999	
v/s Ratio Prot			0.01				0.02	c0.43			0.30	
v/s Ratio Perm		0.03			0.05	c0.16						
v/c Ratio		0.16	0.04		0.22	0.80	0.43	0.61			0.50	
Uniform Delay, d1		32.7	24.7		33.2	37.8	46.3	8.1			11.6	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2		0.3	0.0		0.4	13.2	3.9	0.9			0.6	
Delay (s)		33.0	24.7		33.6	51.0	50.1	8.9			12.2	
Level of Service		C	C		C	D	D	A			B	
Approach Delay (s)		29.4			47.6			9.6			12.2	
Approach LOS		C			D			A			B	

Intersection Summary

HCM Average Control Delay	14.2	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.65				
Actuated Cycle Length (s)	100.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	68.4%	ICU Level of Service		C	
Analysis Period (min)	15				

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	11	95	50	36	157	141	1422	63	0	2427	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	420		200	475		0
Storage Lanes	0		1	0		1	1		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		521			531			1411			1005	
Travel Time (s)		11.8			12.1			32.1			22.8	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	56	101	0	91	167	153	1614	0	0	2467	0
Turn Type	Perm		pt+ov	Perm		Perm	Prot					
Protected Phases		8	1 8		4		1	6			2	
Permitted Phases	8			4		4						
Detector Phase	8	8	1 8	4	4	4	1	6			2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0			4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0	11.0	11.0	32.0			32.0	
Total Split (s)	40.0	40.0	70.0	40.0	40.0	40.0	30.0	80.0	0.0	0.0	50.0	0.0
Total Split (%)	33.3%	33.3%	58.3%	33.3%	33.3%	33.3%	25.0%	66.7%	0.0%	0.0%	41.7%	0.0%
Maximum Green (s)	35.0	35.0		35.0	35.0	35.0	25.0	75.0			45.0	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0			3.0	
Recall Mode	None	None		None	None	None	None	C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.34	0.23		0.47	0.71	0.69	0.43			0.81	
Control Delay		50.8	29.0		54.8	54.1	64.5	4.9			23.3	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0			0.0	
Total Delay		50.8	29.0		54.8	54.1	64.5	4.9			23.3	
Queue Length 50th (ft)		40	58		66	96	114	120			514	
Queue Length 95th (ft)		77	86		113	162	176	193			#827	
Internal Link Dist (ft)		441			451			1331			925	
Turn Bay Length (ft)			100			200	420					
Base Capacity (vph)		374	539		435	476	324	3758			3032	
Starvation Cap Reductn		0	0		0	0	0	0			0	
Spillback Cap Reductn		0	0		0	0	0	0			0	
Storage Cap Reductn		0	0		0	0	0	0			0	
Reduced v/c Ratio		0.15	0.19		0.21	0.35	0.47	0.43			0.81	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection
Natural Cycle: 60
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	11	95	50	36	157	141	1422	63	0	2427	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0			5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.91			0.91	
Frt		1.00	0.85		1.00	0.85	1.00	0.99			1.00	
Flt Protected		0.96	1.00		0.97	1.00	0.95	1.00			1.00	
Satd. Flow (prot)		1759	1417		1836	1538	1556	4774			5028	
Flt Permitted		0.70	1.00		0.79	1.00	0.95	1.00			1.00	
Satd. Flow (perm)		1281	1417		1490	1538	1556	4774			5028	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	44	12	101	53	38	167	153	1546	68	0	2452	15
RTOR Reduction (vph)	0	0	0	0	0	34	0	2	0	0	0	0
Lane Group Flow (vph)	0	56	101	0	91	133	153	1612	0	0	2467	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Perm		pt+ov	Perm		Perm	Prot					
Protected Phases		8	1 8		4		1	6			2	
Permitted Phases	8			4		4						
Actuated Green, G (s)		15.6	37.6		15.6	15.6	17.0	94.4			72.4	
Effective Green, g (s)		15.6	37.6		15.6	15.6	17.0	94.4			72.4	
Actuated g/C Ratio		0.13	0.31		0.13	0.13	0.14	0.79			0.60	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0			5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)		167	444		194	200	220	3756			3034	
v/s Ratio Prot			0.07				c0.10	0.34			c0.49	
v/s Ratio Perm		0.04			0.06	c0.09						
v/c Ratio		0.34	0.23		0.47	0.67	0.70	0.43			0.81	
Uniform Delay, d1		47.5	30.5		48.4	49.7	49.0	4.1			18.5	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2		1.2	0.3		1.8	8.1	9.2	0.4			2.5	
Delay (s)		48.7	30.7		50.2	57.8	58.2	4.5			21.0	
Level of Service		D	C		D	E	E	A			C	
Approach Delay (s)		37.1			55.1			9.1			21.0	
Approach LOS		D			E			A			C	

Intersection Summary

HCM Average Control Delay		18.9	HCM Level of Service		B
HCM Volume to Capacity ratio		0.77			
Actuated Cycle Length (s)		120.0	Sum of lost time (s)		15.0
Intersection Capacity Utilization		78.9%	ICU Level of Service		D
Analysis Period (min)		15			

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	3	51	50	16	249	70	2852	79	0	2375	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	420		200	475		0
Storage Lanes	0		1	0		1	1		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		521			531			1411			1005	
Travel Time (s)		11.8			12.1			32.1			22.8	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	41	54	0	70	265	76	3186	0	0	2411	0
Turn Type	Perm		pt+ov	Perm		Perm	Prot					
Protected Phases		8	1 8		4		1	6			2	
Permitted Phases	8			4		4						
Detector Phase	8	8	1 8	4	4	4	1	6			2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0			4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0	11.0	11.0	32.0			32.0	
Total Split (s)	27.0	27.0	42.0	27.0	27.0	27.0	15.0	73.0	0.0	0.0	58.0	0.0
Total Split (%)	27.0%	27.0%	42.0%	27.0%	27.0%	27.0%	15.0%	73.0%	0.0%	0.0%	58.0%	0.0%
Maximum Green (s)	22.0	22.0		22.0	22.0	22.0	10.0	68.0			53.0	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0			3.0	
Recall Mode	None	None		None	None	None	None	C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.15	0.11		0.24	0.85	0.55	0.95			0.82	
Control Delay		33.3	21.1		34.8	62.8	58.4	22.7			21.7	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0			0.0	
Total Delay		33.3	21.1		34.8	62.8	58.4	22.7			21.7	
Queue Length 50th (ft)		21	21		37	159	47	629			483	
Queue Length 95th (ft)		51	48		76	#284	94	#850			564	
Internal Link Dist (ft)		441			451			1331			925	
Turn Bay Length (ft)			100			200	420					
Base Capacity (vph)		296	492		321	340	156	3345			2923	
Starvation Cap Reductn		0	0		0	0	0	0			0	
Spillback Cap Reductn		0	0		0	0	0	0			0	
Storage Cap Reductn		0	0		0	0	0	0			0	
Reduced v/c Ratio		0.14	0.11		0.22	0.78	0.49	0.95			0.82	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection
Natural Cycle: 75
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	3	51	50	16	249	70	2852	79	0	2375	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0			5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.91			0.91	
Frt		1.00	0.85		1.00	0.85	1.00	1.00			1.00	
Flt Protected		0.96	1.00		0.96	1.00	0.95	1.00			1.00	
Satd. Flow (prot)		1735	1417		1817	1538	1556	4785			5029	
Flt Permitted		0.74	1.00		0.77	1.00	0.95	1.00			1.00	
Satd. Flow (perm)		1347	1417		1457	1538	1556	4785			5029	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	38	3	54	53	17	265	76	3100	86	0	2399	12
RTOR Reduction (vph)	0	0	1	0	0	2	0	3	0	0	0	0
Lane Group Flow (vph)	0	41	53	0	70	263	76	3183	0	0	2411	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Perm		pt+ov	Perm		Perm	Prot					
Protected Phases		8	1 8		4		1	6			2	
Permitted Phases	8			4		4						
Actuated Green, G (s)		20.2	32.9		20.2	20.2	7.7	69.8			57.1	
Effective Green, g (s)		20.2	32.9		20.2	20.2	7.7	69.8			57.1	
Actuated g/C Ratio		0.20	0.33		0.20	0.20	0.08	0.70			0.57	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0			5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)		272	466		294	311	120	3340			2872	
v/s Ratio Prot			0.04				0.05	c0.67			0.48	
v/s Ratio Perm		0.03			0.05	c0.17						
v/c Ratio		0.15	0.11		0.24	0.85	0.63	0.95			0.84	
Uniform Delay, d1		32.8	23.4		33.4	38.4	44.8	13.6			17.7	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2		0.3	0.1		0.4	18.7	10.4	8.0			3.1	
Delay (s)		33.1	23.5		33.9	57.1	55.2	21.6			20.8	
Level of Service		C	C		C	E	E	C			C	
Approach Delay (s)		27.6			52.3			22.4			20.8	
Approach LOS		C			D			C			C	

Intersection Summary

HCM Average Control Delay		23.5	HCM Level of Service		C
HCM Volume to Capacity ratio		0.93			
Actuated Cycle Length (s)		100.0	Sum of lost time (s)		10.0
Intersection Capacity Utilization		88.1%	ICU Level of Service		E
Analysis Period (min)		15			

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	10	35	50	12	316	31	2451	323	0	2197	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	420		200	475		0
Storage Lanes	0		1	0		1	1		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		521			531			1411			1005	
Travel Time (s)		11.8			12.1			32.1			22.8	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	49	37	0	66	336	34	3015	0	0	2246	0
Turn Type	Perm		pt+ov	Perm		Perm	Prot					
Protected Phases		8	1 8		4		1	6			2	
Permitted Phases	8			4		4						
Detector Phase	8	8	1 8	4	4	4	1	6			2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0			4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0	11.0	11.0	32.0			32.0	
Total Split (s)	30.0	30.0	41.0	30.0	30.0	30.0	11.0	70.0	0.0	0.0	59.0	0.0
Total Split (%)	30.0%	30.0%	41.0%	30.0%	30.0%	30.0%	11.0%	70.0%	0.0%	0.0%	59.0%	0.0%
Maximum Green (s)	25.0	25.0		25.0	25.0	25.0	6.0	65.0			54.0	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0			3.0	
Recall Mode	None	None		None	None	None	None	C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.14	0.07		0.19	0.91	0.37	0.96			0.78	
Control Delay		30.5	19.9		31.3	65.4	57.0	25.7			20.0	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0			0.0	
Total Delay		30.5	19.9		31.3	65.4	57.0	25.7			20.0	
Queue Length 50th (ft)		24	14		33	203	21	603			413	
Queue Length 95th (ft)		55	35		69	#362	54	#806			483	
Internal Link Dist (ft)		441			451			1331			925	
Turn Bay Length (ft)			100			200	420					
Base Capacity (vph)		359	484		362	388	93	3139			2876	
Starvation Cap Reductn		0	0		0	0	0	0			0	
Spillback Cap Reductn		0	0		0	0	0	0			0	
Storage Cap Reductn		0	0		0	0	0	0			0	
Reduced v/c Ratio		0.14	0.08		0.18	0.87	0.37	0.96			0.78	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	10	35	50	12	316	31	2451	323	0	2197	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0			5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.91			0.91	
Frt		1.00	0.85		1.00	0.85	1.00	0.98			1.00	
Flt Protected		0.96	1.00		0.96	1.00	0.95	1.00			1.00	
Satd. Flow (prot)		1761	1417		1812	1538	1556	4724			5020	
Flt Permitted		0.78	1.00		0.77	1.00	0.95	1.00			1.00	
Satd. Flow (perm)		1435	1417		1447	1538	1556	4724			5020	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	38	11	37	53	13	336	34	2664	351	0	2219	27
RTOR Reduction (vph)	0	0	3	0	0	3	0	16	0	0	1	0
Lane Group Flow (vph)	0	49	34	0	66	333	34	2999	0	0	2245	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Perm		pt+ov	Perm		Perm	Prot					
Protected Phases		8	1 8		4		1	6			2	
Permitted Phases	8			4		4						
Actuated Green, G (s)		23.9	33.7		23.9	23.9	4.8	66.1			56.3	
Effective Green, g (s)		23.9	33.7		23.9	23.9	4.8	66.1			56.3	
Actuated g/C Ratio		0.24	0.34		0.24	0.24	0.05	0.66			0.56	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0			5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)		343	478		346	368	75	3123			2826	
v/s Ratio Prot			0.02				0.02	c0.63			0.45	
v/s Ratio Perm		0.03			0.05	c0.22						
v/c Ratio		0.14	0.07		0.19	0.90	0.45	0.96			0.79	
Uniform Delay, d1		30.0	22.5		30.3	36.9	46.3	15.7			17.3	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2		0.2	0.1		0.3	24.7	4.3	9.2			2.4	
Delay (s)		30.2	22.6		30.6	61.7	50.6	24.9			19.7	
Level of Service		C	C		C	E	D	C			B	
Approach Delay (s)		26.9			56.6			25.2			19.7	
Approach LOS		C			E			C			B	

Intersection Summary

HCM Average Control Delay	25.3	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.95				
Actuated Cycle Length (s)	100.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	90.0%	ICU Level of Service		E	
Analysis Period (min)	15				

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	43	11	99	50	38	165	148	1480	66	0	2537	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	420		200	475		0
Storage Lanes	0		1	0		1	1		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		521			531			1411			1005	
Travel Time (s)		11.8			12.1			32.1			22.8	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	58	105	0	93	176	161	1681	0	0	2578	0
Turn Type	Perm		pt+ov	Perm		Perm	Prot					
Protected Phases		8	1 8		4		1	6			2	
Permitted Phases	8			4		4						
Detector Phase	8	8	1 8	4	4	4	1	6			2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0			4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0	11.0	11.0	32.0			32.0	
Total Split (s)	40.0	40.0	70.0	40.0	40.0	40.0	30.0	80.0	0.0	0.0	50.0	0.0
Total Split (%)	33.3%	33.3%	58.3%	33.3%	33.3%	33.3%	25.0%	66.7%	0.0%	0.0%	41.7%	0.0%
Maximum Green (s)	35.0	35.0		35.0	35.0	35.0	25.0	75.0			45.0	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0			3.0	
Recall Mode	None	None		None	None	None	None	C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.32	0.23		0.45	0.72	0.70	0.45			0.87	
Control Delay		49.2	27.8		52.6	55.6	64.4	5.5			26.8	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0			0.0	
Total Delay		49.2	27.8		52.6	55.6	64.4	5.5			26.8	
Queue Length 50th (ft)		41	59		67	107	120	135			584	
Queue Length 95th (ft)		78	85		114	173	184	213			#916	
Internal Link Dist (ft)		441			451			1331			925	
Turn Bay Length (ft)			100			200	420					
Base Capacity (vph)		377	552		436	473	324	3715			2960	
Starvation Cap Reductn		0	0		0	0	0	0			0	
Spillback Cap Reductn		0	0		0	0	0	0			0	
Storage Cap Reductn		0	0		0	0	0	0			0	
Reduced v/c Ratio		0.15	0.19		0.21	0.37	0.50	0.45			0.87	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection
Natural Cycle: 70
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	43	11	99	50	38	165	148	1480	66	0	2537	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0			5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.91			0.91	
Frt		1.00	0.85		1.00	0.85	1.00	0.99			1.00	
Flt Protected		0.96	1.00		0.97	1.00	0.95	1.00			1.00	
Satd. Flow (prot)		1758	1417		1837	1538	1556	4774			5028	
Flt Permitted		0.71	1.00		0.79	1.00	0.95	1.00			1.00	
Satd. Flow (perm)		1292	1417		1495	1538	1556	4774			5028	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	46	12	105	53	40	176	161	1609	72	0	2563	15
RTOR Reduction (vph)	0	0	0	0	0	29	0	2	0	0	0	0
Lane Group Flow (vph)	0	58	105	0	93	147	161	1679	0	0	2578	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Perm		pt+ov	Perm		Perm	Prot					
Protected Phases		8	1 8		4		1	6			2	
Permitted Phases	8			4		4						
Actuated Green, G (s)		16.7	39.3		16.7	16.7	17.6	93.3			70.7	
Effective Green, g (s)		16.7	39.3		16.7	16.7	17.6	93.3			70.7	
Actuated g/C Ratio		0.14	0.33		0.14	0.14	0.15	0.78			0.59	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0			5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)		180	464		208	214	228	3712			2962	
v/s Ratio Prot			0.07				c0.10	0.35			c0.51	
v/s Ratio Perm		0.04			0.06	c0.10						
v/c Ratio		0.32	0.23		0.45	0.69	0.71	0.45			0.87	
Uniform Delay, d1		46.5	29.3		47.4	49.2	48.7	4.6			20.8	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2		1.0	0.2		1.5	8.8	9.6	0.4			3.8	
Delay (s)		47.6	29.6		48.9	57.9	58.3	5.0			24.6	
Level of Service		D	C		D	E	E	A			C	
Approach Delay (s)		36.0			54.8			9.6			24.6	
Approach LOS		D			D			A			C	

Intersection Summary

HCM Average Control Delay		21.0	HCM Level of Service		C
HCM Volume to Capacity ratio		0.81			
Actuated Cycle Length (s)		120.0	Sum of lost time (s)		15.0
Intersection Capacity Utilization		81.5%	ICU Level of Service		D
Analysis Period (min)		15			

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	3	54	50	17	260	74	2957	81	0	2461	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	420		200	475		0
Storage Lanes	0		1	0		1	1		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		521			531			1411			1005	
Travel Time (s)		11.8			12.1			32.1			22.8	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	43	57	0	71	277	80	3302	0	0	2498	0
Turn Type	Perm		pt+ov	Perm		Perm	Prot					
Protected Phases		8	1 8		4		1	6			2	
Permitted Phases	8			4		4						
Detector Phase	8	8	1 8	4	4	4	1	6			2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0			4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0	11.0	11.0	32.0			32.0	
Total Split (s)	27.0	27.0	42.0	27.0	27.0	27.0	15.0	73.0	0.0	0.0	58.0	0.0
Total Split (%)	27.0%	27.0%	42.0%	27.0%	27.0%	27.0%	15.0%	73.0%	0.0%	0.0%	58.0%	0.0%
Maximum Green (s)	22.0	22.0		22.0	22.0	22.0	10.0	68.0			53.0	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0			3.0	
Recall Mode	None	None		None	None	None	None	C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.16	0.12		0.24	0.87	0.57	0.99			0.86	
Control Delay		33.3	21.5		34.7	65.7	59.8	30.3			23.5	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0			0.0	
Total Delay		33.3	21.5		34.7	65.7	59.8	30.3			23.5	
Queue Length 50th (ft)		22	23		37	168	49	~741			517	
Queue Length 95th (ft)		52	51		77	#304	98	#907			#619	
Internal Link Dist (ft)		441			451			1331			925	
Turn Bay Length (ft)			100			200	420					
Base Capacity (vph)		295	494		322	339	156	3325			2900	
Starvation Cap Reductn		0	0		0	0	0	0			0	
Spillback Cap Reductn		0	0		0	0	0	0			0	
Storage Cap Reductn		0	0		0	0	0	0			0	
Reduced v/c Ratio		0.15	0.12		0.22	0.82	0.51	0.99			0.86	

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	3	54	50	17	260	74	2957	81	0	2461	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0			5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.91			0.91	
Frt		1.00	0.85		1.00	0.85	1.00	1.00			1.00	
Flt Protected		0.96	1.00		0.96	1.00	0.95	1.00			1.00	
Satd. Flow (prot)		1735	1417		1818	1538	1556	4785			5030	
Flt Permitted		0.74	1.00		0.78	1.00	0.95	1.00			1.00	
Satd. Flow (perm)		1340	1417		1462	1538	1556	4785			5030	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	40	3	57	53	18	277	80	3214	88	0	2486	12
RTOR Reduction (vph)	0	0	1	0	0	1	0	3	0	0	0	0
Lane Group Flow (vph)	0	43	56	0	71	276	80	3299	0	0	2498	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Perm		pt+ov	Perm		Perm	Prot					
Protected Phases		8	1 8		4		1	6			2	
Permitted Phases	8			4		4						
Actuated Green, G (s)		20.6	33.3		20.6	20.6	7.7	69.4			56.7	
Effective Green, g (s)		20.6	33.3		20.6	20.6	7.7	69.4			56.7	
Actuated g/C Ratio		0.21	0.33		0.21	0.21	0.08	0.69			0.57	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0			5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)		276	472		301	317	120	3321			2852	
v/s Ratio Prot			0.04				0.05	c0.69			0.50	
v/s Ratio Perm		0.03			0.05	c0.18						
v/c Ratio		0.16	0.12		0.24	0.87	0.67	0.99			0.88	
Uniform Delay, d1		32.6	23.2		33.1	38.4	44.9	15.1			18.6	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2		0.3	0.1		0.4	22.1	13.1	14.2			4.1	
Delay (s)		32.8	23.3		33.5	60.5	58.0	29.2			22.8	
Level of Service		C	C		C	E	E	C			C	
Approach Delay (s)		27.4			55.0			29.9			22.8	
Approach LOS		C			D			C			C	

Intersection Summary					
HCM Average Control Delay		28.4	HCM Level of Service		C
HCM Volume to Capacity ratio		0.97			
Actuated Cycle Length (s)		100.0	Sum of lost time (s)		10.0
Intersection Capacity Utilization		90.9%	ICU Level of Service		E
Analysis Period (min)		15			

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	10	37	50	12	330	32	2534	335	0	2276	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		200	420		200	475		0
Storage Lanes	0		1	0		1	1		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		521			531			1411			1005	
Travel Time (s)		11.8			12.1			32.1			22.8	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	51	39	0	66	351	35	3118	0	0	2327	0
Turn Type	Perm		pt+ov	Perm		Perm	Prot					
Protected Phases		8	1 8		4		1	6			2	
Permitted Phases	8			4		4						
Detector Phase	8	8	1 8	4	4	4	1	6			2	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0			4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0	11.0	11.0	32.0			32.0	
Total Split (s)	30.0	30.0	41.0	30.0	30.0	30.0	11.0	70.0	0.0	0.0	59.0	0.0
Total Split (%)	30.0%	30.0%	41.0%	30.0%	30.0%	30.0%	11.0%	70.0%	0.0%	0.0%	59.0%	0.0%
Maximum Green (s)	25.0	25.0		25.0	25.0	25.0	6.0	65.0			54.0	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0			3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0			3.0	
Recall Mode	None	None		None	None	None	None	C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
v/c Ratio		0.15	0.08		0.19	0.93	0.38	1.00			0.81	
Control Delay		30.6	20.4		31.3	70.1	57.6	34.0			21.2	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0			0.0	
Total Delay		30.6	20.4		31.3	70.1	57.6	34.0			21.2	
Queue Length 50th (ft)		25	15		33	216	22	~690			441	
Queue Length 95th (ft)		57	38		69	#386	54	#857			516	
Internal Link Dist (ft)		441			451			1331			925	
Turn Bay Length (ft)			100			200	420					
Base Capacity (vph)		357	498		362	387	93	3118			2857	
Starvation Cap Reductn		0	0		0	0	0	0			0	
Spillback Cap Reductn		0	0		0	0	0	0			0	
Storage Cap Reductn		0	0		0	0	0	0			0	
Reduced v/c Ratio		0.14	0.08		0.18	0.91	0.38	1.00			0.81	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	10	37	50	12	330	32	2534	335	0	2276	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0			5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.91			0.91	
Frt		1.00	0.85		1.00	0.85	1.00	0.98			1.00	
Flt Protected		0.96	1.00		0.96	1.00	0.95	1.00			1.00	
Satd. Flow (prot)		1759	1417		1812	1538	1556	4724			5020	
Flt Permitted		0.78	1.00		0.77	1.00	0.95	1.00			1.00	
Satd. Flow (perm)		1427	1417		1447	1538	1556	4724			5020	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.99	0.99	0.99
Adj. Flow (vph)	40	11	39	53	13	351	35	2754	364	0	2299	28
RTOR Reduction (vph)	0	0	2	0	0	2	0	16	0	0	1	0
Lane Group Flow (vph)	0	51	37	0	66	349	35	3102	0	0	2326	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Perm		pt+ov	Perm		Perm	Prot					
Protected Phases		8	1 8		4		1	6			2	
Permitted Phases	8			4		4						
Actuated Green, G (s)		24.3	34.1		24.3	24.3	4.8	65.7			55.9	
Effective Green, g (s)		24.3	34.1		24.3	24.3	4.8	65.7			55.9	
Actuated g/C Ratio		0.24	0.34		0.24	0.24	0.05	0.66			0.56	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0			5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)		347	483		352	374	75	3104			2806	
v/s Ratio Prot			0.03				0.02	c0.66			0.46	
v/s Ratio Perm		0.04			0.05	c0.23						
v/c Ratio		0.15	0.08		0.19	0.93	0.47	1.00			0.83	
Uniform Delay, d1		29.7	22.3		30.0	37.0	46.4	17.1			18.1	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2		0.2	0.1		0.3	29.8	4.5	16.0			3.0	
Delay (s)		29.9	22.4		30.3	66.8	50.9	33.1			21.1	
Level of Service		C	C		C	E	D	C			C	
Approach Delay (s)		26.6			61.1			33.3			21.1	
Approach LOS		C			E			C			C	

Intersection Summary

HCM Average Control Delay	30.4	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.98				
Actuated Cycle Length (s)	100.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	92.7%	ICU Level of Service		F	
Analysis Period (min)	15				

c Critical Lane Group

Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

Synchro 7 Capacity Analysis
Option 12-3 - Left Turn Flyover at Route 1A SB to Tomasello Drive

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	20	8	1208	68	0	2133
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	2	1		1	0	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		770			412
Travel Time (s)	28.4		17.5			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	22	9	1313	74	0	2318
Turn Type		Free		Perm		
Protected Phases	3		2			2
Permitted Phases		Free		2		
Detector Phase	3		2	2		2
Switch Phase						
Minimum Initial (s)	6.0		6.0	6.0		6.0
Minimum Split (s)	11.0		11.0	11.0		11.0
Total Split (s)	25.0	0.0	75.0	75.0	0.0	75.0
Total Split (%)	25.0%	0.0%	75.0%	75.0%	0.0%	75.0%
Maximum Green (s)	20.0		70.0	70.0		70.0
Yellow Time (s)	3.0		3.0	3.0		3.0
All-Red Time (s)	2.0		2.0	2.0		2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	4.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0		3.0
Recall Mode	None		C-Min	C-Min		C-Min
v/c Ratio	0.10	0.01	0.28	0.05		0.49
Control Delay	45.0	0.0	1.1	0.4		2.4
Queue Delay	0.0	0.0	0.0	0.0		0.0
Total Delay	45.0	0.0	1.1	0.4		2.4
Queue Length 50th (ft)	7	0	0	0		0
Queue Length 95th (ft)	19	0	60	6		189
Internal Link Dist (ft)	1168		690			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)	687	1583	4743	1482		4698
Starvation Cap Reductn	0	0	0	0		522
Spillback Cap Reductn	0	0	0	0		0
Storage Cap Reductn	0	0	0	0		0
Reduced v/c Ratio	0.03	0.01	0.28	0.05		0.56

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 40	
Control Type: Actuated-Coordinated	

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	20	8	1208	68	0	2133
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	5.0		5.0
Lane Util. Factor	0.97	1.00	0.91	1.00		0.91
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3433	1583	5085	1583		5036
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3433	1583	5085	1583		5036
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	9	1313	74	0	2318
RTOR Reduction (vph)	0	0	0	9	0	0
Lane Group Flow (vph)	22	9	1313	65	0	2318
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Turn Type		Free		Perm		
Protected Phases	3		2			2
Permitted Phases		Free		2		
Actuated Green, G (s)	2.7	100.0	87.3	87.3		87.3
Effective Green, g (s)	2.7	100.0	87.3	87.3		87.3
Actuated g/C Ratio	0.03	1.00	0.87	0.87		0.87
Clearance Time (s)	5.0		5.0	5.0		5.0
Vehicle Extension (s)	3.0		3.0	3.0		3.0
Lane Grp Cap (vph)	93	1583	4439	1382		4396
v/s Ratio Prot	c0.01		0.26			c0.46
v/s Ratio Perm		0.01		0.04		
v/c Ratio	0.24	0.01	0.30	0.05		0.53
Uniform Delay, d1	47.6	0.0	1.1	0.8		1.5
Progression Factor	1.00	1.00	1.00	1.00		1.66
Incremental Delay, d2	1.3	0.0	0.2	0.1		0.3
Delay (s)	49.0	0.0	1.3	0.9		2.7
Level of Service	D	A	A	A		A
Approach Delay (s)	34.7		1.2			2.7
Approach LOS	C		A			A

Intersection Summary			
HCM Average Control Delay	2.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	19	13	2007	200	0	1716
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	2	1		1	0	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		770			412
Travel Time (s)	28.4		17.5			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	21	14	2182	217	0	1865
Turn Type		Free		Perm		
Protected Phases	3		2			2
Permitted Phases		Free		2		
Detector Phase	3		2	2		2
Switch Phase						
Minimum Initial (s)	6.0		6.0	6.0		6.0
Minimum Split (s)	11.0		11.0	11.0		11.0
Total Split (s)	35.0	0.0	65.0	65.0	0.0	65.0
Total Split (%)	35.0%	0.0%	65.0%	65.0%	0.0%	65.0%
Yellow Time (s)	3.0		3.0	3.0		3.0
All-Red Time (s)	2.0		2.0	2.0		2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	4.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None		C-Min	C-Min		C-Min
v/c Ratio	0.10	0.01	0.46	0.15		0.40
Control Delay	45.1	0.0	1.5	0.4		0.3
Queue Delay	0.0	0.0	0.0	0.0		0.0
Total Delay	45.1	0.0	1.5	0.4		0.3
Queue Length 50th (ft)	6	0	0	0		0
Queue Length 95th (ft)	18	0	125	9		0
Internal Link Dist (ft)	1168		690			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)	1030	1583	4745	1492		4610
Starvation Cap Reductn	0	0	0	0		367
Spillback Cap Reductn	0	0	0	0		0
Storage Cap Reductn	0	0	0	0		0
Reduced v/c Ratio	0.02	0.01	0.46	0.15		0.44

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 40	
Control Type: Actuated-Coordinated	

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	19	13	2007	200	0	1716
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	5.0		5.0
Lane Util. Factor	0.97	1.00	0.91	1.00		0.91
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3433	1583	5085	1583		4940
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3433	1583	5085	1583		4940
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	14	2182	217	0	1865
RTOR Reduction (vph)	0	0	0	28	0	0
Lane Group Flow (vph)	21	14	2182	189	0	1865
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Turn Type		Free		Perm		
Protected Phases	3		2			2
Permitted Phases		Free		2		
Actuated Green, G (s)	2.7	100.0	87.3	87.3		87.3
Effective Green, g (s)	2.7	100.0	87.3	87.3		87.3
Actuated g/C Ratio	0.03	1.00	0.87	0.87		0.87
Clearance Time (s)	5.0		5.0	5.0		5.0
Vehicle Extension (s)	3.0		3.0	3.0		3.0
Lane Grp Cap (vph)	93	1583	4439	1382		4313
v/s Ratio Prot	c0.01		c0.43			0.38
v/s Ratio Perm		0.01		0.12		
v/c Ratio	0.23	0.01	0.49	0.14		0.43
Uniform Delay, d1	47.6	0.0	1.4	0.9		1.3
Progression Factor	1.00	1.00	1.00	1.00		0.06
Incremental Delay, d2	1.2	0.0	0.4	0.2		0.2
Delay (s)	48.9	0.0	1.8	1.1		0.3
Level of Service	D	A	A	A		A
Approach Delay (s)	29.3		1.7			0.3
Approach LOS	C		A			A

Intersection Summary			
HCM Average Control Delay	1.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	52.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	41	59	1691	165	0	1567
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	2	1		1	0	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		770			412
Travel Time (s)	28.4		17.5			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	45	64	1838	179	0	1703
Turn Type		Free		Perm		
Protected Phases	3		2			2
Permitted Phases		Free		2		
Detector Phase	3		2	2		2
Switch Phase						
Minimum Initial (s)	6.0		6.0	6.0		6.0
Minimum Split (s)	11.0		11.0	11.0		11.0
Total Split (s)	35.0	0.0	65.0	65.0	0.0	65.0
Total Split (%)	35.0%	0.0%	65.0%	65.0%	0.0%	65.0%
Maximum Green (s)	30.0		60.0	60.0		60.0
Yellow Time (s)	3.0		3.0	3.0		3.0
All-Red Time (s)	2.0		2.0	2.0		2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	4.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0		3.0
Recall Mode	None		C-Min	C-Min		C-Min
v/c Ratio	0.19	0.04	0.40	0.12		0.38
Control Delay	45.5	0.1	1.9	0.5		1.0
Queue Delay	0.0	0.0	0.0	0.0		0.1
Total Delay	45.5	0.1	1.9	0.5		1.1
Queue Length 50th (ft)	14	0	78	0		39
Queue Length 95th (ft)	31	0	105	9		0
Internal Link Dist (ft)	1168		690			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)	1030	1583	4554	1436		4510
Starvation Cap Reductn	0	0	0	0		1233
Spillback Cap Reductn	0	0	0	0		0
Storage Cap Reductn	0	0	0	0		0
Reduced v/c Ratio	0.04	0.04	0.40	0.12		0.52

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 40	
Control Type: Actuated-Coordinated	

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	41	59	1691	165	0	1567
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	5.0		5.0
Lane Util. Factor	0.97	1.00	0.91	1.00		0.91
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3433	1583	5085	1583		5036
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3433	1583	5085	1583		5036
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	45	64	1838	179	0	1703
RTOR Reduction (vph)	0	0	0	26	0	0
Lane Group Flow (vph)	45	64	1838	153	0	1703
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Turn Type		Free		Perm		
Protected Phases	3		2			2
Permitted Phases		Free		2		
Actuated Green, G (s)	4.4	100.0	85.6	85.6		85.6
Effective Green, g (s)	4.4	100.0	85.6	85.6		85.6
Actuated g/C Ratio	0.04	1.00	0.86	0.86		0.86
Clearance Time (s)	5.0		5.0	5.0		5.0
Vehicle Extension (s)	3.0		3.0	3.0		3.0
Lane Grp Cap (vph)	151	1583	4353	1355		4311
v/s Ratio Prot	c0.01		c0.36			0.34
v/s Ratio Perm		0.04		0.10		
v/c Ratio	0.30	0.04	0.42	0.11		0.40
Uniform Delay, d1	46.3	0.0	1.6	1.1		1.6
Progression Factor	1.00	1.00	1.00	1.00		0.53
Incremental Delay, d2	1.1	0.0	0.3	0.2		0.2
Delay (s)	47.4	0.0	1.9	1.3		1.1
Level of Service	D	A	A	A		A
Approach Delay (s)	19.6		1.9			1.1
Approach LOS	B		A			A

Intersection Summary			
HCM Average Control Delay	2.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	46.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	141	38	1369	251	0	2392
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	2	1		1	0	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		770			412
Travel Time (s)	28.4		17.5			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	153	41	1488	273	0	2600
Turn Type		Free		Perm		
Protected Phases	3		2			2
Permitted Phases		Free		2		
Detector Phase	3		2	2		2
Switch Phase						
Minimum Initial (s)	6.0		6.0	6.0		6.0
Minimum Split (s)	11.0		11.0	11.0		11.0
Total Split (s)	25.0	0.0	75.0	75.0	0.0	75.0
Total Split (%)	25.0%	0.0%	75.0%	75.0%	0.0%	75.0%
Yellow Time (s)	3.0		3.0	3.0		3.0
All-Red Time (s)	2.0		2.0	2.0		2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	4.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None		C-Min	C-Min		C-Min
v/c Ratio	0.46	0.03	0.36	0.21		0.64
Control Delay	46.6	0.0	3.2	0.7		8.0
Queue Delay	0.0	0.0	0.0	0.0		18.7
Total Delay	46.6	0.0	3.2	0.7		26.7
Queue Length 50th (ft)	48	0	73	0		380
Queue Length 95th (ft)	77	0	105	15		452
Internal Link Dist (ft)	1168		690			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)	687	1583	4078	1324		4039
Starvation Cap Reductn	0	0	0	0		1516
Spillback Cap Reductn	0	0	0	0		0
Storage Cap Reductn	0	0	0	0		0
Reduced v/c Ratio	0.22	0.03	0.36	0.21		1.03

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 40	
Control Type: Actuated-Coordinated	

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	141	38	1369	251	0	2392
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	5.0		5.0
Lane Util. Factor	0.97	1.00	0.91	1.00		0.91
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3433	1583	5085	1583		5036
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3433	1583	5085	1583		5036
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	153	41	1488	273	0	2600
RTOR Reduction (vph)	0	0	0	54	0	0
Lane Group Flow (vph)	153	41	1488	219	0	2600
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Turn Type		Free		Perm		
Protected Phases	3		2			2
Permitted Phases		Free		2		
Actuated Green, G (s)	9.8	100.0	80.2	80.2		80.2
Effective Green, g (s)	9.8	100.0	80.2	80.2		80.2
Actuated g/C Ratio	0.10	1.00	0.80	0.80		0.80
Clearance Time (s)	5.0		5.0	5.0		5.0
Vehicle Extension (s)	3.0		3.0	3.0		3.0
Lane Grp Cap (vph)	336	1583	4078	1270		4039
v/s Ratio Prot	c0.04		0.29			c0.52
v/s Ratio Perm		0.03		0.14		
v/c Ratio	0.46	0.03	0.36	0.17		0.64
Uniform Delay, d1	42.6	0.0	2.8	2.3		4.1
Progression Factor	1.00	1.00	1.00	1.00		1.77
Incremental Delay, d2	1.0	0.0	0.3	0.3		0.3
Delay (s)	43.6	0.0	3.0	2.6		7.5
Level of Service	D	A	A	A		A
Approach Delay (s)	34.4		3.0			7.5
Approach LOS	C		A			A

Intersection Summary			
HCM Average Control Delay	6.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	59.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	530	151	2300	867	0	2028
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	2	1		1	0	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		770			412
Travel Time (s)	28.4		17.5			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	576	164	2500	942	0	2204
Turn Type		Free		Perm		
Protected Phases	3		2			2
Permitted Phases		Free		2		
Detector Phase	3		2	2		2
Switch Phase						
Minimum Initial (s)	6.0		6.0	6.0		6.0
Minimum Split (s)	11.0		11.0	11.0		11.0
Total Split (s)	35.0	0.0	65.0	65.0	0.0	65.0
Total Split (%)	35.0%	0.0%	65.0%	65.0%	0.0%	65.0%
Yellow Time (s)	3.0		3.0	3.0		3.0
All-Red Time (s)	2.0		2.0	2.0		2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	4.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None		C-Min	C-Min		C-Min
v/c Ratio	0.76	0.10	0.72	0.68		0.66
Control Delay	42.9	0.1	12.4	3.5		7.7
Queue Delay	0.0	0.0	0.0	0.0		1.7
Total Delay	42.9	0.1	12.4	3.5		9.3
Queue Length 50th (ft)	178	0	327	0		266
Queue Length 95th (ft)	220	0	465	45		364
Internal Link Dist (ft)	1168		690			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)	1030	1583	3450	1377		3351
Starvation Cap Reductn	0	0	0	0		910
Spillback Cap Reductn	0	0	0	0		0
Storage Cap Reductn	0	0	0	0		0
Reduced v/c Ratio	0.56	0.10	0.72	0.68		0.90

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	530	151	2300	867	0	2028
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	5.0		5.0
Lane Util. Factor	0.97	1.00	0.91	1.00		0.91
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3433	1583	5085	1583		4940
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3433	1583	5085	1583		4940
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	576	164	2500	942	0	2204
RTOR Reduction (vph)	0	0	0	303	0	0
Lane Group Flow (vph)	576	164	2500	639	0	2204
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Turn Type		Free		Perm		
Protected Phases	3		2			2
Permitted Phases		Free		2		
Actuated Green, G (s)	22.2	100.0	67.8	67.8		67.8
Effective Green, g (s)	22.2	100.0	67.8	67.8		67.8
Actuated g/C Ratio	0.22	1.00	0.68	0.68		0.68
Clearance Time (s)	5.0		5.0	5.0		5.0
Vehicle Extension (s)	3.0		3.0	3.0		3.0
Lane Grp Cap (vph)	762	1583	3448	1073		3349
v/s Ratio Prot	c0.17		c0.49			0.45
v/s Ratio Perm		0.10		0.40		
v/c Ratio	0.76	0.10	0.73	0.60		0.66
Uniform Delay, d1	36.4	0.0	10.2	8.7		9.4
Progression Factor	1.00	1.00	1.00	1.00		0.72
Incremental Delay, d2	4.3	0.1	1.4	2.4		0.5
Delay (s)	40.7	0.1	11.6	11.1		7.2
Level of Service	D	A	B	B		A
Approach Delay (s)	31.7		11.4			7.2
Approach LOS	C		B			A

Intersection Summary

HCM Average Control Delay	12.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	526	193	1958	873	0	1850
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	2	1		1	0	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		770			412
Travel Time (s)	28.4		17.5			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	572	210	2128	949	0	2011
Turn Type		Free		Perm		
Protected Phases	3		2			2
Permitted Phases		Free		2		
Detector Phase	3		2	2		2
Switch Phase						
Minimum Initial (s)	6.0		6.0	6.0		6.0
Minimum Split (s)	11.0		11.0	11.0		11.0
Total Split (s)	35.0	0.0	65.0	65.0	0.0	65.0
Total Split (%)	35.0%	0.0%	65.0%	65.0%	0.0%	65.0%
Yellow Time (s)	3.0		3.0	3.0		3.0
All-Red Time (s)	2.0		2.0	2.0		2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	4.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None		C-Min	C-Min		C-Min
v/c Ratio	0.76	0.13	0.62	0.69		0.59
Control Delay	42.9	0.2	10.3	3.5		9.6
Queue Delay	0.0	0.0	0.0	0.0		1.0
Total Delay	42.9	0.2	10.3	3.5		10.6
Queue Length 50th (ft)	176	0	242	0		310
Queue Length 95th (ft)	218	0	346	45		348
Internal Link Dist (ft)	1168		690			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)	1030	1583	3455	1380		3421
Starvation Cap Reductn	0	0	0	0		1048
Spillback Cap Reductn	0	0	0	0		0
Storage Cap Reductn	0	0	0	0		0
Reduced v/c Ratio	0.56	0.13	0.62	0.69		0.85

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	526	193	1958	873	0	1850
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	5.0		5.0
Lane Util. Factor	0.97	1.00	0.91	1.00		0.91
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3433	1583	5085	1583		5036
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3433	1583	5085	1583		5036
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	572	210	2128	949	0	2011
RTOR Reduction (vph)	0	0	0	305	0	0
Lane Group Flow (vph)	572	210	2128	644	0	2011
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Turn Type		Free		Perm		
Protected Phases	3		2			2
Permitted Phases		Free		2		
Actuated Green, G (s)	22.1	100.0	67.9	67.9		67.9
Effective Green, g (s)	22.1	100.0	67.9	67.9		67.9
Actuated g/C Ratio	0.22	1.00	0.68	0.68		0.68
Clearance Time (s)	5.0		5.0	5.0		5.0
Vehicle Extension (s)	3.0		3.0	3.0		3.0
Lane Grp Cap (vph)	759	1583	3453	1075		3419
v/s Ratio Prot	c0.17		c0.42			0.40
v/s Ratio Perm		0.13		0.41		
v/c Ratio	0.75	0.13	0.62	0.60		0.59
Uniform Delay, d1	36.4	0.0	8.9	8.7		8.6
Progression Factor	1.00	1.00	1.00	1.00		0.99
Incremental Delay, d2	4.3	0.2	0.8	2.5		0.5
Delay (s)	40.7	0.2	9.7	11.2		9.0
Level of Service	D	A	A	B		A
Approach Delay (s)	29.8		10.1			9.0
Approach LOS	C		B			A

Intersection Summary			
HCM Average Control Delay	12.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	61.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	142	39	1433	255	0	2513
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	2	1		1	0	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		1540			412
Travel Time (s)	28.4		35.0			9.4
Peak Hour Factor	0.68	0.68	0.94	0.94	0.99	0.99
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	209	57	1524	271	0	2538
Turn Type		Free		Perm		
Protected Phases	3		2			2
Permitted Phases		Free		2		
Detector Phase	3		2	2		2
Switch Phase						
Minimum Initial (s)	6.0		6.0	6.0		6.0
Minimum Split (s)	11.0		11.0	11.0		11.0
Total Split (s)	25.0	0.0	75.0	75.0	0.0	75.0
Total Split (%)	25.0%	0.0%	75.0%	75.0%	0.0%	75.0%
Yellow Time (s)	3.0		3.0	3.0		3.0
All-Red Time (s)	2.0		2.0	2.0		2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	4.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None		C-Min	C-Min		C-Min
v/c Ratio	0.53	0.04	0.38	0.21		0.65
Control Delay	46.5	0.1	3.7	0.8		6.0
Queue Delay	0.0	0.0	0.0	0.0		1.8
Total Delay	46.5	0.1	3.7	0.8		7.8
Queue Length 50th (ft)	65	0	85	0		205
Queue Length 95th (ft)	73	0	123	17		290
Internal Link Dist (ft)	1168		1460			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)	687	1583	3997	1302		3883
Starvation Cap Reductn	0	0	0	0		1119
Spillback Cap Reductn	0	0	0	0		0
Storage Cap Reductn	0	0	0	0		0
Reduced v/c Ratio	0.30	0.04	0.38	0.21		0.92

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 40
Control Type: Actuated-Coordinated

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	142	39	1433	255	0	2513
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	5.0		5.0
Lane Util. Factor	0.97	1.00	0.91	1.00		0.91
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3433	1583	5085	1583		4940
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3433	1583	5085	1583		4940
Peak-hour factor, PHF	0.68	0.68	0.94	0.94	0.99	0.99
Adj. Flow (vph)	209	57	1524	271	0	2538
RTOR Reduction (vph)	0	0	0	58	0	0
Lane Group Flow (vph)	209	57	1524	213	0	2538
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Turn Type		Free		Perm		
Protected Phases	3		2			2
Permitted Phases		Free		2		
Actuated Green, G (s)	11.4	100.0	78.6	78.6		78.6
Effective Green, g (s)	11.4	100.0	78.6	78.6		78.6
Actuated g/C Ratio	0.11	1.00	0.79	0.79		0.79
Clearance Time (s)	5.0		5.0	5.0		5.0
Vehicle Extension (s)	3.0		3.0	3.0		3.0
Lane Grp Cap (vph)	391	1583	3997	1244		3883
v/s Ratio Prot	c0.06		0.30			c0.51
v/s Ratio Perm		0.04		0.13		
v/c Ratio	0.53	0.04	0.38	0.17		0.65
Uniform Delay, d1	41.8	0.0	3.3	2.6		4.7
Progression Factor	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	1.4	0.0	0.3	0.3		0.9
Delay (s)	43.2	0.0	3.5	2.9		5.6
Level of Service	D	A	A	A		A
Approach Delay (s)	34.0		3.5			5.6
Approach LOS	C		A			A

Intersection Summary

HCM Average Control Delay	6.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	61.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	552	151	2396	899	0	2132
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	2	1		1	0	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		770			412
Travel Time (s)	28.4		17.5			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	600	164	2604	977	0	2317
Turn Type		Free		Perm		
Protected Phases	3		2			2
Permitted Phases		Free		2		
Detector Phase	3		2	2		2
Switch Phase						
Minimum Initial (s)	6.0		6.0	6.0		6.0
Minimum Split (s)	11.0		11.0	11.0		11.0
Total Split (s)	35.0	0.0	65.0	65.0	0.0	65.0
Total Split (%)	35.0%	0.0%	65.0%	65.0%	0.0%	65.0%
Yellow Time (s)	3.0		3.0	3.0		3.0
All-Red Time (s)	2.0		2.0	2.0		2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	4.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None		C-Min	C-Min		C-Min
v/c Ratio	0.77	0.10	0.76	0.71		0.70
Control Delay	42.7	0.1	13.7	3.8		8.2
Queue Delay	0.0	0.0	0.0	0.0		3.5
Total Delay	42.7	0.1	13.7	3.8		11.7
Queue Length 50th (ft)	185	0	364	0		282
Queue Length 95th (ft)	227	0	516	46		m423
Internal Link Dist (ft)	1168		690			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)	1030	1583	3416	1384		3319
Starvation Cap Reductn	0	0	0	0		890
Spillback Cap Reductn	0	83	0	0		0
Storage Cap Reductn	0	0	0	0		0
Reduced v/c Ratio	0.58	0.11	0.76	0.71		0.95

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	552	151	2396	899	0	2132
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	5.0		5.0
Lane Util. Factor	0.97	1.00	0.91	1.00		0.91
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3433	1583	5085	1583		4940
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3433	1583	5085	1583		4940
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	600	164	2604	977	0	2317
RTOR Reduction (vph)	0	0	0	320	0	0
Lane Group Flow (vph)	600	164	2604	657	0	2317
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Turn Type		Free		Perm		
Protected Phases	3		2			2
Permitted Phases		Free		2		
Actuated Green, G (s)	22.8	100.0	67.2	67.2		67.2
Effective Green, g (s)	22.8	100.0	67.2	67.2		67.2
Actuated g/C Ratio	0.23	1.00	0.67	0.67		0.67
Clearance Time (s)	5.0		5.0	5.0		5.0
Vehicle Extension (s)	3.0		3.0	3.0		3.0
Lane Grp Cap (vph)	783	1583	3417	1064		3320
v/s Ratio Prot	c0.17		c0.51			0.47
v/s Ratio Perm		0.10		0.41		
v/c Ratio	0.77	0.10	0.76	0.62		0.70
Uniform Delay, d1	36.1	0.0	11.0	9.2		10.1
Progression Factor	1.00	1.00	1.00	1.00		0.71
Incremental Delay, d2	4.5	0.1	1.7	2.7		0.5
Delay (s)	40.6	0.1	12.7	11.9		7.6
Level of Service	D	A	B	B		A
Approach Delay (s)	31.9		12.5			7.6
Approach LOS	C		B			A

Intersection Summary			
HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	70.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	548	196	2039	901	0	1945
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	2	1		1	0	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		770			412
Travel Time (s)	28.4		17.5			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	596	213	2216	979	0	2114
Turn Type		Free		Perm		
Protected Phases	3		2			2
Permitted Phases		Free		2		
Detector Phase	3		2	2		2
Switch Phase						
Minimum Initial (s)	6.0		6.0	6.0		6.0
Minimum Split (s)	11.0		11.0	11.0		11.0
Total Split (s)	35.0	0.0	65.0	65.0	0.0	65.0
Total Split (%)	35.0%	0.0%	65.0%	65.0%	0.0%	65.0%
Maximum Green (s)	30.0		60.0	60.0		60.0
Yellow Time (s)	3.0		3.0	3.0		3.0
All-Red Time (s)	2.0		2.0	2.0		2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	4.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0		3.0
Recall Mode	None		C-Min	C-Min		C-Min
v/c Ratio	0.77	0.13	0.65	0.71		0.62
Control Delay	42.8	0.2	11.2	3.8		9.9
Queue Delay	0.0	0.0	0.0	0.0		1.6
Total Delay	42.8	0.2	11.2	3.8		11.5
Queue Length 50th (ft)	184	0	265	0		344
Queue Length 95th (ft)	225	0	380	46		369
Internal Link Dist (ft)	1168		690			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)	1030	1583	3422	1385		3389
Starvation Cap Reductn	0	0	0	0		1031
Spillback Cap Reductn	0	0	0	0		0
Storage Cap Reductn	0	0	0	0		0
Reduced v/c Ratio	0.58	0.13	0.65	0.71		0.90

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	548	196	2039	901	0	1945
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	5.0		5.0
Lane Util. Factor	0.97	1.00	0.91	1.00		0.91
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3433	1583	5085	1583		5036
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3433	1583	5085	1583		5036
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	596	213	2216	979	0	2114
RTOR Reduction (vph)	0	0	0	320	0	0
Lane Group Flow (vph)	596	213	2216	659	0	2114
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Turn Type		Free		Perm		
Protected Phases	3		2			2
Permitted Phases		Free		2		
Actuated Green, G (s)	22.7	100.0	67.3	67.3		67.3
Effective Green, g (s)	22.7	100.0	67.3	67.3		67.3
Actuated g/C Ratio	0.23	1.00	0.67	0.67		0.67
Clearance Time (s)	5.0		5.0	5.0		5.0
Vehicle Extension (s)	3.0		3.0	3.0		3.0
Lane Grp Cap (vph)	779	1583	3422	1065		3389
v/s Ratio Prot	c0.17		c0.44			0.42
v/s Ratio Perm		0.13		0.42		
v/c Ratio	0.77	0.13	0.65	0.62		0.62
Uniform Delay, d1	36.2	0.0	9.5	9.2		9.2
Progression Factor	1.00	1.00	1.00	1.00		0.95
Incremental Delay, d2	4.5	0.2	1.0	2.7		0.5
Delay (s)	40.7	0.2	10.4	11.9		9.2
Level of Service	D	A	B	B		A
Approach Delay (s)	30.0		10.9			9.2
Approach LOS	C		B			A

Intersection Summary			
HCM Average Control Delay	12.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

Synchro 7 Capacity Analysis
Option 12-4 - Left Turn Flyover at Tomasello Drive to Route 1A SB

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	8	1208	68	8	2133
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	0	1		1	2	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		770			412
Travel Time (s)	28.4		17.5			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	9	1313	74	9	2318
Turn Type		Free		Perm	Prot	
Protected Phases			2		1	1 2
Permitted Phases		Free		2		
Detector Phase			2	2	1	1 2
Switch Phase						
Minimum Initial (s)			6.0	6.0	10.0	
Minimum Split (s)			11.0	11.0	15.0	
Total Split (s)	0.0	0.0	60.0	60.0	40.0	100.0
Total Split (%)	0.0%	0.0%	60.0%	60.0%	40.0%	100.0%
Maximum Green (s)			55.0	55.0	35.0	
Yellow Time (s)			3.0	3.0	3.0	
All-Red Time (s)			2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Vehicle Extension (s)			3.0	3.0	3.0	
Recall Mode			C-Min	C-Min	None	
v/c Ratio		0.01	0.67	0.08	0.01	0.66
Control Delay		0.0	18.3	2.8	26.6	0.6
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		0.0	18.3	2.8	26.6	0.6
Queue Length 50th (ft)		0	297	0	2	0
Queue Length 95th (ft)		0	373	20	m2	0
Internal Link Dist (ft)	1168		690			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)		1611	1946	904	1190	3505
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.01	0.67	0.08	0.01	0.66

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 40	
Control Type: Actuated-Coordinated	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	8	1208	68	8	2133
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	5.0	5.0	5.0	5.0
Lane Util. Factor		1.00	0.95	1.00	0.97	0.95
Frt		0.86	1.00	0.85	1.00	1.00
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		1611	3539	1583	3400	3505
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		1611	3539	1583	3400	3505
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	9	1313	74	9	2318
RTOR Reduction (vph)	0	0	0	33	0	0
Lane Group Flow (vph)	0	9	1313	41	9	2318
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Turn Type		Free		Perm	Prot	
Protected Phases			2		1	1 2
Permitted Phases		Free		2		
Actuated Green, G (s)		100.0	55.0	55.0	35.0	100.0
Effective Green, g (s)		100.0	55.0	55.0	35.0	100.0
Actuated g/C Ratio		1.00	0.55	0.55	0.35	1.00
Clearance Time (s)			5.0	5.0	5.0	
Vehicle Extension (s)			3.0	3.0	3.0	
Lane Grp Cap (vph)		1611	1946	871	1190	3505
v/s Ratio Prot			0.37		0.00	c0.66
v/s Ratio Perm		0.01		0.03		
v/c Ratio		0.01	0.67	0.05	0.01	0.66
Uniform Delay, d1		0.0	16.1	10.4	21.2	0.0
Progression Factor		1.00	1.00	1.00	1.25	1.00
Incremental Delay, d2		0.0	1.9	0.1	0.0	0.3
Delay (s)		0.0	18.0	10.5	26.5	0.3
Level of Service		A	B	B	C	A
Approach Delay (s)	0.0		17.6			0.4
Approach LOS	A		B			A

Intersection Summary			
HCM Average Control Delay	6.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	63.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	13	2007	200	30	1716
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	0	1		1	2	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		770			412
Travel Time (s)	28.4		17.5			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	14	2182	217	33	1865
Turn Type		Free		Perm	Prot	
Protected Phases			2		1	1 2
Permitted Phases		Free		2		
Detector Phase			2	2	1	1 2
Switch Phase						
Minimum Initial (s)			6.0	6.0	10.0	
Minimum Split (s)			11.0	11.0	15.0	
Total Split (s)	0.0	0.0	55.0	55.0	20.0	75.0
Total Split (%)	0.0%	0.0%	73.3%	73.3%	26.7%	100.0%
Yellow Time (s)			3.0	3.0	3.0	
All-Red Time (s)			2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode			C-Min	C-Min	None	
v/c Ratio		0.01	0.92	0.19	0.05	0.54
Control Delay		0.0	19.6	1.1	24.6	0.6
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		0.0	19.6	1.1	24.6	0.6
Queue Length 50th (ft)		0	395	0	6	0
Queue Length 95th (ft)		0	#656	19	17	0
Internal Link Dist (ft)	1168		690			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)		1611	2359	1128	667	3438
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.01	0.92	0.19	0.05	0.54

Intersection Summary	
Area Type:	Other
Cycle Length: 75	
Actuated Cycle Length: 75	
Offset: 15 (20%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	13	2007	200	30	1716
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	5.0	5.0	5.0	5.0
Lane Util. Factor		1.00	0.95	1.00	0.97	0.95
Frt		0.86	1.00	0.85	1.00	1.00
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		1611	3539	1583	3335	3438
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		1611	3539	1583	3335	3438
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	14	2182	217	33	1865
RTOR Reduction (vph)	0	0	0	72	0	0
Lane Group Flow (vph)	0	14	2182	145	33	1865
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Turn Type		Free		Perm	Prot	
Protected Phases			2		1	1 2
Permitted Phases		Free		2		
Actuated Green, G (s)		75.0	50.0	50.0	15.0	75.0
Effective Green, g (s)		75.0	50.0	50.0	15.0	75.0
Actuated g/C Ratio		1.00	0.67	0.67	0.20	1.00
Clearance Time (s)			5.0	5.0	5.0	
Vehicle Extension (s)			3.0	3.0	3.0	
Lane Grp Cap (vph)		1611	2359	1055	667	3438
v/s Ratio Prot			c0.62		0.01	c0.54
v/s Ratio Perm		0.01		0.09		
v/c Ratio		0.01	0.92	0.14	0.05	0.54
Uniform Delay, d1		0.0	10.9	4.6	24.2	0.0
Progression Factor		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.0	7.7	0.3	0.0	0.2
Delay (s)		0.0	18.5	4.9	24.3	0.2
Level of Service		A	B	A	C	A
Approach Delay (s)	0.0		17.3			0.6
Approach LOS	A		B			A

Intersection Summary			
HCM Average Control Delay	9.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	5.0
Intersection Capacity Utilization	59.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	59	1691	165	26	1567
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	0	1		1	2	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		770			412
Travel Time (s)	28.4		17.5			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	64	1838	179	28	1703
Turn Type		Free		Perm	Prot	
Protected Phases			2		1	1 2
Permitted Phases		Free		2		
Detector Phase			2	2	1	1 2
Switch Phase						
Minimum Initial (s)			6.0	6.0	10.0	
Minimum Split (s)			11.0	11.0	15.0	
Total Split (s)	0.0	0.0	75.0	75.0	25.0	100.0
Total Split (%)	0.0%	0.0%	75.0%	75.0%	25.0%	100.0%
Maximum Green (s)			70.0	70.0	20.0	
Yellow Time (s)			3.0	3.0	3.0	
All-Red Time (s)			2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Vehicle Extension (s)			3.0	3.0	3.0	
Recall Mode			C-Min	C-Min	None	
v/c Ratio		0.04	0.74	0.15	0.04	0.49
Control Delay		0.1	11.6	1.1	31.8	0.4
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		0.1	11.6	1.1	31.8	0.4
Queue Length 50th (ft)		0	336	0	5	0
Queue Length 95th (ft)		0	420	18	m10	0
Internal Link Dist (ft)	1168		690			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)		1611	2486	1166	680	3479
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.04	0.74	0.15	0.04	0.49

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	59	1691	165	26	1567
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	5.0	5.0	5.0	5.0
Lane Util. Factor		1.00	0.95	1.00	0.97	0.95
Frt		0.86	1.00	0.85	1.00	1.00
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		1611	3539	1583	3400	3505
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		1611	3539	1583	3400	3505
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	64	1838	179	28	1703
RTOR Reduction (vph)	0	0	0	53	0	0
Lane Group Flow (vph)	0	64	1838	126	28	1703
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Turn Type		Free		Perm	Prot	
Protected Phases			2		1	1 2
Permitted Phases		Free		2		
Actuated Green, G (s)		100.0	70.3	70.3	19.7	100.0
Effective Green, g (s)		100.0	70.3	70.3	19.7	100.0
Actuated g/C Ratio		1.00	0.70	0.70	0.20	1.00
Clearance Time (s)			5.0	5.0	5.0	
Vehicle Extension (s)			3.0	3.0	3.0	
Lane Grp Cap (vph)		1611	2488	1113	670	3505
v/s Ratio Prot			c0.52		0.01	c0.49
v/s Ratio Perm		0.04		0.08		
v/c Ratio		0.04	0.74	0.11	0.04	0.49
Uniform Delay, d1		0.0	9.2	4.8	32.5	0.0
Progression Factor		1.00	1.00	1.00	0.98	1.00
Incremental Delay, d2		0.0	2.0	0.2	0.0	0.1
Delay (s)		0.0	11.2	5.0	31.7	0.1
Level of Service		A	B	A	C	A
Approach Delay (s)	0.0		10.6			0.6
Approach LOS	A		B			A

Intersection Summary			
HCM Average Control Delay	5.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	5.0
Intersection Capacity Utilization	50.9%	ICU Level of Service	A
Analysis Period (min)	15		

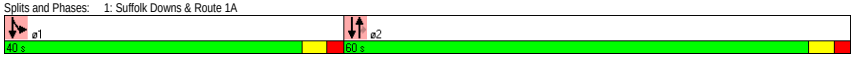
c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	38	1369	251	58	2392
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	0	1		1	2	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		770			412
Travel Time (s)	28.4		17.5			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	41	1488	273	63	2600
Turn Type		Free		Perm	Prot	
Protected Phases			2		1	1 2
Permitted Phases		Free		2		
Detector Phase			2	2	1	1 2
Switch Phase						
Minimum Initial (s)			6.0	6.0	10.0	
Minimum Split (s)			11.0	11.0	15.0	
Total Split (s)	0.0	0.0	60.0	60.0	40.0	100.0
Total Split (%)	0.0%	0.0%	60.0%	60.0%	40.0%	100.0%
Yellow Time (s)			3.0	3.0	3.0	
All-Red Time (s)			2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode			C-Min	C-Min	None	
v/c Ratio		0.03	0.76	0.27	0.05	0.74
Control Delay		0.0	20.8	2.1	27.0	1.7
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		0.0	20.8	2.1	27.0	1.7
Queue Length 50th (ft)		0	366	0	14	0
Queue Length 95th (ft)		0	456	35	m17	47
Internal Link Dist (ft)	1168		690			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)		1611	1946	994	1190	3505
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.03	0.76	0.27	0.05	0.74

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	38	1369	251	58	2392
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	5.0	5.0	5.0	5.0
Lane Util. Factor		1.00	0.95	1.00	0.97	0.95
Frt		0.86	1.00	0.85	1.00	1.00
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		1611	3539	1583	3400	3505
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		1611	3539	1583	3400	3505
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	41	1488	273	63	2600
RTOR Reduction (vph)	0	0	0	123	0	0
Lane Group Flow (vph)	0	41	1488	150	63	2600
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Turn Type		Free		Perm	Prot	
Protected Phases			2		1	1 2
Permitted Phases		Free		2		
Actuated Green, G (s)		100.0	55.0	55.0	35.0	100.0
Effective Green, g (s)		100.0	55.0	55.0	35.0	100.0
Actuated g/C Ratio		1.00	0.55	0.55	0.35	1.00
Clearance Time (s)			5.0	5.0	5.0	
Vehicle Extension (s)			3.0	3.0	3.0	
Lane Grp Cap (vph)		1611	1946	871	1190	3505
v/s Ratio Prot			0.42		0.02	c0.74
v/s Ratio Perm		0.03		0.09		
v/c Ratio		0.03	0.76	0.17	0.05	0.74
Uniform Delay, d1		0.0	17.5	11.2	21.5	0.0
Progression Factor		1.00	1.00	1.00	1.24	1.00
Incremental Delay, d2		0.0	2.9	0.4	0.0	0.3
Delay (s)		0.0	20.4	11.6	26.8	0.3
Level of Service		A	C	B	C	A
Approach Delay (s)	0.0		19.0			1.0
Approach LOS	A		B			A

Intersection Summary			
HCM Average Control Delay	8.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	70.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	151	2300	867	194	2028
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	0	1		1	2	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		770			412
Travel Time (s)	28.4		17.5			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	164	2500	942	211	2204
Turn Type		Free		Perm	Prot	
Protected Phases			2		1	1 2
Permitted Phases		Free		2		
Detector Phase			2	2	1	1 2
Switch Phase						
Minimum Initial (s)			6.0	6.0	10.0	
Minimum Split (s)			11.0	11.0	15.0	
Total Split (s)	0.0	0.0	80.0	80.0	20.0	100.0
Total Split (%)	0.0%	0.0%	80.0%	80.0%	20.0%	100.0%
Yellow Time (s)			3.0	3.0	3.0	
All-Red Time (s)			2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode			C-Min	C-Min	None	
v/c Ratio		0.10	0.94	0.77	0.42	0.64
Control Delay		0.1	19.9	10.9	44.4	0.4
Queue Delay		0.0	1.9	0.0	0.0	0.0
Total Delay		0.1	21.9	10.9	44.4	0.4
Queue Length 50th (ft)		0	593	234	58	0
Queue Length 95th (ft)		0	#837	406	m68	0
Internal Link Dist (ft)	1168		690			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)		1611	2654	1230	500	3438
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		84	75	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.11	0.97	0.77	0.42	0.64

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	151	2300	867	194	2028
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	5.0	5.0	5.0	5.0
Lane Util. Factor		1.00	0.95	1.00	0.97	0.95
Frt		0.86	1.00	0.85	1.00	1.00
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		1611	3539	1583	3335	3438
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		1611	3539	1583	3335	3438
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	164	2500	942	211	2204
RTOR Reduction (vph)	0	0	0	43	0	0
Lane Group Flow (vph)	0	164	2500	899	211	2204
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Turn Type		Free		Perm	Prot	
Protected Phases			2		1	1 2
Permitted Phases		Free		2		
Actuated Green, G (s)		100.0	75.0	75.0	15.0	100.0
Effective Green, g (s)		100.0	75.0	75.0	15.0	100.0
Actuated g/C Ratio		1.00	0.75	0.75	0.15	1.00
Clearance Time (s)			5.0	5.0	5.0	
Vehicle Extension (s)			3.0	3.0	3.0	
Lane Grp Cap (vph)		1611	2654	1187	500	3438
v/s Ratio Prot			c0.71		0.06	c0.64
v/s Ratio Perm		0.10		0.57		
v/c Ratio		0.10	0.94	0.76	0.42	0.64
Uniform Delay, d1		0.0	10.6	7.2	38.6	0.0
Progression Factor		1.00	1.00	1.00	1.11	1.00
Incremental Delay, d2		0.1	8.3	4.5	0.3	0.2
Delay (s)		0.1	19.0	11.8	43.1	0.2
Level of Service		A	B	B	D	A
Approach Delay (s)	0.1		17.0			3.9
Approach LOS	A		B			A

Intersection Summary

HCM Average Control Delay	11.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	5.0
Intersection Capacity Utilization	80.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	193	1958	873	208	1850
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	0	1		1	2	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		770			412
Travel Time (s)	28.4		17.5			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	210	2128	949	226	2011
Turn Type		Free		Perm	Prot	
Protected Phases			2		1	1 2
Permitted Phases		Free		2		
Detector Phase			2	2	1	1 2
Switch Phase						
Minimum Initial (s)			6.0	6.0	10.0	
Minimum Split (s)			11.0	11.0	15.0	
Total Split (s)	0.0	0.0	75.0	75.0	25.0	100.0
Total Split (%)	0.0%	0.0%	75.0%	75.0%	25.0%	100.0%
Yellow Time (s)			3.0	3.0	3.0	
All-Red Time (s)			2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode			C-Min	C-Min	None	
v/c Ratio		0.13	0.86	0.80	0.33	0.57
Control Delay		0.2	16.0	13.8	37.6	0.4
Queue Delay		0.0	0.1	0.0	0.0	0.0
Total Delay		0.2	16.1	13.8	37.6	0.4
Queue Length 50th (ft)		0	468	266	53	0
Queue Length 95th (ft)		0	595	475	m77	0
Internal Link Dist (ft)	1168		690			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)		1611	2477	1183	680	3505
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		74	22	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.14	0.87	0.80	0.33	0.57

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	193	1958	873	208	1850
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	5.0	5.0	5.0	5.0
Lane Util. Factor		1.00	0.95	1.00	0.97	0.95
Frt		0.86	1.00	0.85	1.00	1.00
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		1611	3539	1583	3400	3505
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		1611	3539	1583	3400	3505
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	210	2128	949	226	2011
RTOR Reduction (vph)	0	0	0	75	0	0
Lane Group Flow (vph)	0	210	2128	874	226	2011
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Turn Type		Free		Perm	Prot	
Protected Phases			2		1	1 2
Permitted Phases		Free		2		
Actuated Green, G (s)		100.0	70.0	70.0	20.0	100.0
Effective Green, g (s)		100.0	70.0	70.0	20.0	100.0
Actuated g/C Ratio		1.00	0.70	0.70	0.20	1.00
Clearance Time (s)			5.0	5.0	5.0	
Vehicle Extension (s)			3.0	3.0	3.0	
Lane Grp Cap (vph)		1611	2477	1108	680	3505
v/s Ratio Prot			c0.60		0.07	c0.57
v/s Ratio Perm		0.13		0.55		
v/c Ratio		0.13	0.86	0.79	0.33	0.57
Uniform Delay, d1		0.0	11.3	10.0	34.3	0.0
Progression Factor		1.00	1.00	1.00	1.06	1.00
Incremental Delay, d2		0.2	4.2	5.7	0.2	0.1
Delay (s)		0.2	15.4	15.8	36.7	0.1
Level of Service		A	B	B	D	A
Approach Delay (s)	0.2		15.5			3.8
Approach LOS	A		B			A

Intersection Summary			
HCM Average Control Delay	10.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	5.0
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	39	1433	255	59	2513
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	0	1		1	2	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		1540			412
Travel Time (s)	28.4		35.0			9.4
Peak Hour Factor	0.68	0.68	0.94	0.94	0.99	0.99
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	57	1524	271	60	2538
Turn Type		Free		Perm	Prot	
Protected Phases			2		1	1 2
Permitted Phases		Free		2		
Detector Phase			2	2	1	1 2
Switch Phase						
Minimum Initial (s)			6.0	6.0	10.0	
Minimum Split (s)			11.0	11.0	15.0	
Total Split (s)	0.0	0.0	60.0	60.0	40.0	100.0
Total Split (%)	0.0%	0.0%	60.0%	60.0%	40.0%	100.0%
Yellow Time (s)			3.0	3.0	3.0	
All-Red Time (s)			2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode			C-Min	C-Min	None	
v/c Ratio		0.04	0.78	0.27	0.05	0.74
Control Delay		0.1	21.4	2.1	21.8	1.5
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		0.1	21.4	2.1	21.8	1.5
Queue Length 50th (ft)		0	382	0	12	0
Queue Length 95th (ft)		0	476	35	26	0
Internal Link Dist (ft)	1168		1460			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)		1611	1946	993	1167	3438
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.04	0.78	0.27	0.05	0.74

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 39 (39%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 45	
Control Type: Actuated-Coordinated	

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	39	1433	255	59	2513
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	5.0	5.0	5.0	5.0
Lane Util. Factor		1.00	0.95	1.00	0.97	0.95
Frt		0.86	1.00	0.85	1.00	1.00
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		1611	3539	1583	3335	3438
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		1611	3539	1583	3335	3438
Peak-hour factor, PHF	0.68	0.68	0.94	0.94	0.99	0.99
Adj. Flow (vph)	0	57	1524	271	60	2538
RTOR Reduction (vph)	0	0	0	122	0	0
Lane Group Flow (vph)	0	57	1524	149	60	2538
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Turn Type		Free		Perm	Prot	
Protected Phases			2		1	1 2
Permitted Phases		Free		2		
Actuated Green, G (s)		100.0	55.0	55.0	35.0	100.0
Effective Green, g (s)		100.0	55.0	55.0	35.0	100.0
Actuated g/C Ratio		1.00	0.55	0.55	0.35	1.00
Clearance Time (s)			5.0	5.0	5.0	
Vehicle Extension (s)			3.0	3.0	3.0	
Lane Grp Cap (vph)		1611	1946	871	1167	3438
v/s Ratio Prot			0.43		0.02	c0.74
v/s Ratio Perm		0.04		0.09		
v/c Ratio		0.04	0.78	0.17	0.05	0.74
Uniform Delay, d1		0.0	17.8	11.2	21.5	0.0
Progression Factor		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.0	3.2	0.4	0.0	0.9
Delay (s)		0.0	21.0	11.6	21.5	0.9
Level of Service		A	C	B	C	A
Approach Delay (s)	0.0		19.6			1.3
Approach LOS	A		B			A

Intersection Summary			
HCM Average Control Delay	8.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	151	2396	899	183	2132
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	0	1		1	2	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		770			412
Travel Time (s)	28.4		17.5			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	164	2604	977	199	2317
Turn Type		Free		Prot	Prot	
Protected Phases			2	2	1	1 2
Permitted Phases		Free				
Detector Phase			2	2	1	1 2
Switch Phase						
Minimum Initial (s)			6.0	6.0	10.0	
Minimum Split (s)			11.0	11.0	15.0	
Total Split (s)	0.0	0.0	80.0	80.0	20.0	100.0
Total Split (%)	0.0%	0.0%	80.0%	80.0%	20.0%	100.0%
Yellow Time (s)			3.0	3.0	3.0	
All-Red Time (s)			2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode			C-Min	C-Min	None	
v/c Ratio		0.10	0.98	0.79	0.40	0.67
Control Delay		0.1	26.4	11.9	44.4	0.4
Queue Delay		0.0	17.4	0.0	0.0	0.0
Total Delay		0.1	43.9	11.9	44.4	0.4
Queue Length 50th (ft)		0	687	251	55	0
Queue Length 95th (ft)		0	#1032	446	m61	m0
Internal Link Dist (ft)	1168		690			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)		1611	2654	1235	500	3438
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		219	157	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.12	1.04	0.79	0.40	0.67

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	151	2396	899	183	2132
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	5.0	5.0	5.0	5.0
Lane Util. Factor		1.00	0.95	1.00	0.97	0.95
Frt		0.86	1.00	0.85	1.00	1.00
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		1611	3539	1583	3335	3438
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		1611	3539	1583	3335	3438
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	164	2604	977	199	2317
RTOR Reduction (vph)	0	0	0	48	0	0
Lane Group Flow (vph)	0	164	2604	929	199	2317
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Turn Type		Free		Prot	Prot	
Protected Phases			2	2	1	1 2
Permitted Phases		Free				
Actuated Green, G (s)		100.0	75.0	75.0	15.0	100.0
Effective Green, g (s)		100.0	75.0	75.0	15.0	100.0
Actuated g/C Ratio		1.00	0.75	0.75	0.15	1.00
Clearance Time (s)			5.0	5.0	5.0	
Vehicle Extension (s)			3.0	3.0	3.0	
Lane Grp Cap (vph)		1611	2654	1187	500	3438
v/s Ratio Prot			c0.74	0.59	0.06	c0.67
v/s Ratio Perm		0.10				
v/c Ratio		0.10	0.98	0.78	0.40	0.67
Uniform Delay, d1		0.0	11.8	7.6	38.4	0.0
Progression Factor		1.00	1.00	1.00	1.12	1.00
Incremental Delay, d2		0.1	13.6	5.2	0.2	0.2
Delay (s)		0.1	25.4	12.8	43.3	0.2
Level of Service		A	C	B	D	A
Approach Delay (s)	0.1		22.0			3.6
Approach LOS	A		C			A

Intersection Summary			
HCM Average Control Delay	14.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	5.0
Intersection Capacity Utilization	82.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	196	2039	901	208	1945
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	0	1		1	2	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		770			412
Travel Time (s)	28.4		17.5			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	213	2216	979	226	2114
Turn Type		Free		Perm	Prot	
Protected Phases			2		1	1 2
Permitted Phases		Free		2		
Detector Phase			2	2	1	1 2
Switch Phase						
Minimum Initial (s)			6.0	6.0	10.0	
Minimum Split (s)			11.0	11.0	15.0	
Total Split (s)	0.0	0.0	75.0	75.0	25.0	100.0
Total Split (%)	0.0%	0.0%	75.0%	75.0%	25.0%	100.0%
Maximum Green (s)			70.0	70.0	20.0	
Yellow Time (s)			3.0	3.0	3.0	
All-Red Time (s)			2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Vehicle Extension (s)			3.0	3.0	3.0	
Recall Mode			C-Min	C-Min	None	
v/c Ratio		0.13	0.89	0.83	0.33	0.60
Control Delay		0.2	18.3	15.3	38.4	0.4
Queue Delay		0.0	0.3	0.0	0.0	0.0
Total Delay		0.2	18.7	15.3	38.4	0.4
Queue Length 50th (ft)		0	521	292	54	0
Queue Length 95th (ft)		0	665	529	m74	0
Internal Link Dist (ft)	1168		690			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)		1611	2477	1183	680	3505
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		87	41	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.14	0.91	0.83	0.33	0.60

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	196	2039	901	208	1945
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	5.0	5.0	5.0	5.0
Lane Util. Factor		1.00	0.95	1.00	0.97	0.95
Frt		0.86	1.00	0.85	1.00	1.00
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		1611	3539	1583	3400	3505
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		1611	3539	1583	3400	3505
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	213	2216	979	226	2114
RTOR Reduction (vph)	0	0	0	75	0	0
Lane Group Flow (vph)	0	213	2216	904	226	2114
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Turn Type		Free		Perm	Prot	
Protected Phases			2		1	1 2
Permitted Phases		Free		2		
Actuated Green, G (s)		100.0	70.0	70.0	20.0	100.0
Effective Green, g (s)		100.0	70.0	70.0	20.0	100.0
Actuated g/C Ratio		1.00	0.70	0.70	0.20	1.00
Clearance Time (s)			5.0	5.0	5.0	
Vehicle Extension (s)			3.0	3.0	3.0	
Lane Grp Cap (vph)		1611	2477	1108	680	3505
v/s Ratio Prot			c0.63		0.07	c0.60
v/s Ratio Perm		0.13		0.57		
v/c Ratio		0.13	0.89	0.82	0.33	0.60
Uniform Delay, d1		0.0	12.0	10.5	34.3	0.0
Progression Factor		1.00	1.00	1.00	1.09	1.00
Incremental Delay, d2		0.2	5.5	6.7	0.2	0.2
Delay (s)		0.2	17.6	17.2	37.5	0.2
Level of Service		A	B	B	D	A
Approach Delay (s)	0.2		17.4			3.8
Approach LOS	A		B			A

Intersection Summary

HCM Average Control Delay	11.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	5.0
Intersection Capacity Utilization	73.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

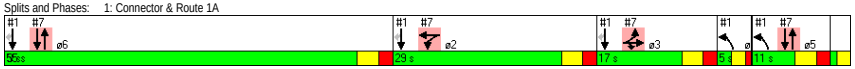
Synchro 7 Capacity Analysis Option 13 – Boardman Street At-Grade, Reverse Jughandle and Relocation of NB Left Turns

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations												
Volume (vph)	0	0	134	0	2526	124						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900						
Right Turn on Red		Yes				Yes						
Link Speed (mph)	30			30	30							
Link Distance (ft)	315			1005	406							
Travel Time (s)	7.2			22.8	9.2							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92						
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	146	0	2746	135						
Turn Type			Prot			Perm						
Protected Phases			4 5		1 2 3 6		1	2	3	4	5	6
Permitted Phases						1 2 3 6						
Detector Phase			4 5		1 2 3 6	1 2 3 6						
Switch Phase												
Minimum Initial (s)							4.0	4.0	6.0	1.0	6.0	1.0
Minimum Split (s)							21.0	21.0	11.0	5.0	11.0	3.0
Total Split (s)	0.0	0.0	16.0	0.0	104.0	104.0	55.0	29.0	17.0	5.0	11.0	3.0
Total Split (%)	0.0%	0.0%	13.3%	0.0%	86.7%	86.7%	46%	24%	14%	4%	9%	3%
Yellow Time (s)							3.0	3.0	3.0	2.0	3.0	2.0
All-Red Time (s)							2.0	2.0	2.0	1.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0						
Total Lost Time (s)	4.0	4.0	3.0	4.0	5.0	5.0						
Lead/Lag							Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes			Yes	Yes
Recall Mode							Max	C-Max	None	None	None	None
v/c Ratio			0.76		0.68	0.10						
Control Delay			77.0		1.4	0.1						
Queue Delay			0.0		3.0	0.0						
Total Delay			77.0		4.4	0.1						
Queue Length 50th (ft)			112		5	0						
Queue Length 95th (ft)			#216		m25	m0						
Internal Link Dist (ft)	235			925	326							
Turn Bay Length (ft)												
Base Capacity (vph)			192		4068	1293						
Starvation Cap Reductn			0		1188	0						
Spillback Cap Reductn			0		0	0						
Storage Cap Reductn			0		0	0						
Reduced v/c Ratio			0.76		0.95	0.10						

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Connector & Route 1A



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	0	134	0	2526	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			3.0		5.0	5.0
Lane Util. Factor			1.00		0.91	1.00
Frt			1.00		1.00	0.85
Flt Protected			0.95		1.00	1.00
Satd. Flow (prot)			1770		5085	1583
Flt Permitted			0.95		1.00	1.00
Satd. Flow (perm)			1770		5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	146	0	2746	135
RTOR Reduction (vph)	0	0	0	0	0	26
Lane Group Flow (vph)	0	0	146	0	2746	109
Turn Type			Prot			Perm
Protected Phases			4 5		1 2 3 6	
Permitted Phases						1 2 3 6
Actuated Green, G (s)			11.0		99.0	99.0
Effective Green, g (s)			11.0		97.0	97.0
Actuated g/C Ratio			0.09		0.81	0.81
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)			162		4110	1280
v/s Ratio Prot			c0.08		c0.54	
v/s Ratio Perm						0.07
v/c Ratio			0.90		0.67	0.09
Uniform Delay, d1			54.0		4.8	2.4
Progression Factor			1.00		0.21	0.22
Incremental Delay, d2			43.2		0.1	0.0
Delay (s)			97.2		1.1	0.5
Level of Service			F		A	A
Approach Delay (s)	0.0			97.2	1.1	
Approach LOS	A			F	A	

Intersection Summary

HCM Average Control Delay	5.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	63.7%	ICU Level of Service	B
Analysis Period (min)	15		

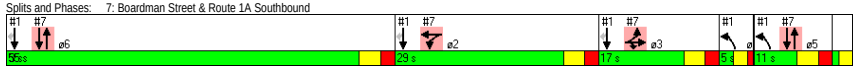
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø4	ø5	ø6
Lane Configurations																
Volume (vph)	53	110	90	384	34	149	0	1045	60	0	2176	14				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900				
Storage Length (ft)	100		100	200		200	420		200	475		0				
Storage Lanes	0		1	1		0	0		0	0		0				
Taper Length (ft)	25		25	25		25	25		25	25		25				
Right Turn on Red			Yes			Yes			No			No				
Link Speed (mph)		30			30			30			30					
Link Distance (ft)		521			531			406			1005					
Travel Time (s)		11.8			12.1			9.2			22.8					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92				
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%				
Shared Lane Traffic (%)				24%												
Lane Group Flow (vph)	0	178	98	317	299	0	0	1201	0	0	2380	0				
Turn Type	Split		Prot	Split												
Protected Phases	3	3	3	2	2			1 5 6			1 5 6		1	4	5	6
Permitted Phases																
Detector Phase	3	3	3	2	2			1 5 6			1 5 6					
Switch Phase																
Minimum Initial (s)	6.0	6.0	6.0	4.0	4.0								4.0	1.0	6.0	1.0
Minimum Split (s)	11.0	11.0	11.0	21.0	21.0								21.0	5.0	11.0	3.0
Total Split (s)	17.0	17.0	17.0	29.0	29.0	0.0	0.0	69.0	0.0	0.0	69.0	0.0	55.0	5.0	11.0	3.0
Total Split (%)	14.2%	14.2%	14.2%	24.2%	24.2%	0.0%	0.0%	57.5%	0.0%	0.0%	57.5%	0.0%	46%	4%	9%	3%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0								3.0	2.0	3.0	2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0								2.0	1.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0				
Lead/Lag	Lead	Lead	Lead	Lag	Lag								Lead	Lag	Lead	Lag
Lead-Lag Optimize?				Yes	Yes								Yes		Yes	Yes
Recall Mode	None	None	None	C-Max	C-Max								Max	None	None	None
v/c Ratio		0.97	0.50	0.93	0.85			0.43			1.01					
Control Delay		112.6	32.2	82.1	61.9			19.9			53.5					
Queue Delay		0.0	0.0	0.0	0.0			0.2			0.0					
Total Delay		112.6	32.2	82.1	61.9			20.1			53.5					
Queue Length 50th (ft)		140	28	256	204			151			~592					
Queue Length 95th (ft)		#284	84	#440	#367			177			#760					
Internal Link Dist (ft)		441			451			326			925					
Turn Bay Length (ft)			100	200												
Base Capacity (vph)		184	196	340	352			2803			2346					
Starvation Cap Reductn		0	0	0	0			740			0					
Spillback Cap Reductn		0	0	0	0			0			0					
Storage Cap Reductn		0	0	0	0			0			0					
Reduced v/c Ratio		0.97	0.50	0.93	0.85			0.58			1.01					

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	53	110	90	384	34	149	0	1045	60	0	2176	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0			5.0			5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95			0.86			0.91	
Frt		1.00	0.85	1.00	0.92			0.99			1.00	
Flt Protected		0.98	1.00	0.95	0.98			1.00			1.00	
Satd. Flow (prot)		1840	1417	1698	1583			6006			5028	
Flt Permitted		0.98	1.00	0.95	0.98			1.00			1.00	
Satd. Flow (perm)		1840	1417	1698	1583			6006			5028	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	58	120	98	417	37	162	0	1136	65	0	2365	15
RTOR Reduction (vph)	0	0	54	0	35	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	178	44	317	264	0	0	1201	0	0	2380	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		Prot	Split								
Protected Phases	3	3	3	2	2			1 5 6			1 5 6	
Permitted Phases												
Actuated Green, G (s)		12.0	12.0	24.0	24.0			64.0			64.0	
Effective Green, g (s)		12.0	12.0	24.0	24.0			62.0			62.0	
Actuated g/C Ratio		0.10	0.10	0.20	0.20			0.52			0.52	
Clearance Time (s)		5.0	5.0	5.0	5.0							
Vehicle Extension (s)		3.0	3.0	3.0	3.0							
Lane Grp Cap (vph)		184	142	340	317			3103			2598	
v/s Ratio Prot		c0.10	0.03	c0.19	0.17			0.20			c0.47	
v/s Ratio Perm												
v/c Ratio		0.97	0.31	0.93	0.83			0.39			0.92	
Uniform Delay, d1		53.8	50.2	47.2	46.1			17.5			26.6	
Progression Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2		56.2	1.2	34.3	21.8			0.1			5.6	
Delay (s)		110.0	51.4	81.5	67.9			17.6			32.2	
Level of Service		F	D	F	E			B			C	
Approach Delay (s)		89.2			74.9			17.6			32.2	
Approach LOS		F			E			B			C	

Intersection Summary

HCM Average Control Delay	37.7	HCM Level of Service		D	
HCM Volume to Capacity ratio	0.96				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		25.0	
Intersection Capacity Utilization	79.7%	ICU Level of Service		D	
Analysis Period (min)	15				

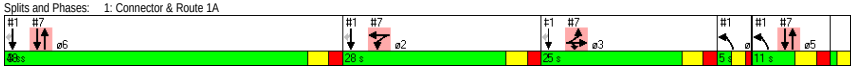
c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations												
Volume (vph)	0	0	66	0	1820	152						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900						
Right Turn on Red		Yes				Yes						
Link Speed (mph)	30			30	30							
Link Distance (ft)	315			1005	406							
Travel Time (s)	7.2			22.8	9.2							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92						
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	72	0	1978	165						
Turn Type			Prot			Perm						
Protected Phases			4 5		1 2 3 6		1	2	3	4	5	6
Permitted Phases						1 2 3 6						
Detector Phase			4 5		1 2 3 6	1 2 3 6						
Switch Phase												
Minimum Initial (s)							4.0	4.0	6.0	1.0	6.0	1.0
Minimum Split (s)							21.0	21.0	11.0	5.0	11.0	3.0
Total Split (s)	0.0	0.0	16.0	0.0	104.0	104.0	48.0	28.0	25.0	5.0	11.0	3.0
Total Split (%)	0.0%	0.0%	13.3%	0.0%	86.7%	86.7%	40%	23%	21%	4%	9%	3%
Yellow Time (s)							3.0	3.0	3.0	2.0	3.0	2.0
All-Red Time (s)							2.0	2.0	2.0	1.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0						
Total Lost Time (s)	4.0	4.0	3.0	4.0	5.0	5.0						
Lead/Lag							Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes			Yes	Yes
Recall Mode							Max	C-Max	None	None	None	None
v/c Ratio			0.38		0.49	0.13						
Control Delay			55.9		1.6	0.3						
Queue Delay			0.0		0.6	0.0						
Total Delay			55.9		2.3	0.3						
Queue Length 50th (ft)			53		10	0						
Queue Length 95th (ft)			101		10	m0						
Internal Link Dist (ft)	235			925	326							
Turn Bay Length (ft)												
Base Capacity (vph)			192		4068	1299						
Starvation Cap Reductn			0		1533	0						
Spillback Cap Reductn			0		0	0						
Storage Cap Reductn			0		0	0						
Reduced v/c Ratio			0.38		0.78	0.13						

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Connector & Route 1A



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	0	66	0	1820	152
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			3.0		5.0	5.0
Lane Util. Factor			1.00		0.91	1.00
Frt			1.00		1.00	0.85
Flt Protected			0.95		1.00	1.00
Satd. Flow (prot)			1770		5085	1583
Flt Permitted			0.95		1.00	1.00
Satd. Flow (perm)			1770		5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	72	0	1978	165
RTOR Reduction (vph)	0	0	0	0	0	32
Lane Group Flow (vph)	0	0	72	0	1978	133
Turn Type			Prot			Perm
Protected Phases			4 5		1 2 3 6	
Permitted Phases						1 2 3 6
Actuated Green, G (s)			11.6		98.4	98.4
Effective Green, g (s)			11.6		96.4	96.4
Actuated g/C Ratio			0.10		0.80	0.80
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)			171		4085	1272
v/s Ratio Prot			c0.04		c0.39	
v/s Ratio Perm						0.08
v/c Ratio			0.42		0.48	0.10
Uniform Delay, d1			51.0		3.8	2.5
Progression Factor			1.00		0.34	0.47
Incremental Delay, d2			1.7		0.1	0.0
Delay (s)			52.7		1.4	1.2
Level of Service			D		A	A
Approach Delay (s)	0.0			52.7	1.4	
Approach LOS	A			D	A	

Intersection Summary			
HCM Average Control Delay	3.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	46.3%	ICU Level of Service	A
Analysis Period (min)	15		

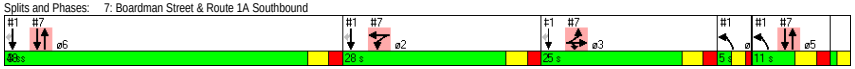
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø4	ø5	ø6
Lane Configurations																
Volume (vph)	55	135	48	182	15	201	0	1850	23	0	1591	11				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900				
Storage Length (ft)	100		100	200		200	420		200	475		0				
Storage Lanes	0		1	1		0	0		0	0		0				
Taper Length (ft)	25		25	25		25	25		25	25		25				
Right Turn on Red			Yes			Yes			No			No				
Link Speed (mph)		30			30			30			30					
Link Distance (ft)		521			531			406			1005					
Travel Time (s)		11.8			12.1			9.2			22.8					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92				
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%				
Shared Lane Traffic (%)				10%												
Lane Group Flow (vph)	0	207	52	178	254	0	0	2036	0	0	1741	0				
Turn Type	Split		Prot	Split												
Protected Phases	3	3	3	2	2			1 5 6			1 5 6		1	4	5	6
Permitted Phases																
Detector Phase	3	3	3	2	2			1 5 6			1 5 6					
Switch Phase																
Minimum Initial (s)	6.0	6.0	6.0	4.0	4.0								4.0	1.0	6.0	1.0
Minimum Split (s)	11.0	11.0	11.0	21.0	21.0								21.0	5.0	11.0	3.0
Total Split (s)	25.0	25.0	25.0	28.0	28.0	0.0	0.0	62.0	0.0	0.0	62.0	0.0	48.0	5.0	11.0	3.0
Total Split (%)	20.8%	20.8%	20.8%	23.3%	23.3%	0.0%	0.0%	51.7%	0.0%	0.0%	51.7%	0.0%	40%	4%	9%	3%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0								3.0	2.0	3.0	2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0								2.0	1.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0				
Lead/Lag	Lead	Lead	Lead	Lag	Lag								Lead	Lag	Lead	Lag
Lead-Lag Optimize?				Yes	Yes								Yes		Yes	Yes
Recall Mode	None	None	None	C-Max	C-Max								Max	None	None	None
v/c Ratio		0.67	0.19	0.55	0.55			0.81			0.83					
Control Delay		58.8	16.9	51.0	13.6			32.8			34.5					
Queue Delay		0.0	0.0	0.0	0.0			3.7			0.0					
Total Delay		58.8	16.9	51.0	13.6			36.5			34.5					
Queue Length 50th (ft)		152	5	132	24			353			386					
Queue Length 95th (ft)		237	41	211	109			397			445					
Internal Link Dist (ft)		441			451			326			925					
Turn Bay Length (ft)			100	200												
Base Capacity (vph)		308	274	325	464			2516			2095					
Starvation Cap Reductn		0	0	0	0			389			0					
Spillback Cap Reductn		0	0	0	0			0			0					
Storage Cap Reductn		0	0	0	0			0			0					
Reduced v/c Ratio		0.67	0.19	0.55	0.55			0.96			0.83					

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	55	135	48	182	15	201	0	1850	23	0	1591	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0			5.0			5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95			0.86			0.91	
Frt		1.00	0.85	1.00	0.87			1.00			1.00	
Flt Protected		0.99	1.00	0.95	1.00			1.00			1.00	
Satd. Flow (prot)		1846	1417	1698	1501			6041			5027	
Flt Permitted		0.99	1.00	0.95	1.00			1.00			1.00	
Satd. Flow (perm)		1846	1417	1698	1501			6041			5027	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	60	147	52	198	16	218	0	2011	25	0	1729	12
RTOR Reduction (vph)	0	0	38	0	177	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	207	15	178	77	0	0	2036	0	0	1741	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		Prot	Split								
Protected Phases	3	3	3	2	2			1 5 6			1 5 6	
Permitted Phases												
Actuated Green, G (s)		20.0	20.0	22.4	22.4			58.0			58.0	
Effective Green, g (s)		20.0	20.0	22.4	22.4			56.0			56.0	
Actuated g/C Ratio		0.17	0.17	0.19	0.19			0.47			0.47	
Clearance Time (s)		5.0	5.0	5.0	5.0							
Vehicle Extension (s)		3.0	3.0	3.0	3.0							
Lane Grp Cap (vph)		308	236	317	280			2819			2346	
v/s Ratio Prot		c0.11	0.01	c0.10	0.05			0.34			c0.35	
v/s Ratio Perm												
v/c Ratio		0.67	0.06	0.56	0.27			0.72			0.74	
Uniform Delay, d1		46.9	42.1	44.3	41.8			25.7			26.1	
Progression Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2		5.7	0.1	7.0	2.4			0.9			1.3	
Delay (s)		52.6	42.2	51.4	44.2			26.7			27.4	
Level of Service		D	D	D	D			C			C	
Approach Delay (s)		50.5			47.2			26.7			27.4	
Approach LOS		D			D			C			C	

Intersection Summary

HCM Average Control Delay	30.3	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.71				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		24.6	
Intersection Capacity Utilization	65.2%	ICU Level of Service		C	
Analysis Period (min)	15				

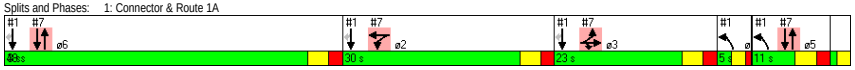
c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations												
Volume (vph)	0	0	29	0	1695	126						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900						
Right Turn on Red		Yes				Yes						
Link Speed (mph)	30			30	30							
Link Distance (ft)	315			1005	406							
Travel Time (s)	7.2			22.8	9.2							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92						
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	32	0	1842	137						
Turn Type			Prot			Perm						
Protected Phases			4 5		1 2 3 6		1	2	3	4	5	6
Permitted Phases						1 2 3 6						
Detector Phase			4 5		1 2 3 6	1 2 3 6						
Switch Phase												
Minimum Initial (s)							4.0	4.0	6.0	1.0	6.0	1.0
Minimum Split (s)							21.0	21.0	11.0	5.0	11.0	3.0
Total Split (s)	0.0	0.0	16.0	0.0	104.0	104.0	48.0	30.0	23.0	5.0	11.0	3.0
Total Split (%)	0.0%	0.0%	13.3%	0.0%	86.7%	86.7%	40%	25%	19%	4%	9%	3%
Yellow Time (s)							3.0	3.0	3.0	2.0	3.0	2.0
All-Red Time (s)							2.0	2.0	2.0	1.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0						
Total Lost Time (s)	4.0	4.0	3.0	4.0	5.0	5.0						
Lead/Lag							Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes			Yes	Yes
Recall Mode							Max	C-Max	None	None	None	None
v/c Ratio			0.17		0.45	0.11						
Control Delay			51.0		1.6	0.3						
Queue Delay			0.0		0.5	0.0						
Total Delay			51.0		2.1	0.3						
Queue Length 50th (ft)			23		2	0						
Queue Length 95th (ft)			55		1	m0						
Internal Link Dist (ft)	235			925	326							
Turn Bay Length (ft)												
Base Capacity (vph)			192		4068	1294						
Starvation Cap Reductn			0		1600	0						
Spillback Cap Reductn			0		0	0						
Storage Cap Reductn			0		0	0						
Reduced v/c Ratio			0.17		0.75	0.11						

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Connector & Route 1A



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	0	29	0	1695	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			3.0		5.0	5.0
Lane Util. Factor			1.00		0.91	1.00
Frt			1.00		1.00	0.85
Flt Protected			0.95		1.00	1.00
Satd. Flow (prot)			1770		5085	1583
Flt Permitted			0.95		1.00	1.00
Satd. Flow (perm)			1770		5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	32	0	1842	137
RTOR Reduction (vph)	0	0	0	0	0	28
Lane Group Flow (vph)	0	0	32	0	1842	109
Turn Type			Prot			Perm
Protected Phases			4 5		1 2 3 6	
Permitted Phases						1 2 3 6
Actuated Green, G (s)			12.2		97.8	97.8
Effective Green, g (s)			12.2		95.8	95.8
Actuated g/C Ratio			0.10		0.80	0.80
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)			180		4060	1264
v/s Ratio Prot			c0.02		c0.36	
v/s Ratio Perm						0.07
v/c Ratio			0.18		0.45	0.09
Uniform Delay, d1			49.3		3.8	2.6
Progression Factor			1.00		0.36	0.59
Incremental Delay, d2			0.5		0.0	0.0
Delay (s)			49.8		1.4	1.6
Level of Service			D		A	A
Approach Delay (s)	0.0			49.8	1.4	
Approach LOS	A			D	A	

Intersection Summary			
HCM Average Control Delay	2.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	36.9%	ICU Level of Service	A
Analysis Period (min)	15		

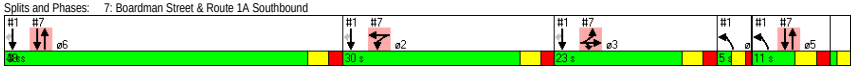
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø4	ø5	ø6
Lane Configurations																
Volume (vph)	50	120	33	184	11	256	0	1475	239	0	1600	25				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900				
Storage Length (ft)	100		100	200		200	420		200	475		0				
Storage Lanes	0		1	1		0	0		0	0		0				
Taper Length (ft)	25		25	25		25	25		25	25		25				
Right Turn on Red			Yes			Yes			No			No				
Link Speed (mph)		30			30			30			30					
Link Distance (ft)		521			531			406			1005					
Travel Time (s)		11.8			12.1			9.2			22.8					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92				
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%				
Shared Lane Traffic (%)				10%												
Lane Group Flow (vph)	0	184	36	180	310	0	0	1863	0	0	1766	0				
Turn Type	Split		Prot	Split												
Protected Phases	3	3	3	2	2			1 5 6			1 5 6		1	4	5	6
Permitted Phases																
Detector Phase	3	3	3	2	2			1 5 6			1 5 6					
Switch Phase																
Minimum Initial (s)	6.0	6.0	6.0	4.0	4.0								4.0	1.0	6.0	1.0
Minimum Split (s)	11.0	11.0	11.0	21.0	21.0								21.0	5.0	11.0	3.0
Total Split (s)	23.0	23.0	23.0	30.0	30.0	0.0	0.0	62.0	0.0	0.0	62.0	0.0	48.0	5.0	11.0	3.0
Total Split (%)	19.2%	19.2%	19.2%	25.0%	25.0%	0.0%	0.0%	51.7%	0.0%	0.0%	51.7%	0.0%	40%	4%	9%	3%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0								3.0	2.0	3.0	2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0								2.0	1.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0				
Lead/Lag	Lead	Lead	Lead	Lag	Lag								Lead	Lag	Lead	Lag
Lead-Lag Optimize?				Yes	Yes								Yes		Yes	Yes
Recall Mode	None	None	None	C-Max	C-Max								Max	None	None	None
v/c Ratio		0.66	0.15	0.51	0.63			0.74			0.83					
Control Delay		60.8	16.1	47.9	18.7			29.8			33.6					
Queue Delay		0.0	0.0	0.0	0.0			1.0			0.0					
Total Delay		60.8	16.1	47.9	18.7			30.8			33.6					
Queue Length 50th (ft)		136	1	130	56			312			395					
Queue Length 95th (ft)		216	32	209	163			354			455					
Internal Link Dist (ft)		441			451			326			925					
Turn Bay Length (ft)			100	200												
Base Capacity (vph)		277	242	354	490			2521			2133					
Starvation Cap Reductn		0	0	0	0			377			0					
Spillback Cap Reductn		0	0	0	0			0			0					
Storage Cap Reductn		0	0	0	0			0			0					
Reduced v/c Ratio		0.66	0.15	0.51	0.63			0.87			0.83					

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	120	33	184	11	256	0	1475	239	0	1600	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0			5.0			5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95			0.86			0.91	
Frt		1.00	0.85	1.00	0.87			0.98			1.00	
Flt Protected		0.99	1.00	0.95	1.00			1.00			1.00	
Satd. Flow (prot)		1845	1417	1698	1489			5933			5016	
Flt Permitted		0.99	1.00	0.95	1.00			1.00			1.00	
Satd. Flow (perm)		1845	1417	1698	1489			5933			5016	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	130	36	200	12	278	0	1603	260	0	1739	27
RTOR Reduction (vph)	0	0	30	0	182	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	184	6	180	128	0	0	1863	0	0	1766	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		Prot	Split								
Protected Phases	3	3	3	2	2			1 5 6			1 5 6	
Permitted Phases												
Actuated Green, G (s)		18.0	18.0	23.8	23.8			59.0			59.0	
Effective Green, g (s)		18.0	18.0	23.8	23.8			57.0			57.0	
Actuated g/C Ratio		0.15	0.15	0.20	0.20			0.48			0.48	
Clearance Time (s)		5.0	5.0	5.0	5.0							
Vehicle Extension (s)		3.0	3.0	3.0	3.0							
Lane Grp Cap (vph)		277	213	337	295			2818			2383	
v/s Ratio Prot		c0.10	0.00	c0.11	0.09			0.31			c0.35	
v/s Ratio Perm												
v/c Ratio		0.66	0.03	0.53	0.43			0.66			0.74	
Uniform Delay, d1		48.1	43.5	43.1	42.2			24.1			25.5	
Progression Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2		5.9	0.1	6.0	4.6			0.6			1.3	
Delay (s)		54.0	43.6	49.1	46.8			24.7			26.8	
Level of Service		D	D	D	D			C			C	
Approach Delay (s)		52.3			47.6			24.7			26.8	
Approach LOS		D			D			C			C	

Intersection Summary

HCM Average Control Delay	29.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	24.2
Intersection Capacity Utilization	66.3%	ICU Level of Service	C
Analysis Period (min)	15		

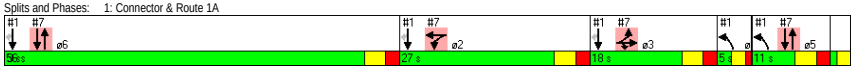
c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations												
Volume (vph)	0	0	137	0	2747	127						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900						
Right Turn on Red		Yes				Yes						
Link Speed (mph)	30			30	30							
Link Distance (ft)	315			1005	406							
Travel Time (s)	7.2			22.8	9.2							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92						
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	149	0	2986	138						
Turn Type			Prot			Perm						
Protected Phases			4 5		1 2 3 6		1	2	3	4	5	6
Permitted Phases						1 2 3 6						
Detector Phase			4 5		1 2 3 6	1 2 3 6						
Switch Phase												
Minimum Initial (s)							4.0	4.0	6.0	1.0	6.0	1.0
Minimum Split (s)							21.0	21.0	11.0	5.0	11.0	3.0
Total Split (s)	0.0	0.0	16.0	0.0	104.0	104.0	56.0	27.0	18.0	5.0	11.0	3.0
Total Split (%)	0.0%	0.0%	13.3%	0.0%	86.7%	86.7%	47%	23%	15%	4%	9%	3%
Yellow Time (s)							3.0	3.0	3.0	2.0	3.0	2.0
All-Red Time (s)							2.0	2.0	2.0	1.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0						
Total Lost Time (s)	4.0	4.0	3.0	4.0	5.0	5.0						
Lead/Lag							Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes			Yes	Yes
Recall Mode							Max	C-Max	None	None	None	None
v/c Ratio			0.78		0.73	0.11						
Control Delay			78.6		2.1	0.1						
Queue Delay			0.0		17.7	0.0						
Total Delay			78.6		19.9	0.1						
Queue Length 50th (ft)			114		26	0						
Queue Length 95th (ft)			#221		m13	m0						
Internal Link Dist (ft)	235			925	326							
Turn Bay Length (ft)												
Base Capacity (vph)			192		4068	1294						
Starvation Cap Reductn			0		1168	0						
Spillback Cap Reductn			0		0	0						
Storage Cap Reductn			0		0	0						
Reduced v/c Ratio			0.78		1.03	0.11						

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Connector & Route 1A



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	0	137	0	2747	127
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			3.0		5.0	5.0
Lane Util. Factor			1.00		0.91	1.00
Frt			1.00		1.00	0.85
Flt Protected			0.95		1.00	1.00
Satd. Flow (prot)			1770		5085	1583
Flt Permitted			0.95		1.00	1.00
Satd. Flow (perm)			1770		5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	149	0	2986	138
RTOR Reduction (vph)	0	0	0	0	0	26
Lane Group Flow (vph)	0	0	149	0	2986	112
Turn Type			Prot			Perm
Protected Phases			4 5		1 2 3 6	
Permitted Phases						1 2 3 6
Actuated Green, G (s)			11.0		99.0	99.0
Effective Green, g (s)			11.0		97.0	97.0
Actuated g/C Ratio			0.09		0.81	0.81
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)			162		4110	1280
v/s Ratio Prot			c0.08		c0.59	
v/s Ratio Perm						0.07
v/c Ratio			0.92		0.73	0.09
Uniform Delay, d1			54.1		5.3	2.4
Progression Factor			1.00		0.34	0.22
Incremental Delay, d2			47.2		0.1	0.0
Delay (s)			101.3		1.9	0.5
Level of Service			F		A	A
Approach Delay (s)	0.0			101.3	1.8	
Approach LOS	A			F	A	

Intersection Summary

HCM Average Control Delay	6.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	68.2%	ICU Level of Service	C
Analysis Period (min)	15		

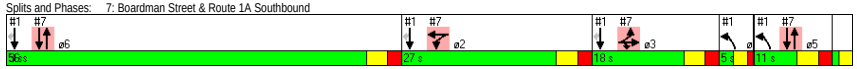
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø4	ø5	ø6
Lane Configurations																
Volume (vph)	60	140	92	384	35	153	0	1300	62	0	2388	14				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900				
Storage Length (ft)	100		100	200		200	420		200	475		0				
Storage Lanes	0		1	1		0	0		0	0		0				
Taper Length (ft)	25		25	25		25	25		25	25		25				
Right Turn on Red			Yes			Yes			No			No				
Link Speed (mph)		30			30			30			30					
Link Distance (ft)		521			531			406			1005					
Travel Time (s)		11.8			12.1			9.2			22.8					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92				
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%				
Shared Lane Traffic (%)				23%												
Lane Group Flow (vph)	0	217	100	321	300	0	0	1480	0	0	2611	0				
Turn Type	Split		Prot	Split												
Protected Phases	3	3	3	2	2			1 5 6			1 5 6		1	4	5	6
Permitted Phases																
Detector Phase	3	3	3	2	2			1 5 6			1 5 6					
Switch Phase																
Minimum Initial (s)	6.0	6.0	6.0	4.0	4.0								4.0	1.0	6.0	1.0
Minimum Split (s)	11.0	11.0	11.0	21.0	21.0								21.0	5.0	11.0	3.0
Total Split (s)	18.0	18.0	18.0	27.0	27.0	0.0	0.0	70.0	0.0	0.0	70.0	0.0	56.0	5.0	11.0	3.0
Total Split (%)	15.0%	15.0%	15.0%	22.5%	22.5%	0.0%	0.0%	58.3%	0.0%	0.0%	58.3%	0.0%	47%	4%	9%	3%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0								3.0	2.0	3.0	2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0								2.0	1.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0				
Lead/Lag	Lead	Lead	Lead	Lag	Lag								Lead	Lag	Lead	Lag
Lead-Lag Optimize?				Yes	Yes								Yes		Yes	Yes
Recall Mode	None	None	None	C-Max	C-Max								Max	None	None	None
v/c Ratio		1.08	0.50	1.03	0.92			0.52			1.09					
Control Delay		138.1	34.3	107.7	73.9			21.1			79.9					
Queue Delay		0.0	0.0	0.0	0.0			0.4			0.0					
Total Delay		138.1	34.3	107.7	73.9			21.5			79.9					
Queue Length 50th (ft)		~189	33	~281	208			194			~836					
Queue Length 95th (ft)		#347	91	#472	#387			224			#926					
Internal Link Dist (ft)		441			451			326			925					
Turn Bay Length (ft)			100	200												
Base Capacity (vph)		200	202	311	327			2856			2388					
Starvation Cap Reductn		0	0	0	0			737			0					
Spillback Cap Reductn		0	0	0	0			0			0					
Storage Cap Reductn		0	0	0	0			0			0					
Reduced v/c Ratio		1.08	0.50	1.03	0.92			0.70			1.09					

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	140	92	384	35	153	0	1300	62	0	2388	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0			5.0			5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95			0.86			0.91	
Frt		1.00	0.85	1.00	0.92			0.99			1.00	
Flt Protected		0.99	1.00	0.95	0.98			1.00			1.00	
Satd. Flow (prot)		1844	1417	1698	1580			6013			5028	
Flt Permitted		0.99	1.00	0.95	0.98			1.00			1.00	
Satd. Flow (perm)		1844	1417	1698	1580			6013			5028	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	152	100	417	38	166	0	1413	67	0	2596	15
RTOR Reduction (vph)	0	0	48	0	38	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	217	52	321	262	0	0	1480	0	0	2611	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		Prot	Split								
Protected Phases	3	3	3	2	2			1 5 6			1 5 6	
Permitted Phases												
Actuated Green, G (s)		13.0	13.0	22.0	22.0			65.0			65.0	
Effective Green, g (s)		13.0	13.0	22.0	22.0			63.0			63.0	
Actuated g/C Ratio		0.11	0.11	0.18	0.18			0.52			0.52	
Clearance Time (s)		5.0	5.0	5.0	5.0							
Vehicle Extension (s)		3.0	3.0	3.0	3.0							
Lane Grp Cap (vph)		200	154	311	290			3157			2640	
v/s Ratio Prot		c0.12	0.04	c0.19	0.17			0.25			c0.52	
v/s Ratio Perm												
v/c Ratio		1.08	0.34	1.03	0.90			0.47			0.99	
Uniform Delay, d1		53.5	49.5	49.0	48.0			18.0			28.2	
Progression Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2		88.1	1.3	59.6	33.2			0.1			14.8	
Delay (s)		141.6	50.8	108.6	81.2			18.1			43.0	
Level of Service		F	D	F	F			B			D	
Approach Delay (s)		113.0			95.4			18.1			43.0	
Approach LOS		F			F			B			D	

Intersection Summary

HCM Average Control Delay	46.5	HCM Level of Service	D
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	85.9%	ICU Level of Service	E
Analysis Period (min)	15		

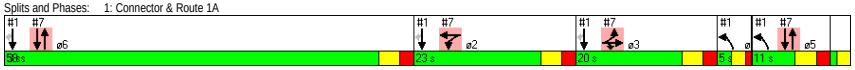
c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations												
Volume (vph)	0	0	70	0	2666	194						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900						
Right Turn on Red		Yes				Yes						
Link Speed (mph)	30			30	30							
Link Distance (ft)	315			1005	406							
Travel Time (s)	7.2			22.8	9.2							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92						
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	76	0	2898	211						
Turn Type			Prot			Perm						
Protected Phases			4 5		1 2 3 6		1	2	3	4	5	6
Permitted Phases						1 2 3 6						
Detector Phase			4 5		1 2 3 6	1 2 3 6						
Switch Phase												
Minimum Initial (s)							4.0	4.0	6.0	1.0	6.0	1.0
Minimum Split (s)							21.0	21.0	11.0	5.0	11.0	3.0
Total Split (s)	0.0	0.0	16.0	0.0	104.0	104.0	58.0	23.0	20.0	5.0	11.0	3.0
Total Split (%)	0.0%	0.0%	13.3%	0.0%	86.7%	86.7%	48%	19%	17%	4%	9%	3%
Yellow Time (s)							3.0	3.0	3.0	2.0	3.0	2.0
All-Red Time (s)							2.0	2.0	2.0	1.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0						
Total Lost Time (s)	4.0	4.0	3.0	4.0	5.0	5.0						
Lead/Lag							Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes			Yes	Yes
Recall Mode							Max	C-Max	None	None	None	None
v/c Ratio			0.40		0.71	0.16						
Control Delay			56.5		2.6	0.2						
Queue Delay			0.0		8.7	0.0						
Total Delay			56.5		11.3	0.2						
Queue Length 50th (ft)			56		12	0						
Queue Length 95th (ft)			107		m12	m0						
Internal Link Dist (ft)	235			925	326							
Turn Bay Length (ft)												
Base Capacity (vph)			192		4068	1309						
Starvation Cap Reductn			0		1168	0						
Spillback Cap Reductn			0		0	0						
Storage Cap Reductn			0		0	0						
Reduced v/c Ratio			0.40		1.00	0.16						

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Connector & Route 1A



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	0	70	0	2666	194
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			3.0		5.0	5.0
Lane Util. Factor			1.00		0.91	1.00
Frt			1.00		1.00	0.85
Flt Protected			0.95		1.00	1.00
Satd. Flow (prot)			1770		5085	1583
Flt Permitted			0.95		1.00	1.00
Satd. Flow (perm)			1770		5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	76	0	2898	211
RTOR Reduction (vph)	0	0	0	0	0	41
Lane Group Flow (vph)	0	0	76	0	2898	170
Turn Type			Prot			Perm
Protected Phases			4 5		1 2 3 6	
Permitted Phases						1 2 3 6
Actuated Green, G (s)			11.6		98.4	98.4
Effective Green, g (s)			11.6		96.4	96.4
Actuated g/C Ratio			0.10		0.80	0.80
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)			171		4085	1272
v/s Ratio Prot			c0.04		c0.57	
v/s Ratio Perm						0.11
v/c Ratio			0.44		0.71	0.13
Uniform Delay, d1			51.2		5.4	2.6
Progression Factor			1.00		0.39	0.27
Incremental Delay, d2			1.8		0.2	0.0
Delay (s)			53.0		2.3	0.7
Level of Service			D		A	A
Approach Delay (s)	0.0			53.0	2.2	
Approach LOS	A			D	A	

Intersection Summary

HCM Average Control Delay	3.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	61.5%	ICU Level of Service	B
Analysis Period (min)	15		

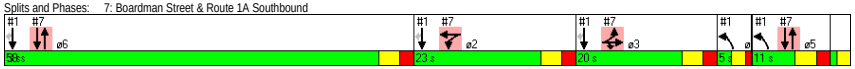
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø4	ø5	ø6
Lane Configurations																
Volume (vph)	58	155	51	240	16	249	0	2735	79	0	2375	12				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900				
Storage Length (ft)	100		100	200		200	420		200	475		0				
Storage Lanes	0		1	1		0	0		0	0		0				
Taper Length (ft)	25		25	25		25	25		25	25		25				
Right Turn on Red			Yes			Yes			No			No				
Link Speed (mph)		30			30			30			30					
Link Distance (ft)		521			531			406			1005					
Travel Time (s)		11.8			12.1			9.2			22.8					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92				
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%				
Shared Lane Traffic (%)				10%												
Lane Group Flow (vph)	0	231	55	235	314	0	0	3059	0	0	2595	0				
Turn Type	Split		Prot	Split												
Protected Phases	3	3	3	2	2			1 5 6			1 5 6		1	4	5	6
Permitted Phases																
Detector Phase	3	3	3	2	2			1 5 6			1 5 6					
Switch Phase																
Minimum Initial (s)	6.0	6.0	6.0	4.0	4.0								4.0	1.0	6.0	1.0
Minimum Split (s)	11.0	11.0	11.0	21.0	21.0								21.0	5.0	11.0	3.0
Total Split (s)	20.0	20.0	20.0	23.0	23.0	0.0	0.0	72.0	0.0	0.0	72.0	0.0	58.0	5.0	11.0	3.0
Total Split (%)	16.7%	16.7%	16.7%	19.2%	19.2%	0.0%	0.0%	60.0%	0.0%	0.0%	60.0%	0.0%	48%	4%	9%	3%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0								3.0	2.0	3.0	2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0								2.0	1.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0				
Lead/Lag	Lead	Lead	Lead	Lag	Lag								Lead	Lag	Lead	Lag
Lead-Lag Optimize?				Yes	Yes								Yes		Yes	Yes
Recall Mode	None	None	None	C-Max	C-Max								Max	None	None	None
v/c Ratio		1.00	0.26	0.92	0.88			1.01			1.03					
Control Delay		112.1	22.8	90.2	51.4			49.6			56.2					
Queue Delay		0.0	0.0	0.0	0.0			90.1			0.0					
Total Delay		112.1	22.8	90.2	51.4			139.7			56.2					
Queue Length 50th (ft)		182	10	191	133			~646			~710					
Queue Length 95th (ft)		#347	50	#353	#309			#760			#893					
Internal Link Dist (ft)		441			451			326			925					
Turn Bay Length (ft)			100	200												
Base Capacity (vph)		231	213	255	356			3014			2514					
Starvation Cap Reductn		0	0	0	0			520			0					
Spillback Cap Reductn		0	0	0	0			0			0					
Storage Cap Reductn		0	0	0	0			0			0					
Reduced v/c Ratio		1.00	0.26	0.92	0.88			1.23			1.03					

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	58	155	51	240	16	249	0	2735	79	0	2375	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0			5.0			5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95			0.86			0.91	
Frt		1.00	0.85	1.00	0.87			1.00			1.00	
Flt Protected		0.99	1.00	0.95	1.00			1.00			1.00	
Satd. Flow (prot)		1849	1417	1698	1499			6028			5029	
Flt Permitted		0.99	1.00	0.95	1.00			1.00			1.00	
Satd. Flow (perm)		1849	1417	1698	1499			6028			5029	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	63	168	55	261	17	271	0	2973	86	0	2582	13
RTOR Reduction (vph)	0	0	36	0	132	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	231	19	235	182	0	0	3059	0	0	2595	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		Prot	Split								
Protected Phases	3	3	3	2	2			1 5 6			1 5 6	
Permitted Phases												
Actuated Green, G (s)		15.0	15.0	17.4	17.4			68.0			68.0	
Effective Green, g (s)		15.0	15.0	17.4	17.4			66.0			66.0	
Actuated g/C Ratio		0.12	0.12	0.14	0.14			0.55			0.55	
Clearance Time (s)		5.0	5.0	5.0	5.0							
Vehicle Extension (s)		3.0	3.0	3.0	3.0							
Lane Grp Cap (vph)		231	177	246	217			3315			2766	
v/s Ratio Prot		c0.12	0.01	c0.14	0.12			0.51			c0.52	
v/s Ratio Perm												
v/c Ratio		1.00	0.11	0.96	0.84			0.92			0.94	
Uniform Delay, d1		52.5	46.6	50.9	49.9			24.7			25.1	
Progression Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2		59.2	0.3	46.9	30.6			5.0			7.0	
Delay (s)		111.7	46.8	97.8	80.5			29.6			32.1	
Level of Service		F	D	F	F			C			C	
Approach Delay (s)		99.2			87.9			29.6			32.1	
Approach LOS		F			F			C			C	

Intersection Summary

HCM Average Control Delay	38.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	24.6
Intersection Capacity Utilization	84.7%	ICU Level of Service	E
Analysis Period (min)	15		

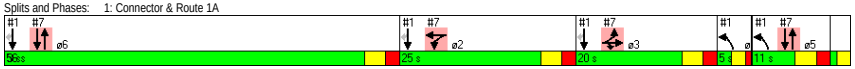
c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations												
Volume (vph)	0	0	31	0	2534	173						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900						
Right Turn on Red		Yes				Yes						
Link Speed (mph)	30			30	30							
Link Distance (ft)	315			1005	406							
Travel Time (s)	7.2			22.8	9.2							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92						
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	34	0	2754	188						
Turn Type			Prot			Perm						
Protected Phases			4 5		1 2 3 6		1	2	3	4	5	6
Permitted Phases						1 2 3 6						
Detector Phase			4 5		1 2 3 6	1 2 3 6						
Switch Phase												
Minimum Initial (s)							4.0	4.0	6.0	1.0	6.0	1.0
Minimum Split (s)							21.0	21.0	11.0	5.0	11.0	3.0
Total Split (s)	0.0	0.0	16.0	0.0	104.0	104.0	56.0	25.0	20.0	5.0	11.0	3.0
Total Split (%)	0.0%	0.0%	13.3%	0.0%	86.7%	86.7%	47%	21%	17%	4%	9%	3%
Yellow Time (s)							3.0	3.0	3.0	2.0	3.0	2.0
All-Red Time (s)							2.0	2.0	2.0	1.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0						
Total Lost Time (s)	4.0	4.0	3.0	4.0	5.0	5.0						
Lead/Lag							Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes			Yes	Yes
Recall Mode							Max	C-Max	None	None	None	None
v/c Ratio			0.18		0.68	0.14						
Control Delay			51.2		2.5	0.2						
Queue Delay			0.0		9.3	0.0						
Total Delay			51.2		11.8	0.2						
Queue Length 50th (ft)			24		11	0						
Queue Length 95th (ft)			57		m4	m0						
Internal Link Dist (ft)	235			925	326							
Turn Bay Length (ft)												
Base Capacity (vph)			192		4068	1304						
Starvation Cap Reductn			0		1316	0						
Spillback Cap Reductn			0		0	0						
Storage Cap Reductn			0		0	0						
Reduced v/c Ratio			0.18		1.00	0.14						

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green	
Natural Cycle: 140	
Control Type: Actuated-Coordinated	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Connector & Route 1A



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	0	31	0	2534	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			3.0		5.0	5.0
Lane Util. Factor			1.00		0.91	1.00
Frt			1.00		1.00	0.85
Flt Protected			0.95		1.00	1.00
Satd. Flow (prot)			1770		5085	1583
Flt Permitted			0.95		1.00	1.00
Satd. Flow (perm)			1770		5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	34	0	2754	188
RTOR Reduction (vph)	0	0	0	0	0	38
Lane Group Flow (vph)	0	0	34	0	2754	150
Turn Type			Prot			Perm
Protected Phases			4 5		1 2 3 6	
Permitted Phases						1 2 3 6
Actuated Green, G (s)			12.2		97.8	97.8
Effective Green, g (s)			12.2		95.8	95.8
Actuated g/C Ratio			0.10		0.80	0.80
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)			180		4060	1264
v/s Ratio Prot			c0.02		c0.54	
v/s Ratio Perm						0.09
v/c Ratio			0.19		0.68	0.12
Uniform Delay, d1			49.4		5.3	2.7
Progression Factor			1.00		0.43	0.37
Incremental Delay, d2			0.5		0.1	0.0
Delay (s)			49.9		2.4	1.0
Level of Service			D		A	A
Approach Delay (s)	0.0			49.9	2.3	
Approach LOS	A			D	A	

Intersection Summary			
HCM Average Control Delay	2.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	53.1%	ICU Level of Service	A
Analysis Period (min)	15		

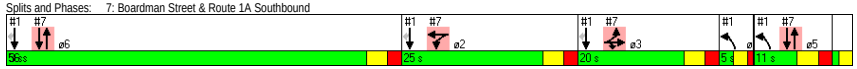
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø4	ø5	ø6
Lane Configurations																
Volume (vph)	69	150	35	242	12	316	0	2336	323	0	2370	27				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900				
Storage Length (ft)	100		100	200		200	420		200	475		0				
Storage Lanes	0		1	1		0	0		0	0		0				
Taper Length (ft)	25		25	25		25	25		25	25		25				
Right Turn on Red			Yes			Yes			No			No				
Link Speed (mph)		30			30			30			30					
Link Distance (ft)		521			531			406			1005					
Travel Time (s)		11.8			12.1			9.2			22.8					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92				
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%				
Shared Lane Traffic (%)				10%												
Lane Group Flow (vph)	0	238	38	237	382	0	0	2890	0	0	2605	0				
Turn Type	Split		Prot	Split												
Protected Phases	3	3	3	2	2			1 5 6			1 5 6		1	4	5	6
Permitted Phases																
Detector Phase	3	3	3	2	2			1 5 6			1 5 6					
Switch Phase																
Minimum Initial (s)	6.0	6.0	6.0	4.0	4.0								4.0	1.0	6.0	1.0
Minimum Split (s)	11.0	11.0	11.0	21.0	21.0								21.0	5.0	11.0	3.0
Total Split (s)	20.0	20.0	20.0	25.0	25.0	0.0	0.0	70.0	0.0	0.0	70.0	0.0	56.0	5.0	11.0	3.0
Total Split (%)	16.7%	16.7%	16.7%	20.8%	20.8%	0.0%	0.0%	58.3%	0.0%	0.0%	58.3%	0.0%	47%	4%	9%	3%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0								3.0	2.0	3.0	2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0								2.0	1.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0				
Lead/Lag	Lead	Lead	Lead	Lag	Lag								Lead	Lag	Lead	Lag
Lead-Lag Optimize?				Yes	Yes								Yes		Yes	Yes
Recall Mode	None	None	None	C-Max	C-Max								Max	None	None	None
v/c Ratio		1.03	0.19	0.84	1.04			0.99			1.06					
Control Delay		120.0	24.9	73.7	87.0			43.6			64.4					
Queue Delay		0.0	0.0	0.0	0.0			75.7			0.0					
Total Delay		120.0	24.9	73.7	87.0			119.3			64.4					
Queue Length 50th (ft)		~198	8	189	~229			~583			~834					
Queue Length 95th (ft)		#361	42	#333	#436			#707			#924					
Internal Link Dist (ft)		441			451			326			925					
Turn Bay Length (ft)			100	200												
Base Capacity (vph)		230	201	283	369			2925			2469					
Starvation Cap Reductn		0	0	0	0			476			0					
Spillback Cap Reductn		0	0	0	0			0			0					
Storage Cap Reductn		0	0	0	0			0			0					
Reduced v/c Ratio		1.03	0.19	0.84	1.04			1.18			1.06					

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	69	150	35	242	12	316	0	2336	323	0	2370	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0			5.0			5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95			0.86			0.91	
Frt		1.00	0.85	1.00	0.87			0.98			1.00	
Flt Protected		0.98	1.00	0.95	1.00			1.00			1.00	
Satd. Flow (prot)		1842	1417	1698	1489			5948			5022	
Flt Permitted		0.98	1.00	0.95	1.00			1.00			1.00	
Satd. Flow (perm)		1842	1417	1698	1489			5948			5022	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	75	163	38	263	13	343	0	2539	351	0	2576	29
RTOR Reduction (vph)	0	0	24	0	122	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	238	14	237	260	0	0	2890	0	0	2605	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		Prot	Split								
Protected Phases	3	3	3	2	2			1 5 6			1 5 6	
Permitted Phases												
Actuated Green, G (s)		15.0	15.0	18.8	18.8			67.0			67.0	
Effective Green, g (s)		15.0	15.0	18.8	18.8			65.0			65.0	
Actuated g/C Ratio		0.12	0.12	0.16	0.16			0.54			0.54	
Clearance Time (s)		5.0	5.0	5.0	5.0							
Vehicle Extension (s)		3.0	3.0	3.0	3.0							
Lane Grp Cap (vph)		230	177	266	233			3222			2720	
v/s Ratio Prot		c0.13	0.01	0.14	c0.17			0.49			c0.52	
v/s Ratio Perm												
v/c Ratio		1.03	0.08	0.89	1.11			0.90			0.96	
Uniform Delay, d1		52.5	46.4	49.6	50.6			24.5			26.2	
Progression Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2		68.7	0.2	33.0	93.2			3.7			9.3	
Delay (s)		121.2	46.6	82.6	143.8			28.2			35.5	
Level of Service		F	D	F	F			C			D	
Approach Delay (s)		110.9			120.4			28.2			35.5	
Approach LOS		F			F			C			D	

Intersection Summary

HCM Average Control Delay	43.7	HCM Level of Service	D
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	24.2
Intersection Capacity Utilization	87.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
1: Connector & Route 1A

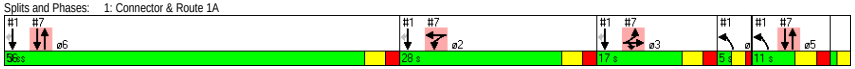
8/6/2013

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations												
Volume (vph)	0	0	144	0	2887	133						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900						
Right Turn on Red		Yes				Yes						
Link Speed (mph)	30			30	30							
Link Distance (ft)	315			1005	406							
Travel Time (s)	7.2			22.8	9.2							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92						
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	157	0	3138	145						
Turn Type			Prot			Perm						
Protected Phases			4 5		1 2 3 6		1	2	3	4	5	6
Permitted Phases						1 2 3 6						
Detector Phase			4 5		1 2 3 6	1 2 3 6						
Switch Phase												
Minimum Initial (s)							4.0	4.0	6.0	1.0	6.0	1.0
Minimum Split (s)							21.0	21.0	11.0	5.0	11.0	3.0
Total Split (s)	0.0	0.0	16.0	0.0	104.0	104.0	56.0	28.0	17.0	5.0	11.0	3.0
Total Split (%)	0.0%	0.0%	13.3%	0.0%	86.7%	86.7%	47%	23%	14%	4%	9%	3%
Yellow Time (s)							3.0	3.0	3.0	2.0	3.0	2.0
All-Red Time (s)							2.0	2.0	2.0	1.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0						
Total Lost Time (s)	4.0	4.0	3.0	4.0	5.0	5.0						
Lead/Lag							Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes			Yes	Yes
Recall Mode							Max	C-Max	None	None	None	None
v/c Ratio			0.82		0.77	0.11						
Control Delay			83.6		3.0	0.1						
Queue Delay			0.0		37.8	0.0						
Total Delay			83.6		40.9	0.1						
Queue Length 50th (ft)			121		93	0						
Queue Length 95th (ft)			#237		m68	m0						
Internal Link Dist (ft)	235			925	326							
Turn Bay Length (ft)												
Base Capacity (vph)			192		4068	1295						
Starvation Cap Reductn			0		1162	0						
Spillback Cap Reductn			0		0	0						
Storage Cap Reductn			0		0	0						
Reduced v/c Ratio			0.82		1.08	0.11						

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Connector & Route 1A



HCM Signalized Intersection Capacity Analysis
1: Connector & Route 1A

8/6/2013

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	0	144	0	2887	133
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			3.0		5.0	5.0
Lane Util. Factor			1.00		0.91	1.00
Frt			1.00		1.00	0.85
Flt Protected			0.95		1.00	1.00
Satd. Flow (prot)			1770		5085	1583
Flt Permitted			0.95		1.00	1.00
Satd. Flow (perm)			1770		5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	157	0	3138	145
RTOR Reduction (vph)	0	0	0	0	0	28
Lane Group Flow (vph)	0	0	157	0	3138	117
Turn Type			Prot			Perm
Protected Phases			4 5		1 2 3 6	
Permitted Phases						1 2 3 6
Actuated Green, G (s)			11.0		99.0	99.0
Effective Green, g (s)			11.0		97.0	97.0
Actuated g/C Ratio			0.09		0.81	0.81
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)			162		4110	1280
v/s Ratio Prot			c0.09		c0.62	
v/s Ratio Perm						0.07
v/c Ratio			0.97		0.76	0.09
Uniform Delay, d1			54.3		5.8	2.4
Progression Factor			1.00		0.45	0.22
Incremental Delay, d2			60.8		0.1	0.0
Delay (s)			115.1		2.6	0.5
Level of Service			F		A	A
Approach Delay (s)	0.0			115.1	2.6	
Approach LOS	A			F	A	

Intersection Summary

HCM Average Control Delay	7.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
7: Boardman Street & Route 1A Southbound

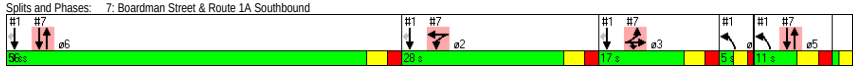
8/6/2013

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø4	ø5	ø6
Lane Configurations																
Volume (vph)	70	115	97	414	37	161	0	1365	65	0	2510	15				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900				
Storage Length (ft)	100		100	200		200	420		200	475		0				
Storage Lanes	0		1	1		0	0		0	0		0				
Taper Length (ft)	25		25	25		25	25		25	25		25				
Right Turn on Red			Yes			Yes			No			No				
Link Speed (mph)		30			30			30			30					
Link Distance (ft)		521			531			406			1005					
Travel Time (s)		11.8			12.1			9.2			22.8					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92				
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%				
Shared Lane Traffic (%)				24%												
Lane Group Flow (vph)	0	201	105	342	323	0	0	1555	0	0	2744	0				
Turn Type	Split		Prot	Split												
Protected Phases	3	3	3	2	2			1 5 6			1 5 6		1	4	5	6
Permitted Phases																
Detector Phase	3	3	3	2	2			1 5 6			1 5 6					
Switch Phase																
Minimum Initial (s)	6.0	6.0	6.0	4.0	4.0								4.0	1.0	6.0	1.0
Minimum Split (s)	11.0	11.0	11.0	21.0	21.0								21.0	5.0	11.0	3.0
Total Split (s)	17.0	17.0	17.0	28.0	28.0	0.0	0.0	70.0	0.0	0.0	70.0	0.0	56.0	5.0	11.0	3.0
Total Split (%)	14.2%	14.2%	14.2%	23.3%	23.3%	0.0%	0.0%	58.3%	0.0%	0.0%	58.3%	0.0%	47%	4%	9%	3%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0								3.0	2.0	3.0	2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0								2.0	1.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0				
Lead/Lag	Lead	Lead	Lead	Lag	Lag								Lead	Lag	Lead	Lag
Lead-Lag Optimize?				Yes	Yes								Yes		Yes	Yes
Recall Mode	None	None	None	C-Max	C-Max								Max	None	None	None
v/c Ratio		1.10	0.56	1.05	0.95			0.54			1.15					
Control Delay		145.2	39.0	111.2	80.2			21.7			102.4					
Queue Delay		0.0	0.0	0.0	0.0			0.5			0.0					
Total Delay		145.2	39.0	111.2	80.2			22.1			102.4					
Queue Length 50th (ft)		~177	38	~304	230			207			~915					
Queue Length 95th (ft)		#330	98	#501	#425			238			#1003					
Internal Link Dist (ft)		441			451			326			925					
Turn Bay Length (ft)			100	200												
Base Capacity (vph)		183	189	325	339			2856			2388					
Starvation Cap Reductn		0	0	0	0			723			0					
Spillback Cap Reductn		0	0	0	0			0			0					
Storage Cap Reductn		0	0	0	0			0			0					
Reduced v/c Ratio		1.10	0.56	1.05	0.95			0.73			1.15					

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



HCM Signalized Intersection Capacity Analysis
7: Boardman Street & Route 1A Southbound

8/6/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	115	97	414	37	161	0	1365	65	0	2510	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0			5.0			5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95			0.86			0.91	
Frt		1.00	0.85	1.00	0.92			0.99			1.00	
Flt Protected		0.98	1.00	0.95	0.98			1.00			1.00	
Satd. Flow (prot)		1830	1417	1698	1583			6013			5028	
Flt Permitted		0.98	1.00	0.95	0.98			1.00			1.00	
Satd. Flow (perm)		1830	1417	1698	1583			6013			5028	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	76	125	105	450	40	175	0	1484	71	0	2728	16
RTOR Reduction (vph)	0	0	48	0	36	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	201	57	342	287	0	0	1555	0	0	2744	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		Prot	Split								
Protected Phases	3	3	3	2	2			1 5 6			1 5 6	
Permitted Phases												
Actuated Green, G (s)		12.0	12.0	23.0	23.0			65.0			65.0	
Effective Green, g (s)		12.0	12.0	23.0	23.0			63.0			63.0	
Actuated g/C Ratio		0.10	0.10	0.19	0.19			0.52			0.52	
Clearance Time (s)		5.0	5.0	5.0	5.0							
Vehicle Extension (s)		3.0	3.0	3.0	3.0							
Lane Grp Cap (vph)		183	142	325	303			3157			2640	
v/s Ratio Prot		c0.11	0.04	c0.20	0.18			0.26			c0.55	
v/s Ratio Perm												
v/c Ratio		1.10	0.40	1.05	0.95			0.49			1.04	
Uniform Delay, d1		54.0	50.6	48.5	47.9			18.3			28.5	
Progression Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2		95.3	1.9	64.3	40.1			0.1			28.8	
Delay (s)		149.3	52.5	112.8	88.0			18.4			57.3	
Level of Service		F	D	F	F			B			E	
Approach Delay (s)		116.1			100.8			18.4			57.3	
Approach LOS		F			F			B			E	

Intersection Summary

HCM Average Control Delay	54.7	HCM Level of Service	D
HCM Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	88.6%	ICU Level of Service	E
Analysis Period (min)	15		

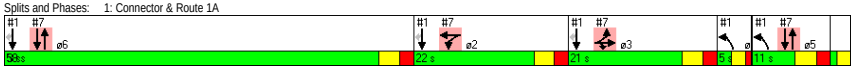
c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations												
Volume (vph)	0	0	70	0	2777	203						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900						
Right Turn on Red		Yes				Yes						
Link Speed (mph)	30			30	30							
Link Distance (ft)	315			1005	406							
Travel Time (s)	7.2			22.8	9.2							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92						
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	76	0	3018	221						
Turn Type			Prot			Perm						
Protected Phases			4 5		1 2 3 6		1	2	3	4	5	6
Permitted Phases						1 2 3 6						
Detector Phase			4 5		1 2 3 6	1 2 3 6						
Switch Phase												
Minimum Initial (s)							4.0	4.0	6.0	1.0	6.0	1.0
Minimum Split (s)							21.0	21.0	11.0	5.0	11.0	3.0
Total Split (s)	0.0	0.0	16.0	0.0	104.0	104.0	58.0	22.0	21.0	5.0	11.0	3.0
Total Split (%)	0.0%	0.0%	13.3%	0.0%	86.7%	86.7%	48%	18%	18%	4%	9%	3%
Yellow Time (s)							3.0	3.0	3.0	2.0	3.0	2.0
All-Red Time (s)							2.0	2.0	2.0	1.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0						
Total Lost Time (s)	4.0	4.0	3.0	4.0	5.0	5.0						
Lead/Lag							Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes			Yes	Yes
Recall Mode							Max	C-Max	None	None	None	None
v/c Ratio			0.40		0.74	0.17						
Control Delay			56.5		3.2	0.2						
Queue Delay			0.0		22.0	0.0						
Total Delay			56.5		25.2	0.2						
Queue Length 50th (ft)			56		95	0						
Queue Length 95th (ft)			107		m12	m0						
Internal Link Dist (ft)	235			925	326							
Turn Bay Length (ft)												
Base Capacity (vph)			192		4068	1311						
Starvation Cap Reductn			0		1169	0						
Spillback Cap Reductn			0		0	0						
Storage Cap Reductn			0		0	0						
Reduced v/c Ratio			0.40		1.04	0.17						

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Connector & Route 1A



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	0	70	0	2777	203
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			3.0		5.0	5.0
Lane Util. Factor			1.00		0.91	1.00
Frt			1.00		1.00	0.85
Flt Protected			0.95		1.00	1.00
Satd. Flow (prot)			1770		5085	1583
Flt Permitted			0.95		1.00	1.00
Satd. Flow (perm)			1770		5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	76	0	3018	221
RTOR Reduction (vph)	0	0	0	0	0	43
Lane Group Flow (vph)	0	0	76	0	3018	178
Turn Type			Prot			Perm
Protected Phases			4 5		1 2 3 6	
Permitted Phases						1 2 3 6
Actuated Green, G (s)			11.6		98.4	98.4
Effective Green, g (s)			11.6		96.4	96.4
Actuated g/C Ratio			0.10		0.80	0.80
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)			171		4085	1272
v/s Ratio Prot			c0.04		c0.59	
v/s Ratio Perm						0.11
v/c Ratio			0.44		0.74	0.14
Uniform Delay, d1			51.2		5.7	2.6
Progression Factor			1.00		0.46	0.28
Incremental Delay, d2			1.8		0.2	0.0
Delay (s)			53.0		2.9	0.7
Level of Service			D		A	A
Approach Delay (s)	0.0			53.0	2.7	
Approach LOS	A			D	A	

Intersection Summary

HCM Average Control Delay	3.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	61.5%	ICU Level of Service	B
Analysis Period (min)	15		

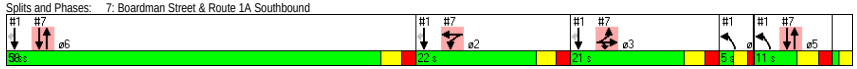
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø4	ø5	ø6
Lane Configurations																
Volume (vph)	65	170	54	252	17	261	0	2837	83	0	2471	12				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900				
Storage Length (ft)	100		100	200		200	420		200	475		0				
Storage Lanes	0		1	1		0	0		0	0		0				
Taper Length (ft)	25		25	25		25	25		25	25		25				
Right Turn on Red			Yes			Yes			No			No				
Link Speed (mph)		30			30			30			30					
Link Distance (ft)		521			531			406			1005					
Travel Time (s)		11.8			12.1			9.2			22.8					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92				
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%				
Shared Lane Traffic (%)				10%												
Lane Group Flow (vph)	0	256	59	247	329	0	0	3174	0	0	2699	0				
Turn Type	Split		Prot	Split												
Protected Phases	3	3	3	2	2			1 5 6			1 5 6		1	4	5	6
Permitted Phases																
Detector Phase	3	3	3	2	2			1 5 6			1 5 6					
Switch Phase																
Minimum Initial (s)	6.0	6.0	6.0	4.0	4.0								4.0	1.0	6.0	1.0
Minimum Split (s)	11.0	11.0	11.0	21.0	21.0								21.0	5.0	11.0	3.0
Total Split (s)	21.0	21.0	21.0	22.0	22.0	0.0	0.0	72.0	0.0	0.0	72.0	0.0	58.0	5.0	11.0	3.0
Total Split (%)	17.5%	17.5%	17.5%	18.3%	18.3%	0.0%	0.0%	60.0%	0.0%	0.0%	60.0%	0.0%	48%	4%	9%	3%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0								3.0	2.0	3.0	2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0								2.0	1.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0				
Lead/Lag	Lead	Lead	Lead	Lag	Lag								Lead	Lag	Lead	Lag
Lead-Lag Optimize?				Yes	Yes								Yes		Yes	Yes
Recall Mode	None	None	None	C-Max	C-Max								Max	None	None	None
v/c Ratio		1.04	0.26	1.02	0.95			1.05			1.07					
Control Delay		118.9	24.0	115.4	64.9			61.8			70.6					
Queue Delay		0.0	0.0	0.0	0.0			91.7			0.0					
Total Delay		118.9	24.0	115.4	64.9			153.5			70.6					
Queue Length 50th (ft)		~214	13	~214	149			~732			~863					
Queue Length 95th (ft)		#382	54	#389	#344			#858			#952					
Internal Link Dist (ft)		441			451			326			925					
Turn Bay Length (ft)			100	200												
Base Capacity (vph)		246	224	241	346			3014			2514					
Starvation Cap Reductn		0	0	0	0			498			0					
Spillback Cap Reductn		0	0	0	0			0			0					
Storage Cap Reductn		0	0	0	0			0			0					
Reduced v/c Ratio		1.04	0.26	1.02	0.95			1.26			1.07					

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	65	170	54	252	17	261	0	2837	83	0	2471	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0			5.0			5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95			0.86			0.91	
Frt		1.00	0.85	1.00	0.87			1.00			1.00	
Flt Protected		0.99	1.00	0.95	1.00			1.00			1.00	
Satd. Flow (prot)		1848	1417	1698	1499			6028			5030	
Flt Permitted		0.99	1.00	0.95	1.00			1.00			1.00	
Satd. Flow (perm)		1848	1417	1698	1499			6028			5030	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	71	185	59	274	18	284	0	3084	90	0	2686	13
RTOR Reduction (vph)	0	0	35	0	134	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	256	24	247	195	0	0	3174	0	0	2699	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		Prot	Split								
Protected Phases	3	3	3	2	2			1 5 6			1 5 6	
Permitted Phases												
Actuated Green, G (s)		16.0	16.0	16.4	16.4			68.0			68.0	
Effective Green, g (s)		16.0	16.0	16.4	16.4			66.0			66.0	
Actuated g/C Ratio		0.13	0.13	0.14	0.14			0.55			0.55	
Clearance Time (s)		5.0	5.0	5.0	5.0							
Vehicle Extension (s)		3.0	3.0	3.0	3.0							
Lane Grp Cap (vph)		246	189	232	205			3315			2767	
v/s Ratio Prot		c0.14	0.02	c0.15	0.13			0.53			c0.54	
v/s Ratio Perm												
v/c Ratio		1.04	0.13	1.06	0.95			0.96			0.98	
Uniform Delay, d1		52.0	45.9	51.8	51.4			25.7			26.2	
Progression Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2		68.4	0.3	77.2	51.5			7.9			11.9	
Delay (s)		120.4	46.2	129.0	102.9			33.6			38.1	
Level of Service		F	D	F	F			C			D	
Approach Delay (s)		106.5			114.1			33.6			38.1	
Approach LOS		F			F			C			D	

Intersection Summary

HCM Average Control Delay	45.6	HCM Level of Service	D
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	24.6
Intersection Capacity Utilization	88.5%	ICU Level of Service	E
Analysis Period (min)	15		

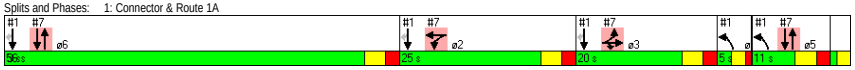
c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations												
Volume (vph)	0	0	32	0	2573	182						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900						
Right Turn on Red		Yes				Yes						
Link Speed (mph)	30			30	30							
Link Distance (ft)	315			1005	406							
Travel Time (s)	7.2			22.8	9.2							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92						
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	35	0	2797	198						
Turn Type			Prot			Perm						
Protected Phases			4 5		1 2 3 6		1	2	3	4	5	6
Permitted Phases						1 2 3 6						
Detector Phase			4 5		1 2 3 6	1 2 3 6						
Switch Phase												
Minimum Initial (s)							4.0	4.0	6.0	1.0	6.0	1.0
Minimum Split (s)							21.0	21.0	11.0	5.0	11.0	3.0
Total Split (s)	0.0	0.0	16.0	0.0	104.0	104.0	56.0	25.0	20.0	5.0	11.0	3.0
Total Split (%)	0.0%	0.0%	13.3%	0.0%	86.7%	86.7%	47%	21%	17%	4%	9%	3%
Yellow Time (s)							3.0	3.0	3.0	2.0	3.0	2.0
All-Red Time (s)							2.0	2.0	2.0	1.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0						
Total Lost Time (s)	4.0	4.0	3.0	4.0	5.0	5.0						
Lead/Lag							Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes			Yes	Yes
Recall Mode							Max	C-Max	None	None	None	None
v/c Ratio			0.18		0.69	0.15						
Control Delay			51.3		2.6	0.2						
Queue Delay			0.0		18.4	0.0						
Total Delay			51.3		21.0	0.2						
Queue Length 50th (ft)			25		27	0						
Queue Length 95th (ft)			58		m2	m0						
Internal Link Dist (ft)	235			925	326							
Turn Bay Length (ft)												
Base Capacity (vph)			192		4068	1306						
Starvation Cap Reductn			0		1354	0						
Spillback Cap Reductn			0		0	0						
Storage Cap Reductn			0		0	0						
Reduced v/c Ratio			0.18		1.03	0.15						

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Connector & Route 1A



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	0	32	0	2573	182
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			3.0		5.0	5.0
Lane Util. Factor			1.00		0.91	1.00
Frt			1.00		1.00	0.85
Flt Protected			0.95		1.00	1.00
Satd. Flow (prot)			1770		5085	1583
Flt Permitted			0.95		1.00	1.00
Satd. Flow (perm)			1770		5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	35	0	2797	198
RTOR Reduction (vph)	0	0	0	0	0	40
Lane Group Flow (vph)	0	0	35	0	2797	158
Turn Type			Prot			Perm
Protected Phases			4 5		1 2 3 6	
Permitted Phases						1 2 3 6
Actuated Green, G (s)			12.2		97.8	97.8
Effective Green, g (s)			12.2		95.8	95.8
Actuated g/C Ratio			0.10		0.80	0.80
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)			180		4060	1264
v/s Ratio Prot			c0.02		c0.55	
v/s Ratio Perm						0.10
v/c Ratio			0.19		0.69	0.13
Uniform Delay, d1			49.4		5.4	2.7
Progression Factor			1.00		0.46	0.37
Incremental Delay, d2			0.5		0.0	0.0
Delay (s)			49.9		2.5	1.0
Level of Service			D		A	A
Approach Delay (s)	0.0			49.9	2.4	
Approach LOS	A			D	A	

Intersection Summary

HCM Average Control Delay	3.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	53.9%	ICU Level of Service	A
Analysis Period (min)	15		

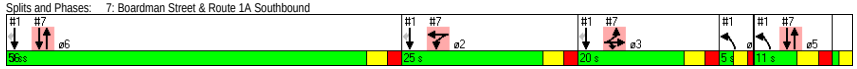
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø4	ø5	ø6
Lane Configurations																
Volume (vph)	75	155	37	255	12	332	0	2455	339	0	2466	28				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900				
Storage Length (ft)	100		100	200		200	420		200	475		0				
Storage Lanes	0		1	1		0	0		0	0		0				
Taper Length (ft)	25		25	25		25	25		25	25		25				
Right Turn on Red			Yes			Yes			No			No				
Link Speed (mph)		30			30			30			30					
Link Distance (ft)		521			531			406			1005					
Travel Time (s)		11.8			12.1			9.2			22.8					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92				
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%				
Shared Lane Traffic (%)				10%												
Lane Group Flow (vph)	0	250	40	249	402	0	0	3036	0	0	2710	0				
Turn Type	Split		Prot	Split												
Protected Phases	3	3	3	2	2			1 5 6			1 5 6		1	4	5	6
Permitted Phases																
Detector Phase	3	3	3	2	2			1 5 6			1 5 6					
Switch Phase																
Minimum Initial (s)	6.0	6.0	6.0	4.0	4.0								4.0	1.0	6.0	1.0
Minimum Split (s)	11.0	11.0	11.0	21.0	21.0								21.0	5.0	11.0	3.0
Total Split (s)	20.0	20.0	20.0	25.0	25.0	0.0	0.0	70.0	0.0	0.0	70.0	0.0	56.0	5.0	11.0	3.0
Total Split (%)	16.7%	16.7%	16.7%	20.8%	20.8%	0.0%	0.0%	58.3%	0.0%	0.0%	58.3%	0.0%	47%	4%	9%	3%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0								3.0	2.0	3.0	2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0								2.0	1.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0				
Lead/Lag	Lead	Lead	Lead	Lag	Lag								Lead	Lag	Lead	Lag
Lead-Lag Optimize?				Yes	Yes								Yes		Yes	Yes
Recall Mode	None	None	None	C-Max	C-Max								Max	None	None	None
v/c Ratio		1.09	0.20	0.88	1.11			1.04			1.10					
Control Delay		133.5	25.7	79.5	110.2			57.1			80.4					
Queue Delay		0.0	0.0	0.0	0.0			82.7			0.0					
Total Delay		133.5	25.7	79.5	110.2			139.8			80.4					
Queue Length 50th (ft)		~218	9	200	~274			~707			~895					
Queue Length 95th (ft)		#384	43	#356	#486			#827			#985					
Internal Link Dist (ft)		441			451			326			925					
Turn Bay Length (ft)			100	200												
Base Capacity (vph)		230	201	283	363			2925			2469					
Starvation Cap Reductn		0	0	0	0			453			0					
Spillback Cap Reductn		0	0	0	0			0			0					
Storage Cap Reductn		0	0	0	0			0			0					
Reduced v/c Ratio		1.09	0.20	0.88	1.11			1.23			1.10					

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	75	155	37	255	12	332	0	2455	339	0	2466	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0			5.0			5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95			0.86			0.91	
Frt		1.00	0.85	1.00	0.87			0.98			1.00	
Flt Protected		0.98	1.00	0.95	1.00			1.00			1.00	
Satd. Flow (prot)		1839	1417	1698	1489			5948			5022	
Flt Permitted		0.98	1.00	0.95	1.00			1.00			1.00	
Satd. Flow (perm)		1839	1417	1698	1489			5948			5022	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	82	168	40	277	13	361	0	2668	368	0	2680	30
RTOR Reduction (vph)	0	0	24	0	116	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	250	16	249	286	0	0	3036	0	0	2710	0
Heavy Vehicles (%)	5%	0%	14%	1%	0%	5%	16%	8%	7%	3%	3%	14%
Turn Type	Split		Prot	Split								
Protected Phases	3	3	3	2	2			1 5 6			1 5 6	
Permitted Phases												
Actuated Green, G (s)		15.0	15.0	18.8	18.8			67.0			67.0	
Effective Green, g (s)		15.0	15.0	18.8	18.8			65.0			65.0	
Actuated g/C Ratio		0.12	0.12	0.16	0.16			0.54			0.54	
Clearance Time (s)		5.0	5.0	5.0	5.0							
Vehicle Extension (s)		3.0	3.0	3.0	3.0							
Lane Grp Cap (vph)		230	177	266	233			3222			2720	
v/s Ratio Prot		c0.14	0.01	0.15	c0.19			0.51			c0.54	
v/s Ratio Perm												
v/c Ratio		1.09	0.09	0.94	1.23			0.94			1.00	
Uniform Delay, d1		52.5	46.5	50.0	50.6			25.7			27.4	
Progression Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2		84.5	0.2	40.9	133.5			6.6			16.3	
Delay (s)		137.0	46.7	90.9	184.1			32.3			43.7	
Level of Service		F	D	F	F			C			D	
Approach Delay (s)		124.5			148.5			32.3			43.7	
Approach LOS		F			F			C			D	

Intersection Summary

HCM Average Control Delay	52.2	HCM Level of Service	D
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	24.2
Intersection Capacity Utilization	90.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

Host Community Agreement (HCA) Concept Plans

\\vhbproj\Boston\10271.01\cadd\planset\2011 concepts\full build concepts\on-site mitigation\Brown Circle Concept.dwg



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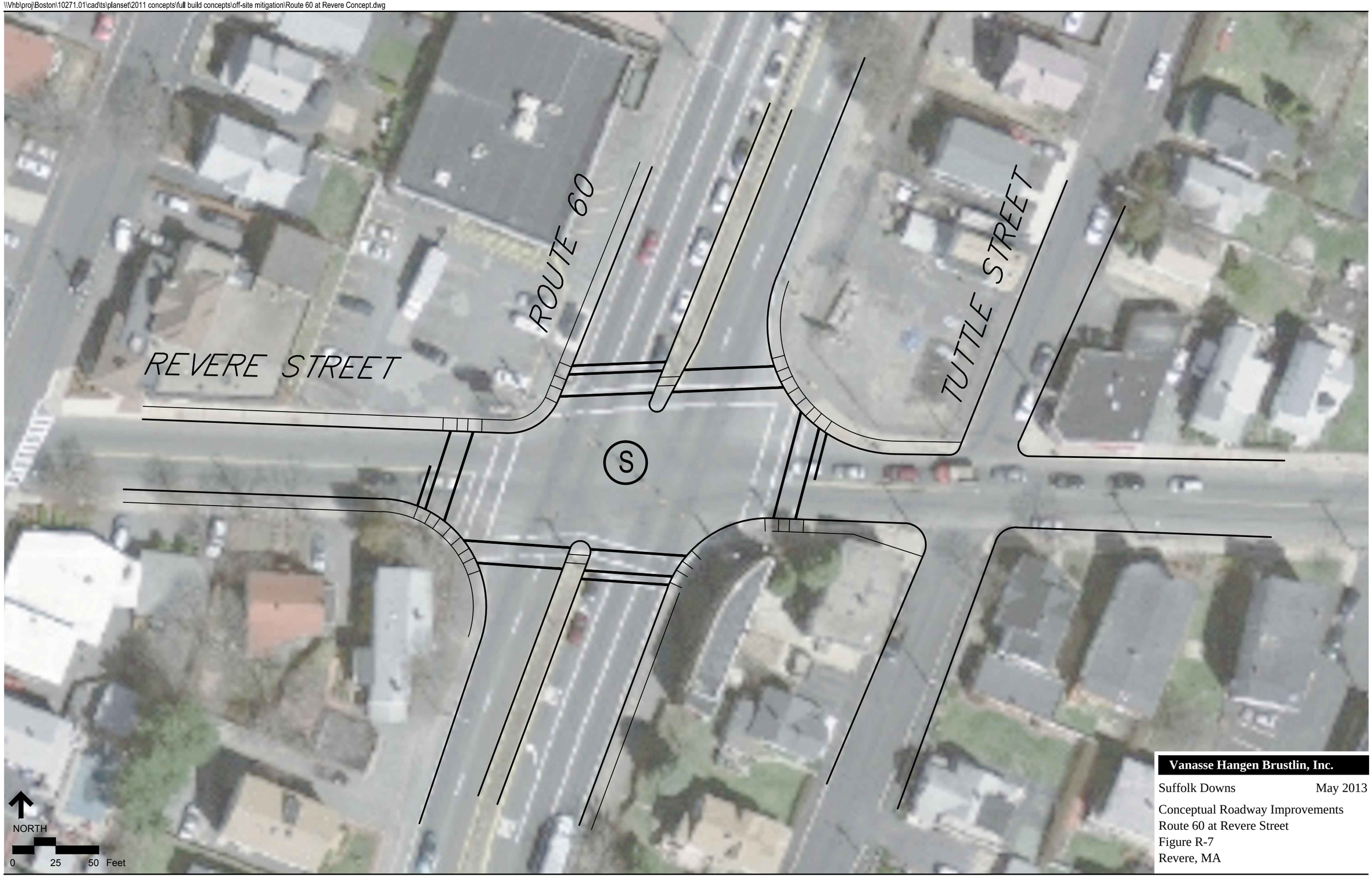
Suffolk Downs May 2013

Conceptual Roadway Improvements
Brown Circle
Figure R-6
Revere, MA

\\Vhb\proj\Boston\10271.01\cad\ts\planset\2011 concepts\full build concepts\off-site mitigation\Route 60 at Revere Concept.dwg



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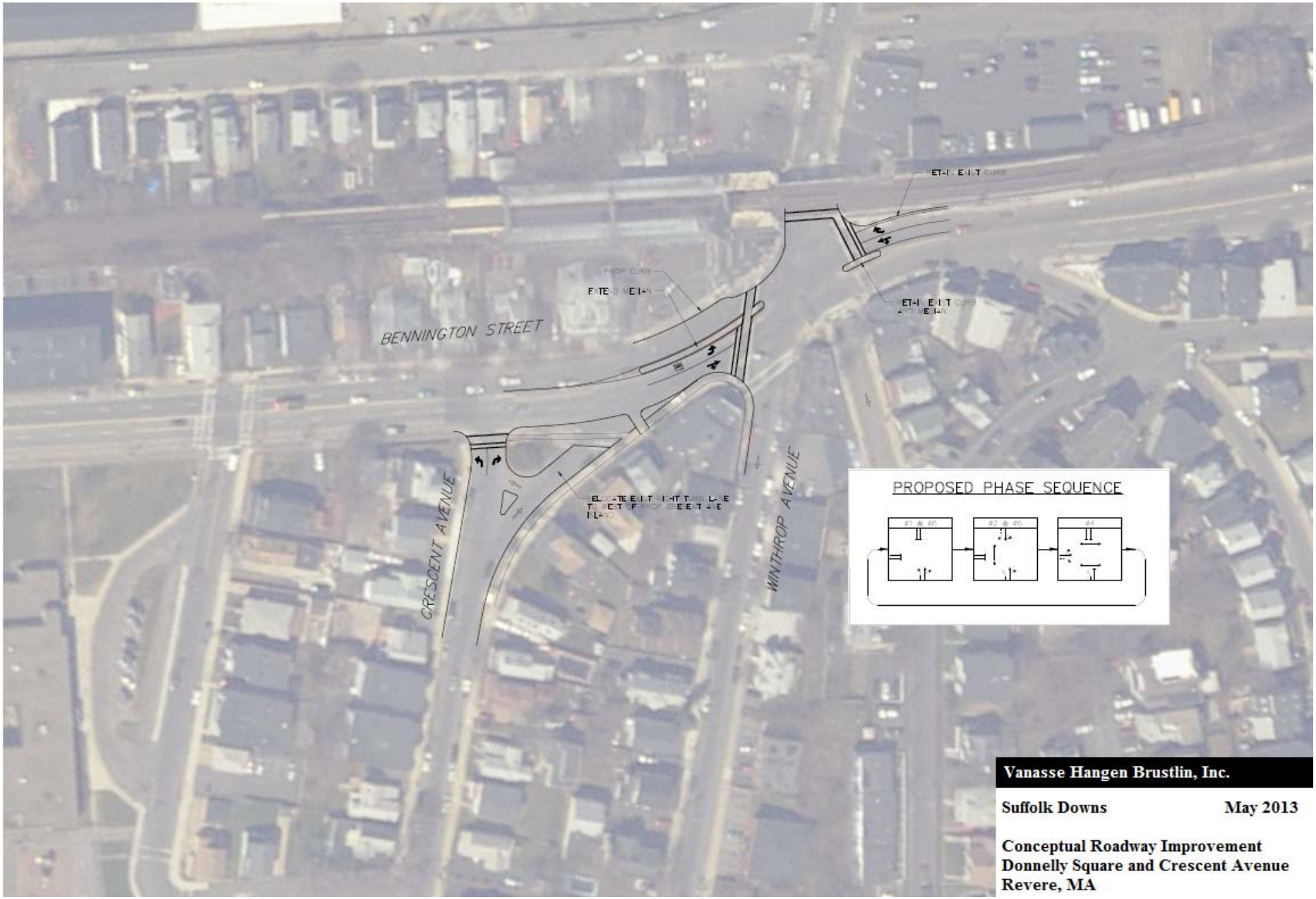
Suffolk Downs May 2013

Conceptual Roadway Improvements
Route 60 at Revere Street
Figure R-7
Revere, MA



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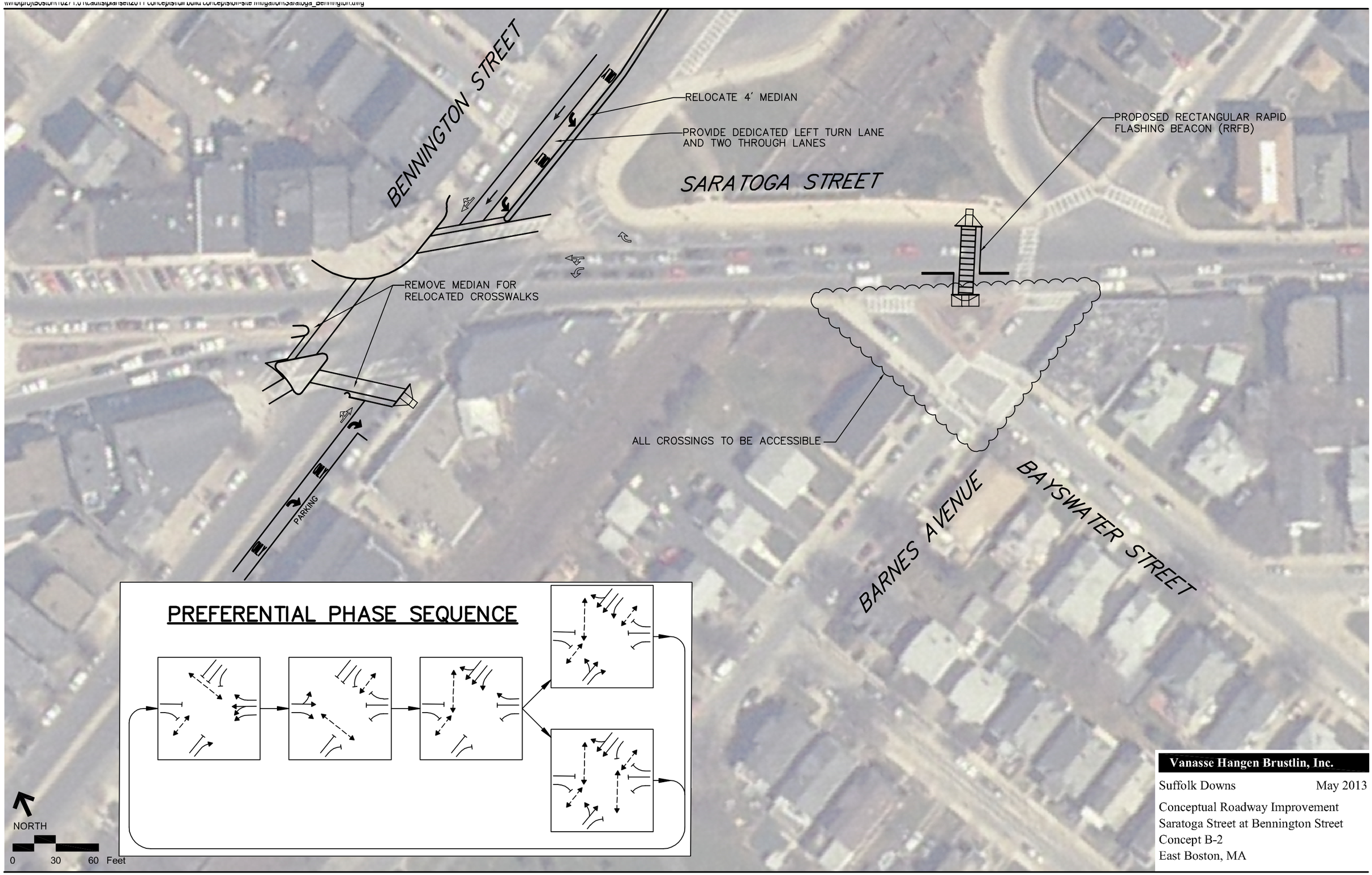
Suffolk Downs **May 2013**

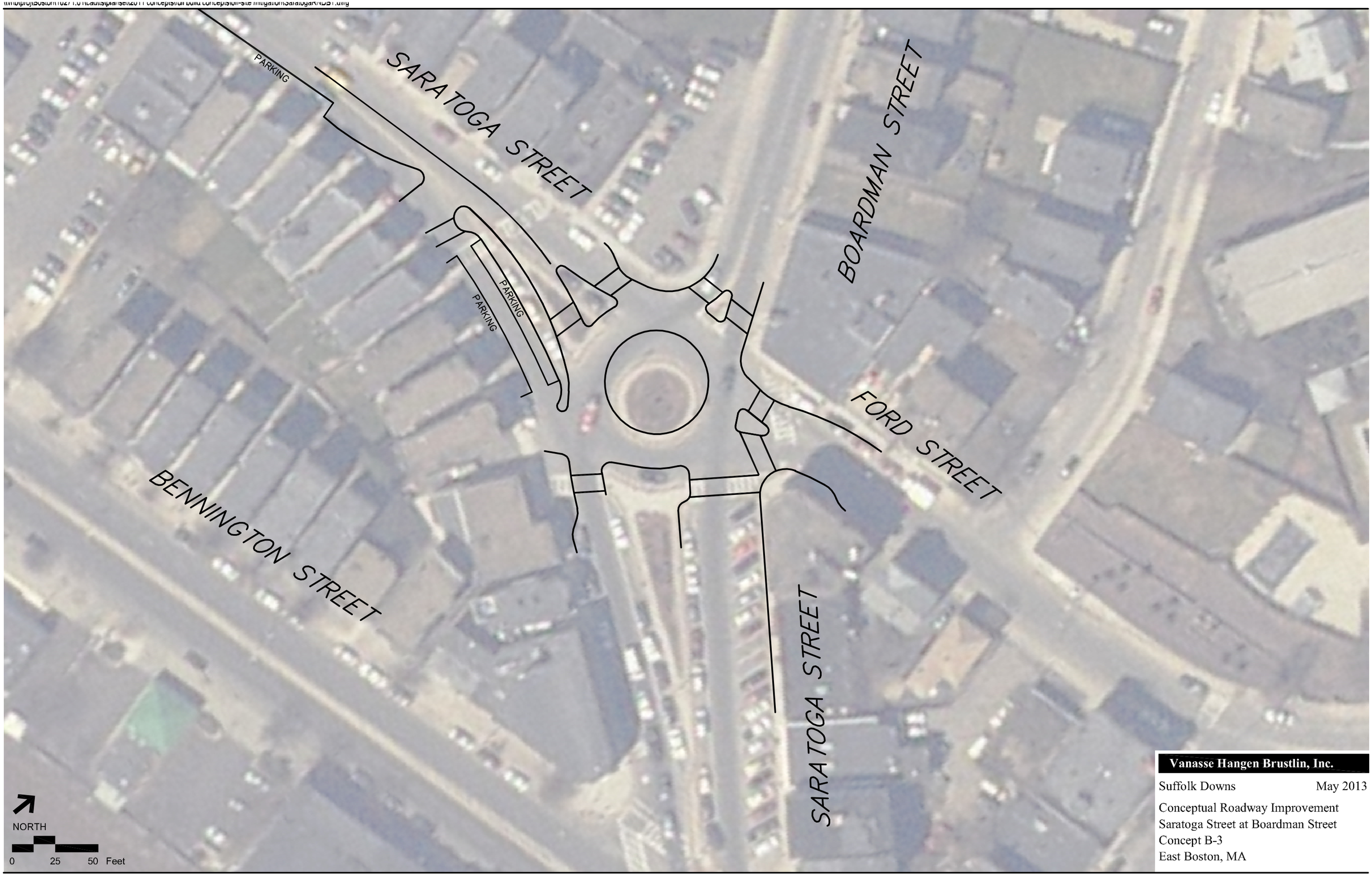
Conceptual Roadway Improvement
Donnelly Square and Crescent Avenue
Revere, MA



Vanasse Hangen Brustlin, Inc.

Suffolk Downs May 2013

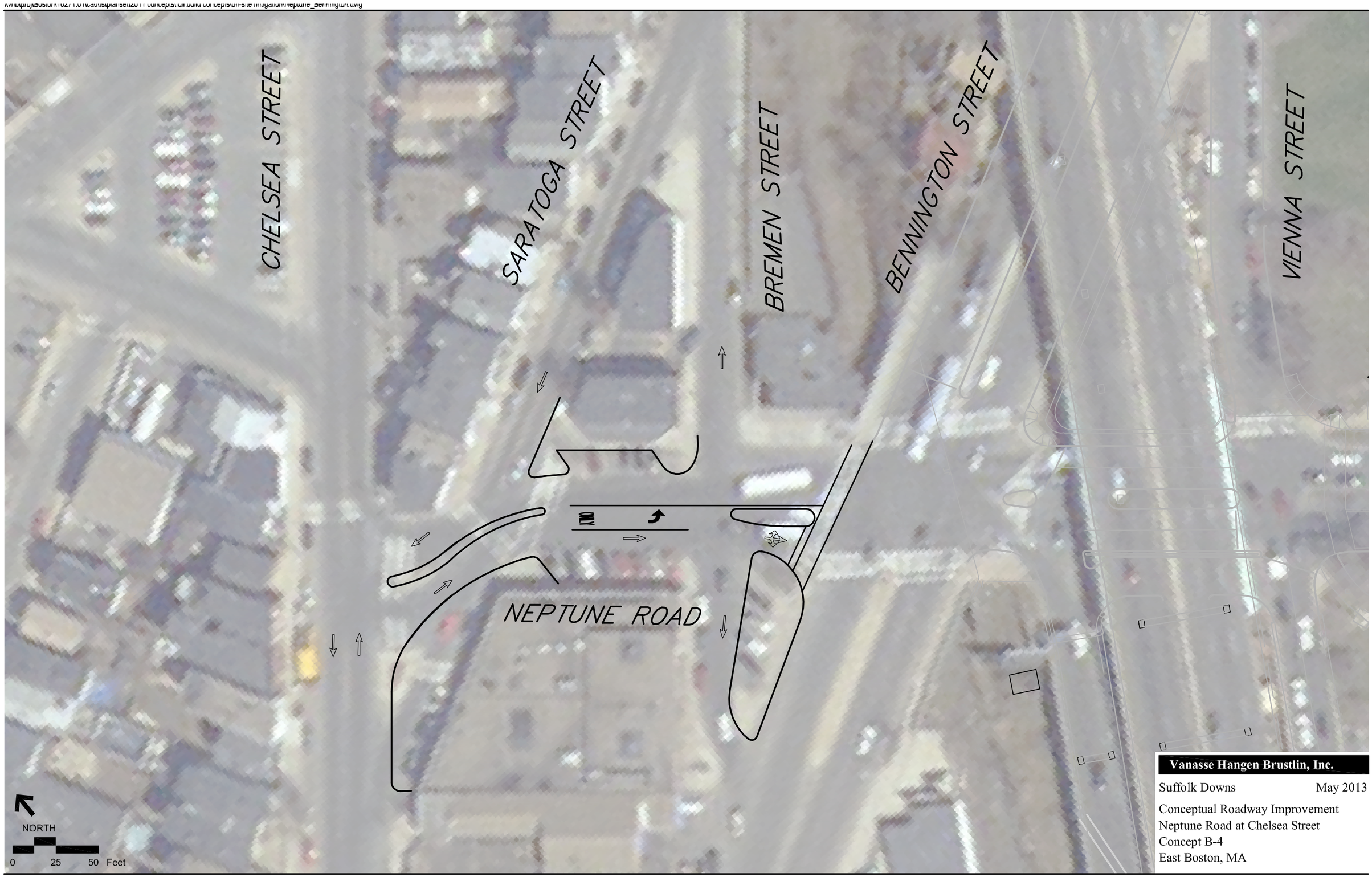
Conceptual Roadway Improvement
Saratoga Street at Bennington Street
Concept B-2
East Boston, MA



Vanasse Hangen Brustlin, Inc.

Suffolk Downs May 2013

Conceptual Roadway Improvement
Saratoga Street at Boardman Street
Concept B-3
East Boston, MA



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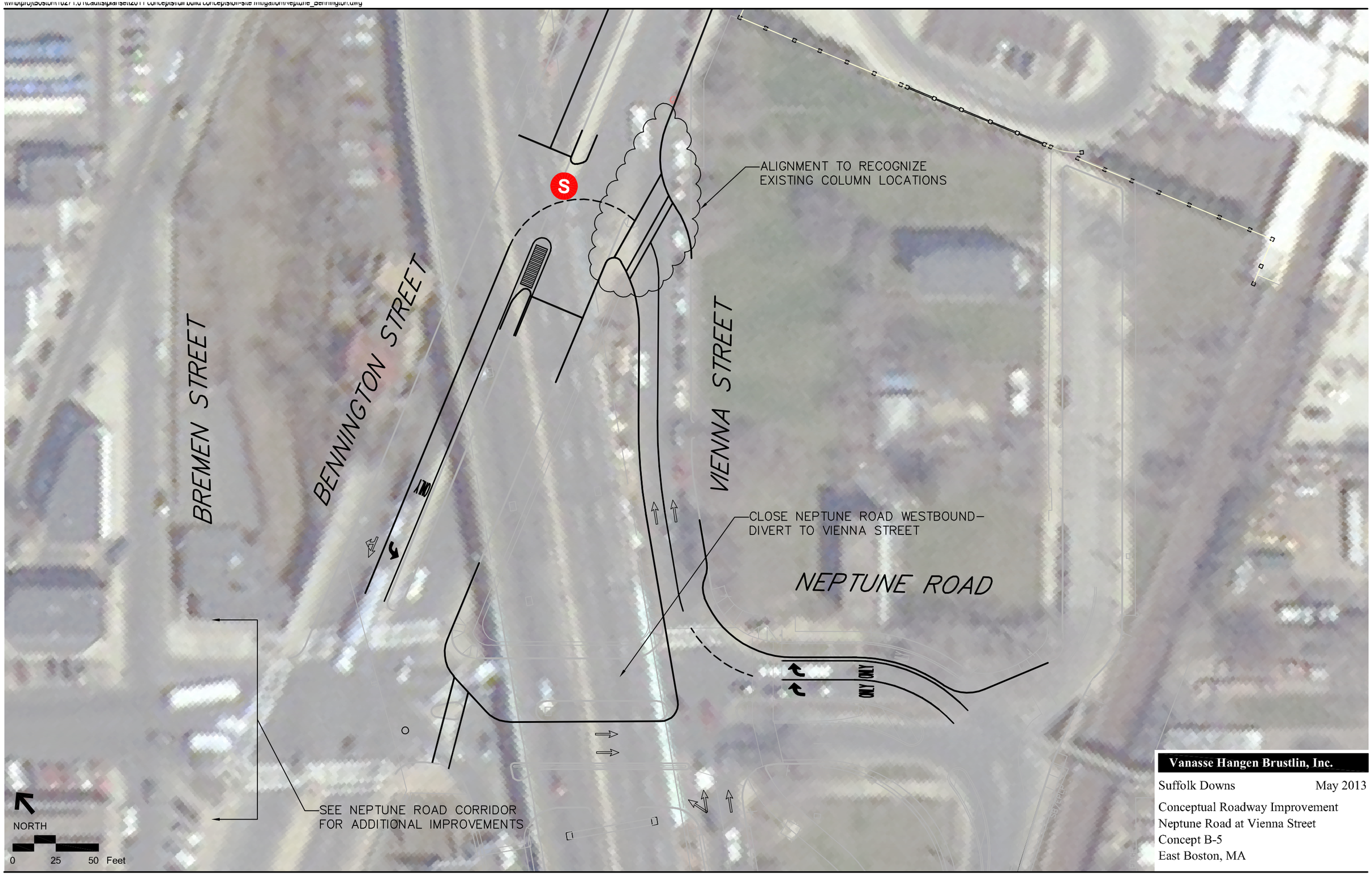
Suffolk Downs May 2013

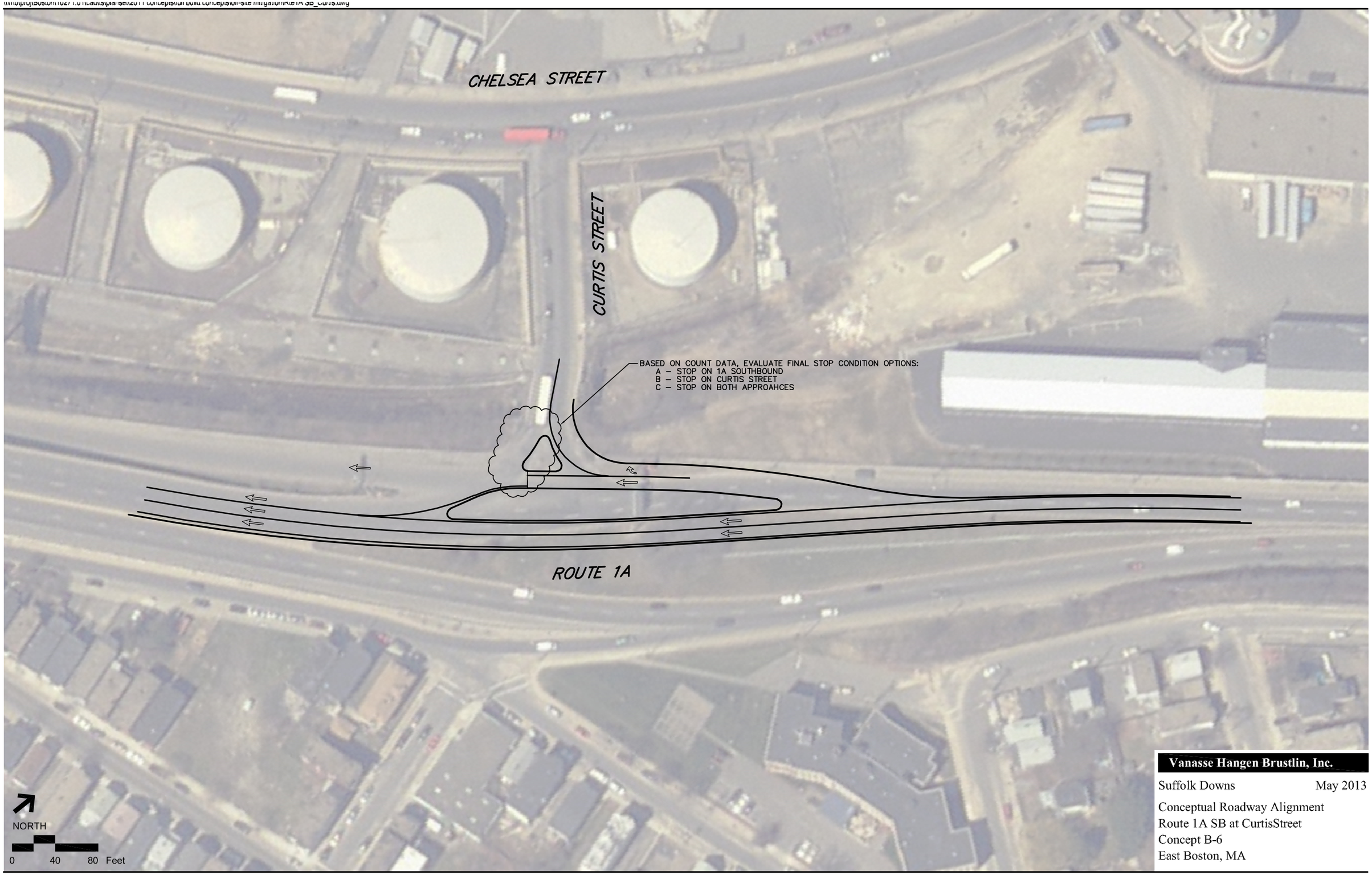
Conceptual Roadway Improvement
Neptune Road at Chelsea Street
Concept B-4
East Boston, MA



Vanasse Hangen Brustlin, Inc.

Suffolk Downs May 2013

Conceptual Roadway Improvement
Neptune Road at Vienna Street
Concept B-5
East Boston, MA



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Suffolk Downs May 2013

Conceptual Roadway Alignment
Route 1A SB at CurtisStreet
Concept B-6
East Boston, MA



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Suffolk Downs **May 2013**

On-Street Bicycle Accomodations
Bennington Street
East Boston/Revere, MA
Sheet 1 of 2



Vanasse Hangen Brustlin, Inc.

Suffolk Downs **May 2013**

On-Street Bicycle Accomodations
Bennington Street
East Boston/Revere, MA
Sheet 2 of 2

Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

Synchro 7 Capacity Analysis
2012 Existing Condition
Friday Evening Peak Hour

Signalized and Unsignalized Synchro Analysis

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1373	213	266	1390	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	9	11	12	12
Storage Length (ft)		0	130		0	0
Storage Lanes		0	1		0	0
Taper Length (ft)		25	25		25	25
Right Turn on Red		Yes				Yes
Link Speed (mph)	30			30	30	
Link Distance (ft)	572			1857	345	
Travel Time (s)	13.0			42.2	7.8	
Peak Hour Factor	0.93	0.93	0.92	0.92	0.95	0.95
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Bus Blockages (#/hr)	0	0	0	2	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1705	0	289	1511	0	0
Turn Type			Prot			
Protected Phases	2		1	1 2		
Permitted Phases						
Detector Phase	2		1	1 2		
Switch Phase						
Minimum Initial (s)	4.0		4.0			
Minimum Split (s)	20.0		20.0			
Total Split (s)	75.0	0.0	30.0	105.0	0.0	0.0
Total Split (%)	71.4%	0.0%	28.6%	100.0%	0.0%	0.0%
Yellow Time (s)	3.5		3.5			
All-Red Time (s)	0.5		0.5			
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	Max		None			
v/c Ratio	0.51		0.73	0.31		
Control Delay	8.7		48.5	0.2		
Queue Delay	0.3		0.0	0.0		
Total Delay	9.0		48.5	0.2		
Queue Length 50th (ft)	178		179	0		
Queue Length 95th (ft)	212		#293	0		
Internal Link Dist (ft)	492			1777	265	
Turn Bay Length (ft)			130			
Base Capacity (vph)	3316		399	4923		
Starvation Cap Reductn	838		0	0		
Spillback Cap Reductn	0		0	0		
Storage Cap Reductn	0		0	0		
Reduced v/c Ratio	0.69		0.72	0.31		

Intersection Summary

Area Type: Other
Cycle Length: 105
Actuated Cycle Length: 104.8
Natural Cycle: 40
Control Type: Semi Act-Uncoord
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Route 145 & Route 1A on-ramp



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1373	213	266	1390	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	11	11	9	11	12	12
Total Lost time (s)	4.0		4.0	4.0		
Lane Util. Factor	0.91		1.00	0.91		
Frt	0.98		1.00	1.00		
Flt Protected	1.00		0.95	1.00		
Satd. Flow (prot)	4864		1608	4951		
Flt Permitted	1.00		0.95	1.00		
Satd. Flow (perm)	4864		1608	4951		
Peak-hour factor, PHF	0.93	0.93	0.92	0.92	0.95	0.95
Adj. Flow (vph)	1476	229	289	1511	0	0
RTOR Reduction (vph)	20	0	0	0	0	0
Lane Group Flow (vph)	1685	0	289	1511	0	0
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Bus Blockages (#/hr)	0	0	0	2	0	0
Turn Type			Prot			
Protected Phases	2		1	1 2		
Permitted Phases						
Actuated Green, G (s)	71.0		25.8	104.8		
Effective Green, g (s)	71.0		25.8	104.8		
Actuated g/C Ratio	0.68		0.25	1.00		
Clearance Time (s)	4.0		4.0			
Vehicle Extension (s)	3.0		3.0			
Lane Grp Cap (vph)	3295		396	4951		
v/s Ratio Prot	c0.35		c0.18	0.31		
v/s Ratio Perm						
v/c Ratio	0.51		0.73	0.31		
Uniform Delay, d1	8.3		36.3	0.0		
Progression Factor	1.00		1.00	1.00		
Incremental Delay, d2	0.6		6.6	0.0		
Delay (s)	8.9		42.9	0.0		
Level of Service	A		D	A		
Approach Delay (s)	8.9			6.9	0.0	
Approach LOS	A			A	A	

Intersection Summary

HCM Average Control Delay	7.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	104.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	52.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations													
Volume (vph)	94	265	207	0	0	0	390	415	87	47	203	105	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	10	12	12	12	10	11	12	12	12	12	
Storage Length (ft)	0		50	0		0	0		0	0		0	
Storage Lanes	0		1	0		0	1		0	0		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		988			531			233			338		
Travel Time (s)		22.5			12.1			5.3			7.7		
Peak Hour Factor	0.98	0.98	0.98	0.92	0.92	0.92	0.96	0.96	0.96	0.97	0.97	0.97	
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%	
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	2	
Parking (#/hr)									0				
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	366	211	0	0	0	406	523	0	0	365	0	
Turn Type	Split		Prot				D.P+P			Perm			
Protected Phases	4	4	4				2	2 6			6		9
Permitted Phases							6			6			
Detector Phase	4	4	4				2	2 6		6	6		
Switch Phase													
Minimum Initial (s)	1.0	1.0	1.0				1.0			1.0	1.0		1.0
Minimum Split (s)	7.0	7.0	7.0				6.0			7.0	7.0		5.0
Total Split (s)	29.0	29.0	29.0	0.0	0.0	0.0	13.0	31.0	0.0	18.0	18.0	0.0	22.0
Total Split (%)	35.4%	35.4%	35.4%	0.0%	0.0%	0.0%	15.9%	37.8%	0.0%	22.0%	22.0%	0.0%	27%
Yellow Time (s)	4.0	4.0	4.0				4.0			5.0	5.0		3.5
All-Red Time (s)	2.0	2.0	2.0				1.0			1.0	1.0		0.5
Lost Time Adjust (s)	-2.0	-2.0	-2.0	0.0	0.0	0.0	-1.0	-1.0	0.0	-2.0	-2.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lag	Lag	Lag				Lead			Lag	Lag		Lead
Lead-Lag Optimize?	Yes	Yes	Yes				Yes			Yes	Yes		Yes
Recall Mode	None	None	None				None			Max	Max		None
v/c Ratio		0.68	0.42				0.97	0.69			0.54		
Control Delay		26.6	12.0				59.4	22.5			22.4		
Queue Delay		0.0	0.0				0.0	0.0			0.0		
Total Delay		26.6	12.0				59.4	22.5			22.4		
Queue Length 50th (ft)		95	22				81	110			42		
Queue Length 95th (ft)		#310	106				#404	#494			#147		
Internal Link Dist (ft)		908			451			153			258		
Turn Bay Length (ft)			50										
Base Capacity (vph)		725	639				418	761			676		
Starvation Cap Reductn		0	0				0	0			0		
Spillback Cap Reductn		0	0				0	0			0		
Storage Cap Reductn		0	0				0	0			0		
Reduced v/c Ratio		0.50	0.33				0.97	0.69			0.54		

Intersection Summary

Area Type: CBD
Cycle Length: 82
Actuated Cycle Length: 59.5
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Winthrop Avenue & State Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	94	265	207	0	0	0	390	415	87	47	203	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	10	12	12	12	10	11	12	12	12	12
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	
Lane Util. Factor		1.00	1.00				1.00	1.00			0.95	
Frt		1.00	0.85				1.00	0.97			0.96	
Flt Protected		0.99	1.00				0.95	1.00			0.99	
Satd. Flow (prot)		1655	1319				1501	1594			3054	
Flt Permitted		0.99	1.00				0.47	1.00			0.83	
Satd. Flow (perm)		1655	1319				738	1594			2548	
Peak-hour factor, PHF	0.98	0.98	0.98	0.92	0.92	0.92	0.96	0.96	0.96	0.97	0.97	0.97
Adj. Flow (vph)	96	270	211	0	0	0	406	432	91	48	209	108
RTOR Reduction (vph)	0	0	75	0	0	0	0	8	0	0	52	0
Lane Group Flow (vph)	0	366	136	0	0	0	406	515	0	0	313	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	2
Parking (#/hr)									0			
Turn Type	Split		Prot				D.P+P			Perm		
Protected Phases	4	4	4				2	2 6			6	
Permitted Phases							6			6		
Actuated Green, G (s)		17.4	17.4				20.8	25.8			12.5	
Effective Green, g (s)		19.4	19.4				22.8	26.8			14.5	
Actuated g/C Ratio		0.31	0.31				0.37	0.43			0.23	
Clearance Time (s)		6.0	6.0				5.0				6.0	
Vehicle Extension (s)		3.0	3.0				3.0				3.0	
Lane Grp Cap (vph)		516	411				385	687			594	
v/s Ratio Prot		c0.22	0.10				c0.16	0.32				
v/s Ratio Perm							c0.23				0.12	
v/c Ratio		0.71	0.33				1.05	0.75			0.53	
Uniform Delay, d1		18.9	16.4				18.1	14.9			20.9	
Progression Factor		1.00	1.00				1.00	1.00			1.00	
Incremental Delay, d2		4.4	0.5				60.9	4.5			3.3	
Delay (s)		23.4	16.9				79.0	19.4			24.2	
Level of Service		C	B				E	B			C	
Approach Delay (s)		21.0			0.0			45.4			24.2	
Approach LOS		C			A			D			C	

Intersection Summary

HCM Average Control Delay	33.8	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.88				
Actuated Cycle Length (s)	62.2	Sum of lost time (s)		19.0	
Intersection Capacity Utilization	72.9%	ICU Level of Service		C	
Analysis Period (min)	15				

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø3
Lane Configurations													
Volume (vph)	32	351	468	131	232	66	289	243	107	93	283	16	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	10	12	12	10	12	12	10	16	12	12	12	
Storage Length (ft)	0		0	0		0	250		305	0		150	
Storage Lanes	0		1	1		0	1		1	0		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			No			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		3390			1736			677			1166		
Travel Time (s)		77.0			39.5			15.4			26.5		
Peak Hour Factor	0.92	0.92	0.92	0.79	0.79	0.79	0.84	0.84	0.84	0.91	0.91	0.91	
Heavy Vehicles (%)	2%	2%	2%	6%	6%	6%	4%	4%	4%	2%	2%	2%	
Parking (#/hr)			1			1				1			
Shared Lane Traffic (%)							10%						
Lane Group Flow (vph)	0	417	509	166	378	0	310	323	127	0	431	0	
Turn Type	Perm		pm+ov	D.P+P			Split		pt+ov	Split			
Protected Phases		1	2	7	1 7		2	2	2 7	4	4		3
Permitted Phases	1		1	1									
Detector Phase	1	1	2	7	1 7		2	2	2 7	4	4		
Switch Phase													
Minimum Initial (s)	4.0	4.0	4.0	4.0			4.0	4.0		4.0	4.0		4.0
Minimum Split (s)	13.0	13.0	20.0	8.0			20.0	20.0		20.0	20.0		30.0
Total Split (s)	37.0	37.0	34.0	13.0	50.0	0.0	34.0	34.0	47.0	45.0	45.0	0.0	30.0
Total Split (%)	23.3%	23.3%	21.4%	8.2%	31.4%	0.0%	21.4%	21.4%	29.6%	28.3%	28.3%	0.0%	19%
Yellow Time (s)	3.0	3.0	3.0	3.0			3.0	3.0		3.0	3.0		3.0
All-Red Time (s)	1.0	1.0	1.0	1.0			1.0	1.0		1.0	1.0		1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lead	Lag				Lag	Lag		Lag	Lag		Lead
Lead-Lag Optimize?	Yes	Yes	Yes				Yes	Yes		Yes	Yes		Yes
Recall Mode	None	None	None	None			None	None		None	None		None
v/c Ratio		4.96	0.83	1.14	0.78		0.97	1.04	0.24		0.89		
Control Delay		1816.9	47.3	155.7	55.9		98.5	113.7	5.1		69.7		
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0		
Total Delay		1816.9	47.3	155.7	55.9		98.5	113.7	5.1		69.7		
Queue Length 50th (ft)		~583	329	~108	266		266	282	0		332		
Queue Length 95th (ft)		#979	#750	#275	427		#534	#573	28		#697		
Internal Link Dist (ft)		3310			1656			597			1086		
Turn Bay Length (ft)							250		305				
Base Capacity (vph)		84	612	145	486		319	312	534		484		
Starvation Cap Reductn		0	0	0	0		0	0	0		0		
Spillback Cap Reductn		0	0	0	0		0	0	0		0		
Storage Cap Reductn		0	0	0	0		0	0	0		0		
Reduced v/c Ratio		4.96	0.83	1.14	0.78		0.97	1.04	0.24		0.89		

Intersection Summary

Area Type: CBD
Cycle Length: 159
Actuated Cycle Length: 141
Natural Cycle: 145
Control Type: Actuated-Uncoordinated
Description: WB defacto left recoded

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Bennington Street & Saratoga Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	32	351	468	131	232	66	289	243	107	93	283	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	10	12	12	10	16	12	12	12
Total Lost time (s)		4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		0.95	0.95	1.00		1.00	
Frt		1.00	0.85	1.00	0.97		1.00	1.00	0.85		0.99	
Flt Protected		1.00	1.00	0.95	1.00		0.95	0.99	1.00		0.99	
Satd. Flow (prot)		1558	1275	1533	1455		1484	1450	1584		1648	
Flt Permitted		0.23	1.00	0.12	1.00		0.95	0.99	1.00		0.99	
Satd. Flow (perm)		354	1275	194	1455		1484	1450	1584		1648	
Peak-hour factor, PHF	0.92	0.92	0.92	0.79	0.79	0.79	0.84	0.84	0.84	0.91	0.91	0.91
Adj. Flow (vph)	35	382	509	166	294	84	344	289	127	102	311	18
RTOR Reduction (vph)	0	0	0	0	6	0	0	0	92	0	1	0
Lane Group Flow (vph)	0	417	509	166	372	0	310	323	35	0	430	0
Heavy Vehicles (%)	2%	2%	2%	6%	6%	6%	4%	4%	4%	2%	2%	2%
Parking (#/hr)			1			1			1			
Turn Type	Perm		pm+ov	D.P+P			Split		pt+ov	Split		
Protected Phases		1	2	7	1 7		2	2	2 7	4	4	
Permitted Phases	1		1	1								
Actuated Green, G (s)		33.3	63.6	42.4	46.4		30.3	30.3	39.4		41.4	
Effective Green, g (s)		33.3	63.6	42.4	46.4		30.3	30.3	39.4		41.4	
Actuated g/C Ratio		0.23	0.44	0.30	0.32		0.21	0.21	0.27		0.29	
Clearance Time (s)		4.0	4.0	4.0			4.0	4.0			4.0	
Vehicle Extension (s)		3.0	3.0	3.0			3.0	3.0			3.0	
Lane Grp Cap (vph)		82	601	142	471		314	307	436		476	
v/s Ratio Prot			0.18	c0.07	0.26		0.21	c0.22	0.02		c0.26	
v/s Ratio Perm		c1.18	0.22	0.27								
v/c Ratio		5.09	0.85	1.17	0.79		0.99	1.05	0.08		0.90	
Uniform Delay, d1		55.0	35.5	45.1	44.0		56.3	56.5	38.5		49.0	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2		1865.3	10.7	128.1	8.6		46.9	65.7	0.1		20.3	
Delay (s)		1920.3	46.2	173.2	52.6		103.2	122.2	38.6		69.4	
Level of Service		F	D	F	D		F	F	D		E	
Approach Delay (s)		890.2			89.4			100.5			69.4	
Approach LOS		F			F			F			E	

Intersection Summary

HCM Average Control Delay	368.0	HCM Level of Service	F
HCM Volume to Capacity ratio	2.18		
Actuated Cycle Length (s)	143.3	Sum of lost time (s)	29.2
Intersection Capacity Utilization	93.2%	ICU Level of Service	F
Analysis Period (min)	15		

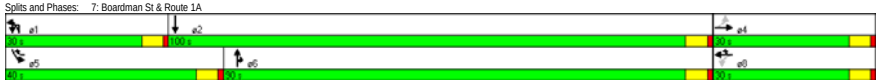
Description: WB defacto left recoded
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	34	3	48	182	15	201	26	40	1961	23	152	1591	11
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Width (ft)	10	11	12	12	10	10	12	11	11	11	11	11	12
Storage Length (ft)	130		0	0		250		400		500	380		0
Storage Lanes	1		0	0		1		1		1	1		0
Taper Length (ft)	25		25	25		25		25		25	25		25
Right Turn on Red			Yes			No				Yes			Yes
Link Speed (mph)		30			30				30			30	
Link Distance (ft)		537			1355				733			925	
Travel Time (s)		12.2			30.8				16.7			21.0	
Confl. Peds. (#/hr)										8			1
Peak Hour Factor	0.82	0.82	0.82	0.76	0.76	0.76	0.99	0.99	0.99	0.99	0.98	0.98	0.98
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	6%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	8	0
Shared Lane Traffic (%)													
Lane Group Flow (vph)	41	63	0	0	259	264	0	66	1981	23	155	1634	0
Turn Type	Perm			Perm		pt+ov	Prot	Prot		Prot	Prot		
Protected Phases		4			8	8 5	1	1	6	6	5	2	
Permitted Phases	4			8									
Detector Phase	4	4		8	8	8 5	1	1	6	6	5	2	
Switch Phase													
Minimum Initial (s)	10.0	10.0		10.0	10.0		8.0	8.0	20.0	20.0	8.0	20.0	
Minimum Split (s)	29.0	29.0		32.0	32.0		13.0	13.0	31.0	31.0	13.0	29.0	
Total Split (s)	30.0	30.0	0.0	30.0	30.0	70.0	30.0	30.0	90.0	90.0	40.0	100.0	0.0
Total Split (%)	18.8%	18.8%	0.0%	18.8%	18.8%	43.8%	18.8%	18.8%	56.3%	56.3%	25.0%	62.5%	0.0%
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag							Lead	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None		None	None		None	None	Min	Min	None	Min	
v/c Ratio	0.76	0.24			1.54	0.64		0.55	1.20	0.03	0.75	0.88	
Control Delay	126.8	16.6			309.5	47.8		81.4	127.2	5.3	81.9	28.0	
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	126.8	16.6			309.5	47.8		81.4	127.2	5.3	81.9	28.0	
Queue Length 50th (ft)	38	3			~346	211		62	~1205	0	144	652	
Queue Length 95th (ft)	#104	39			#449	246		116	#1466	14	224	#904	
Internal Link Dist (ft)		457			1275				653			845	
Turn Bay Length (ft)	130					250		400		500	380		
Base Capacity (vph)	54	260			168	533		247	1644	745	345	1848	
Starvation Cap Reductn	0	0			0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0			0	0		0	0	0	0	0	
Storage Cap Reductn	0	0			0	0		0	0	0	0	0	
Reduced v/c Ratio	0.76	0.24			1.54	0.50		0.27	1.20	0.03	0.45	0.88	

Intersection Summary

Area Type: Other
Cycle Length: 160
Actuated Cycle Length: 146.3
Natural Cycle: 150
Control Type: Semi Act-Uncoord
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman St & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	34	3	48	182	15	201	26	40	1961	23	152	1591	11
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Width	10	11	12	12	10	10	12	11	11	11	11	11	12
Total Lost time (s)	5.0	5.0			5.0	5.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.86			1.00	0.85		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00			0.96	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1314	1231			1347	1197		1386	2772	1240	1399	2751	
Flt Permitted	0.23	1.00			0.70	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	313	1231			982	1197		1386	2772	1240	1399	2751	
Peak-hour factor, PHF	0.82	0.82	0.82	0.76	0.76	0.76	0.99	0.99	0.99	0.99	0.98	0.98	0.98
Adj. Flow (vph)	41	4	59	239	20	264	26	40	1981	23	155	1623	11
RTOR Reduction (vph)	0	49	0	0	0	0	0	0	0	9	0	0	0
Lane Group Flow (vph)	41	14	0	0	259	264	0	66	1981	14	155	1634	0
Confl. Peds. (#/hr)										8			1
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	6%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	8	0
Turn Type	Perm			Perm		pt+ov	Prot	Prot		Prot	Prot		
Protected Phases		4			8	8 5	1	1	6	6	5	2	
Permitted Phases	4			8									
Actuated Green, G (s)	25.0	25.0			25.0	50.5		10.0	86.7	86.7	20.5	97.2	
Effective Green, g (s)	25.0	25.0			25.0	50.5		11.0	87.7	87.7	21.5	98.2	
Actuated g/C Ratio	0.17	0.17			0.17	0.34		0.07	0.60	0.60	0.15	0.67	
Clearance Time (s)	5.0	5.0			5.0			5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	2.5	2.5			2.5			2.0	5.0	5.0	2.0	5.0	
Lane Grp Cap (vph)	53	209			167	411		104	1652	739	204	1835	
v/s Ratio Prot		0.01				c0.22		0.05	c0.71	0.01	0.11	c0.59	
v/s Ratio Perm	0.13				c0.26								
v/c Ratio	0.77	0.07			1.55	0.64		0.63	1.20	0.02	0.76	0.89	
Uniform Delay, d1	58.4	51.3			61.1	40.7		66.1	29.7	12.2	60.4	20.1	
Progression Factor	1.00	1.00			1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	48.2	0.1			275.2	3.0		9.0	95.8	0.0	13.4	6.3	
Delay (s)	106.6	51.4			336.3	43.8		75.1	125.5	12.2	73.8	26.4	
Level of Service	F	D			F	D		E	F	B	E	C	
Approach Delay (s)		73.2			188.7				122.6			30.5	
Approach LOS		E			F				F			C	

Intersection Summary

HCM Average Control Delay	92.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	147.2	Sum of lost time (s)	13.0
Intersection Capacity Utilization	104.8%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBT	NBR	SBT	SBR	SEL2	SEL	SER	SER2
Lane Configurations															
Volume (vph)	9	213	12	845	391	92	62	568	1250	517	10	1	122	15	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	10	16	12	12	12	12	12	14	16	12	12	12	12	12
Storage Length (ft)	50		0	0		0			0		0		0	0	
Storage Lanes	1		1	2		0			1		0		1	0	
Taper Length (ft)	25		25	25		25			25		25		25	25	
Right Turn on Red			Yes				No		Yes						Yes
Link Speed (mph)		30			30			30		30			30		
Link Distance (ft)		485			572			480		673			302		
Travel Time (s)		11.0			13.0			10.9		15.3			6.9		
Peak Hour Factor	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.97	0.97	0.94	0.94	0.76	0.76	0.76	0.76
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	2%	3%	3%	3%	3%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	247	13	918	592	0	0	586	1289	561	0	0	183	0	0
Turn Type	Split		Prot	Split					custom			Split			
Protected Phases	4	4	4	8	8			2	2	6		12	12		
Permitted Phases									4 8 12						
Detector Phase	4	4	4	8	8			2	2	6		12	12		
Switch Phase															
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0	4.0		4.0	4.0		
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0			21.0	21.0	21.0		21.0	21.0		
Total Split (s)	35.0	35.0	35.0	80.0	80.0	0.0	0.0	70.0	70.0	70.0	0.0	30.0	30.0	0.0	0.0
Total Split (%)	16.3%	16.3%	16.3%	37.2%	37.2%	0.0%	0.0%	32.6%	32.6%	32.6%	0.0%	14.0%	14.0%	0.0%	0.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0	4.0		4.0	4.0		
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0			1.0	1.0	1.0		1.0	1.0		
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	0.0	0.0	-1.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag															
Lead-Lag Optimize?															
Recall Mode	None	None	None	None	None			Max	Max	Max		None	None		
v/c Ratio		0.71	0.07	0.74	0.92			0.51	0.77	0.43			0.85		
Control Delay		98.9	31.4	61.0	82.7			57.4	3.5	55.2			118.7		
Queue Delay		0.0	0.0	30.0	118.3			0.0	0.0	0.0			0.0		
Total Delay		98.9	31.4	91.0	200.9			57.4	3.5	55.2			118.7		
Queue Length 50th (ft)		174	0	556	764			344	0	320			247		
Queue Length 95th (ft)		230	25	666	#1042			427	0	397			296		
Internal Link Dist (ft)		405			492			400		593			222		
Turn Bay Length (ft)															
Base Capacity (vph)		496	279	1304	678			1156	1672	1306			229		
Starvation Cap Reductn		0	0	428	209			0	0	0			0		
Spillback Cap Reductn		0	0	0	0			0	0	0			0		
Storage Cap Reductn		0	0	0	0			0	0	0			0		
Reduced v/c Ratio		0.50	0.05	1.05	1.26			0.51	0.77	0.43			0.80		

Intersection Summary

Area Type: Other
Cycle Length: 215
Actuated Cycle Length: 201
Natural Cycle: 95
Control Type: Semi Act-Uncoord
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Winthrop Avenue & Route 16



Movement	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBT	NBR	SBT	SBR	SEL2	SEL	SER	SER2
Lane Configurations															
Volume (vph)	9	213	12	845	391	92	62	568	1250	517	10	1	122	15	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	16	12	12	12	12	12	14	16	12	12	12	12	12
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0	4.0	4.0			4.0		
Lane Util. Factor		0.95	1.00	0.97	1.00			0.95	1.00	0.95			1.00		
Frt		1.00	0.85	1.00	0.96			1.00	0.85	1.00			0.98		
Flt Protected		1.00	1.00	0.95	1.00			1.00	1.00	1.00			0.96		
Satd. Flow (prot)		3202	1729	3433	1784			3505	1672	3960			1756		
Flt Permitted		1.00	1.00	0.95	1.00			1.00	1.00	1.00			0.96		
Satd. Flow (perm)		3202	1729	3433	1784			3505	1672	3960			1756		
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.97	0.97	0.94	0.94	0.76	0.76	0.76	0.76
Adj. Flow (vph)	10	237	13	918	425	100	67	586	1289	550	11	1	161	20	1
RTOR Reduction (vph)	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	247	1	918	592	0	0	586	1289	561	0	0	183	0	0
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	2%	3%	3%	3%	3%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Turn Type	Split		Prot	Split					custom			Split			
Protected Phases	4	4	4	8	8			2	2	6		12	12		
Permitted Phases									4 8 12						
Actuated Green, G (s)		20.9	20.9	71.2	71.2			65.3	191.0	65.3			23.6		
Effective Green, g (s)		21.9	21.9	72.2	72.2			66.3	193.0	66.3			24.6		
Actuated g/C Ratio		0.11	0.11	0.36	0.36			0.33	0.96	0.33			0.12		
Clearance Time (s)		5.0	5.0	5.0	5.0			5.0	5.0	5.0			5.0		
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0	3.0	3.0			3.0		
Lane Grp Cap (vph)		349	188	1233	641			1156	1672	1306			215		
v/s Ratio Prot		0.08	0.00	0.27	c0.33			0.17	c0.25	0.14			0.10		
v/s Ratio Perm									0.52						
v/c Ratio		0.71	0.01	0.74	0.92			0.51	0.77	0.43			0.85		
Uniform Delay, d1		86.5	79.9	56.3	61.8			54.2	0.6	52.6			86.4		
Progression Factor		1.00	1.00	1.00	1.00			1.00	1.00	1.00			1.00		
Incremental Delay, d2		6.4	0.0	2.5	19.0			1.6	2.3	1.0			26.2		
Delay (s)		92.9	79.9	58.8	80.8			55.8	2.9	53.6			112.6		
Level of Service		F	E	E	F			E	A	D			F		
Approach Delay (s)		92.2			67.4			19.4		53.6			112.6		
Approach LOS		F			E			B		D			F		

Intersection Summary

HCM Average Control Delay	48.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	201.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	90.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations											
Volume (vph)	222	23	53	0	147	1076	297	241	229	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	16	12	12	12	12	12	12	12	12
Storage Length (ft)		0	0	0		0	115		200	0	0
Storage Lanes		1	1	0		2	1		1	0	0
Taper Length (ft)		25	25	25		25	25		25	25	25
Right Turn on Red			Yes			Yes			Yes		
Link Speed (mph)		30			30			30		30	
Link Distance (ft)		335			262			919		278	
Travel Time (s)		7.6			6.0			20.9		6.3	
Confl. Peds. (#/hr)	1					2	2				
Peak Hour Factor	0.87	0.87	0.87	0.91	0.91	0.91	0.88	0.88	0.88	0.92	0.92
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%
Shared Lane Traffic (%)	50%										
Lane Group Flow (vph)	127	154	61	0	162	1182	338	274	260	0	0
Turn Type	Split		Prot			Free	Prot		Prot		
Protected Phases	8	8	8		6		1	16	16		
Permitted Phases						Free					
Detector Phase	8	8	8		6		1	16	16		
Switch Phase											
Minimum Initial (s)	4.0	4.0	4.0		4.0		4.0				
Minimum Split (s)	20.0	20.0	20.0		20.0		8.0				
Total Split (s)	20.0	20.0	20.0	0.0	20.0	0.0	30.0	50.0	50.0	0.0	0.0
Total Split (%)	28.6%	28.6%	28.6%	0.0%	28.6%	0.0%	42.9%	71.4%	71.4%	0.0%	0.0%
Yellow Time (s)	3.0	3.0	3.0		3.0		3.0				
All-Red Time (s)	1.0	1.0	1.0		1.0		1.0				
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lag	Lag		Lead						
Lead-Lag Optimize?	Yes	Yes	Yes		Yes						
Recall Mode	None	None	None		Max		None				
v/c Ratio	0.42	0.25	0.16		0.14	0.75	0.60	0.10	0.21		
Control Delay	26.2	21.9	7.9		17.9	3.3	21.2	3.5	1.1		
Queue Delay	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		
Total Delay	26.2	21.9	7.9		17.9	3.3	21.2	3.5	1.1		
Queue Length 50th (ft)	40	24	0		20	0	91	12	0		
Queue Length 95th (ft)	96	52	25		53	0	176	30	18		
Internal Link Dist (ft)		255			182			839		198	
Turn Bay Length (ft)							115		200		
Base Capacity (vph)	518	1036	618		1138	1579	925	2638	1248		
Starvation Cap Reductn	0	0	0		0	0	0	0	0		
Spillback Cap Reductn	0	0	0		0	0	0	0	0		
Storage Cap Reductn	0	0	0		0	0	0	0	0		
Reduced v/c Ratio	0.25	0.15	0.10		0.14	0.75	0.37	0.10	0.21		

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 53.5
Natural Cycle: 60
Control Type: Actuated-Uncoordinated

Splits and Phases: 10: State Road & Ocean Avenue



Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations											
Volume (vph)	222	23	53	0	147	1076	297	241	229	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	16	12	12	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0		
Lane Util. Factor	0.91	0.91	1.00		0.95	1.00	1.00	0.95	1.00		
Frpb, ped/bikes	1.00	1.00	1.00		1.00	0.99	1.00	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00		
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85		
Flt Protected	0.95	0.95	1.00		1.00	1.00	0.95	1.00	1.00		
Satd. Flow (prot)	1626	3253	1812		3574	1579	1787	3574	1599		
Flt Permitted	0.95	0.95	1.00		1.00	1.00	0.95	1.00	1.00		
Satd. Flow (perm)	1626	3253	1812		3574	1579	1787	3574	1599		
Peak-hour factor, PHF	0.87	0.87	0.87	0.91	0.91	0.91	0.88	0.88	0.88	0.92	0.92
Adj. Flow (vph)	255	26	61	0	162	1182	338	274	260	0	0
RTOR Reduction (vph)	0	0	52	0	0	0	0	0	78	0	0
Lane Group Flow (vph)	127	154	9	0	162	1182	338	274	182	0	0
Confl. Peds. (#/hr)	1					2	2				
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%
Turn Type	Split		Prot			Free	Prot		Prot		
Protected Phases	8	8	8		6		1	16	16		
Permitted Phases						Free					
Actuated Green, G (s)	8.1	8.1	8.1		17.0	54.0	16.9	37.9	37.9		
Effective Green, g (s)	8.1	8.1	8.1		17.0	54.0	16.9	37.9	37.9		
Actuated g/C Ratio	0.15	0.15	0.15		0.31	1.00	0.31	0.70	0.70		
Clearance Time (s)	4.0	4.0	4.0		4.0		4.0				
Vehicle Extension (s)	3.0	3.0	3.0		3.0		3.0				
Lane Grp Cap (vph)	244	488	272		1125	1579	559	2508	1122		
v/s Ratio Prot	0.08	0.05	0.01		0.05		0.19	0.08	0.11		
v/s Ratio Perm						c0.75					
v/c Ratio	0.52	0.32	0.03		0.14	0.75	0.60	0.11	0.16		
Uniform Delay, d1	21.2	20.5	19.6		13.3	0.0	15.7	2.6	2.7		
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00		
Incremental Delay, d2	2.0	0.4	0.1		0.3	3.3	1.9	0.0	0.1		
Delay (s)	23.2	20.9	19.7		13.5	3.3	17.6	2.6	2.8		
Level of Service	C	C	B		B	A	B	A	A		
Approach Delay (s)		21.5			4.5			8.5		0.0	
Approach LOS		C			A			A		A	

Intersection Summary

HCM Average Control Delay	8.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	54.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	45.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	100	7	8	0	0	0	0	2031	0	0	1738	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	16	12	12	12	11	11	11	11	11	11
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		122			363			405			225	
Travel Time (s)		2.8			8.3			9.2			5.1	
Peak Hour Factor	0.84	0.84	0.84	0.92	0.92	0.92	0.98	0.98	0.98	0.97	0.97	0.97
Heavy Vehicles (%)	24%	24%	24%	2%	2%	2%	6%	6%	6%	6%	6%	6%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	137	0	0	0	0	0	2072	0	0	1792	0
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Detector Phase	4	4						2			6	
Switch Phase												
Minimum Initial (s)	4.0	4.0						4.0			4.0	
Minimum Split (s)	14.0	14.0						27.0			27.0	
Total Split (s)	36.0	36.0	0.0	0.0	0.0	0.0	0.0	55.0	0.0	0.0	55.0	0.0
Total Split (%)	39.6%	39.6%	0.0%	0.0%	0.0%	0.0%	0.0%	60.4%	0.0%	0.0%	60.4%	0.0%
Yellow Time (s)	4.0	4.0						5.0			5.0	
All-Red Time (s)	2.0	2.0						2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	4.0	4.0	4.0	4.0	4.0	7.0	4.0	4.0	7.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None						Max			Max	
v/c Ratio		0.54						0.94			0.82	
Control Delay		35.0						22.9			13.7	
Queue Delay		0.0						0.0			0.0	
Total Delay		35.0						22.9			13.7	
Queue Length 50th (ft)		55						368			258	
Queue Length 95th (ft)		98						#687			445	
Internal Link Dist (ft)		42			283			325			145	
Turn Bay Length (ft)												
Base Capacity (vph)		686						2198			2198	
Starvation Cap Reductn		0						0			0	
Spillback Cap Reductn		0						0			0	
Storage Cap Reductn		0						0			0	
Reduced v/c Ratio		0.20						0.94			0.82	

Intersection Summary	
Area Type:	Other
Cycle Length: 91	
Actuated Cycle Length: 72.4	
Natural Cycle: 65	
Control Type: Semi Act-Uncoord	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 12: Jughandle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	100	7	8	0	0	0	0	2031	0	0	1738	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	16	16	16	12	12	12	11	11	11	11	11	11
Total Lost time (s)		6.0						7.0			7.0	
Lane Util. Factor		1.00						0.95			0.95	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1648						3292			3292	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1648						3292			3292	
Peak-hour factor, PHF	0.84	0.84	0.84	0.92	0.92	0.92	0.98	0.98	0.98	0.97	0.97	0.97
Adj. Flow (vph)	119	8	10	0	0	0	0	2072	0	0	1792	0
RTOR Reduction (vph)	0	4	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	133	0	0	0	0	0	2072	0	0	1792	0
Heavy Vehicles (%)	24%	24%	24%	2%	2%	2%	6%	6%	6%	6%	6%	6%
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Actuated Green, G (s)		11.1						48.4			48.4	
Effective Green, g (s)		11.1						48.4			48.4	
Actuated g/C Ratio		0.15						0.67			0.67	
Clearance Time (s)		6.0						7.0			7.0	
Vehicle Extension (s)		3.0						3.0			3.0	
Lane Grp Cap (vph)		252						2198			2198	
v/s Ratio Prot								c0.63			0.54	
v/s Ratio Perm		0.08										
v/c Ratio		0.53						0.94			0.82	
Uniform Delay, d1		28.3						10.8			8.8	
Progression Factor		1.00						1.00			1.00	
Incremental Delay, d2		2.0						9.8			3.5	
Delay (s)		30.3						20.6			12.3	
Level of Service		C						C			B	
Approach Delay (s)		30.3			0.0			20.6			12.3	
Approach LOS		C			A			C			B	

Intersection Summary					
HCM Average Control Delay	17.2	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.87				
Actuated Cycle Length (s)	72.5	Sum of lost time (s)		13.0	
Intersection Capacity Utilization	73.4%	ICU Level of Service		D	
Analysis Period (min)	15				
c Critical Lane Group					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Volume (vph)	18	233	48	66	206	14	13	117	1136	71	29	357	1067	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	50		0		150		0		800		0
Storage Lanes	1		0	1		0		1		0		1		0
Taper Length (ft)	25		25	25		25		25		25		25		25
Right Turn on Red			Yes			Yes				Yes				Yes
Link Speed (mph)		30			30				30				30	
Link Distance (ft)		1202			2003				910				1421	
Travel Time (s)		27.3			45.5				20.7				32.3	
Confl. Peds. (#/hr)	17		14	14		17				2				8
Confl. Bikes (#/hr)			1			1								
Peak Hour Factor	0.88	0.88	0.88	0.94	0.94	0.94	0.92	0.92	0.92	0.92	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)														
Lane Group Flow (vph)	20	320	0	70	234	0	0	141	1312	0	0	407	1128	0
Turn Type	Perm			Perm				Prot				Prot		
Protected Phases		4			8			1	6			5	2	
Permitted Phases	4			8										
Detector Phase	4	4		8	8			1	6			5	2	
Switch Phase														
Minimum Initial (s)	4.0	4.0		4.0	4.0			4.0	4.0			4.0	4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0			31.0	11.0			11.0	11.0	
Total Split (s)	36.0	36.0	0.0	36.0	36.0	0.0	0.0	36.0	56.0	0.0	0.0	36.0	56.0	0.0
Total Split (%)	28.1%	28.1%	0.0%	28.1%	28.1%	0.0%	0.0%	28.1%	43.8%	0.0%	0.0%	28.1%	43.8%	0.0%
Yellow Time (s)	4.0	4.0		4.0	4.0			4.0	4.0			4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0			2.0	2.0			2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	4.0	6.0	6.0	4.0	4.0	6.0	6.0	4.0	4.0	6.0	6.0	4.0
Lead/Lag								Lead	Lag			Lead	Lag	
Lead-Lag Optimize?								Yes	Yes			Yes	Yes	
Recall Mode	None	None		None	None			None	Max			None	Max	
v/c Ratio	0.13	0.85		0.80	0.61			no cap	0.93			no cap	0.80	
Control Delay	41.6	67.4		98.9	50.9				48.2				38.0	
Queue Delay	0.0	0.0		0.0	0.0				0.0				0.0	
Total Delay	41.6	67.4		98.9	50.9			Error	48.2			Error	38.0	
Queue Length 50th (ft)	13	242		54	169			~237	531			~685	421	
Queue Length 95th (ft)	36	343		#136	254			#381	#712			#905	530	
Internal Link Dist (ft)		1122			1923				830				1341	
Turn Bay Length (ft)	50			50				150				800		
Base Capacity (vph)	179	440		104	454			1	1409			1	1418	
Starvation Cap Reductn	0	0		0	0			0	0			0	0	
Spillback Cap Reductn	0	0		0	0			0	0			0	0	
Storage Cap Reductn	0	0		0	0			0	0			0	0	
Reduced v/c Ratio	0.11	0.73		0.67	0.52			141.00	0.93			407.00	0.80	

Intersection Summary

Area Type: Other
Cycle Length: 128
Actuated Cycle Length: 123.6
Natural Cycle: 90
Control Type: Semi Act-Uncoord
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 15: Revere St & Route 60



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Volume (vph)	18	233	48	66	206	14	13	117	1136	71	29	357	1067	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	0.95			1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00			1.00	1.00			1.00	1.00	
Flpb, ped/bikes	0.99	1.00		0.99	1.00			1.00	1.00			1.00	1.00	
Frt	1.00	0.97		1.00	0.99			1.00	0.99			1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00			0.95	1.00	
Satd. Flow (prot)	1726	1787		1771	1859			1752	3469			1752	3502	
Flt Permitted	0.40	1.00		0.23	1.00			0.13	1.00			0.13	1.00	
Satd. Flow (perm)	736	1787		426	1859			246	3469			246	3502	
Peak-hour factor, PHF	0.88	0.88	0.88	0.94	0.94	0.94	0.92	0.92	0.92	0.92	0.95	0.95	0.95	0.95
Adj. Flow (vph)	20	265	55	70	219	15	14	127	1235	77	31	376	1123	5
RTOR Reduction (vph)	0	6	0	0	2	0	0	0	4	0	0	0	0	0
Lane Group Flow (vph)	20	314	0	70	232	0	0	141	1308	0	0	407	1128	0
Confl. Peds. (#/hr)	17		14	14		17				2				8
Confl. Bikes (#/hr)			1			1								
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Perm			Perm				Prot				Prot		
Protected Phases		4			8			1	6			5	2	
Permitted Phases	4			8										
Actuated Green, G (s)	25.5	25.5		25.5	25.5			30.0	50.1			30.0	50.1	
Effective Green, g (s)	25.5	25.5		25.5	25.5			30.0	50.1			30.0	50.1	
Actuated g/C Ratio	0.21	0.21		0.21	0.21			0.24	0.41			0.24	0.41	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			3.0	3.0	
Lane Grp Cap (vph)	152	369		88	384			60	1406			60	1420	
v/s Ratio Prot		c0.18			0.12				c0.38				0.32	
v/s Ratio Perm	0.03			0.16				0.57				c1.65		
v/c Ratio	0.13	0.85		0.80	0.60			2.35	0.93			6.78	0.79	
Uniform Delay, d1	40.0	47.2		46.6	44.5			46.8	35.1			46.8	32.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00			1.00	1.00	
Incremental Delay, d2	0.4	16.8		37.6	2.7			655.9	12.3			2637.2	4.7	
Delay (s)	40.4	64.0		84.2	47.1			702.7	47.4			2684.0	36.9	
Level of Service	D	E		F	D			F	D			F	D	
Approach Delay (s)		62.6			55.7				111.0				738.8	
Approach LOS		E			E				F				F	

Intersection Summary

HCM Average Control Delay	367.2	HCM Level of Service	F
HCM Volume to Capacity ratio	2.58		
Actuated Cycle Length (s)	123.6	Sum of lost time (s)	18.0
Intersection Capacity Utilization	94.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

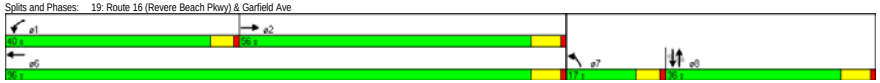
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1307	156	352	1496	6	267	275	140	170	180	143
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	10	10	10	11	11	12	12	12	12
Storage Length (ft)	0		0	200		0	300		50	0		80
Storage Lanes	0		0	1		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			No			No
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2232			2756			1675			1148	
Travel Time (s)		50.7			62.6			38.1			26.1	
Confl. Peds. (#/hr)	6					6	5		30	30		5
Peak Hour Factor	0.98	0.98	0.98	0.93	0.93	0.93	0.86	0.86	0.86	0.96	0.96	0.96
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	2%	2%	2%	1%	1%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1493	0	378	1615	0	310	320	163	177	188	149
Turn Type				Prot			pm+pt		Perm	Perm		Perm
Protected Phases		2		1	6		7	8			8	
Permitted Phases							8		8	8		8
Detector Phase		2		1	6		7	8	8	8	8	8
Switch Phase												
Minimum Initial (s)		15.0		8.0	15.0		8.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)		55.0		13.0	21.0		13.0	16.0	16.0	16.0	16.0	16.0
Total Split (s)	0.0	56.0	0.0	40.0	96.0	0.0	17.0	36.0	36.0	36.0	36.0	36.0
Total Split (%)	0.0%	37.6%	0.0%	26.8%	64.4%	0.0%	11.4%	24.2%	24.2%	24.2%	24.2%	24.2%
Yellow Time (s)		5.0		4.0	5.0		4.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)		1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	5.0	6.0	4.0	5.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag		Lag		Lead			Lead	Lag	Lag	Lag	Lag	Lag
Lead-Lag Optimize?								Yes	Yes	Yes	Yes	Yes
Recall Mode		Max		None	None		None	None	None	None	None	None
v/c Ratio		0.92		0.98	0.57		0.99	0.88	0.54	2.46	0.50	0.47
Control Delay		57.6		98.2	18.8		94.5	82.9	61.0	720.3	58.0	58.2
Queue Delay		0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		57.6		98.2	18.8		94.5	82.9	61.0	720.3	58.0	58.2
Queue Length 50th (ft)		507		369	331		250	305	144	~284	164	129
Queue Length 95th (ft)		#580		#584	375		#428	#441	212	#445	246	204
Internal Link Dist (ft)		2152			2676			1595			1068	
Turn Bay Length (ft)				200			300		50			80
Base Capacity (vph)		1617		384	2836		314	363	301	72	379	316
Starvation Cap Reductn		0		0	0		0	0	0	0	0	0
Spillback Cap Reductn		0		0	0		0	0	0	0	0	0
Storage Cap Reductn		0		0	0		0	0	0	0	0	0
Reduced v/c Ratio		0.92		0.98	0.57		0.99	0.88	0.54	2.46	0.50	0.47

Intersection Summary

Area Type: Other
Cycle Length: 149
Actuated Cycle Length: 149
Natural Cycle: 150
Control Type: Semi Act-Uncoord
Description: HAS EXCL PED PHASE

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 19: Route 16 (Revere Beach Pkwy) & Garfield Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1307	156	352	1496	6	267	275	140	170	180	143
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	10	10	10	11	11	12	12	12	12
Total Lost time (s)		6.0		5.0	6.0		5.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor		0.91		1.00	0.91		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes		1.00		1.00	1.00		1.00	1.00	0.94	1.00	1.00	0.98
Flpb, ped/bikes		1.00		1.00	1.00		1.00	1.00	1.00	0.98	1.00	1.00
Frt		0.98		1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		4790		1636	4697		1708	1801	1495	1753	1881	1568
Flt Permitted		1.00		0.95	1.00		0.47	1.00	1.00	0.19	1.00	1.00
Satd. Flow (perm)		4790		1636	4697		847	1801	1495	358	1881	1568
Peak-hour factor, PHF	0.98	0.98	0.98	0.93	0.93	0.93	0.86	0.86	0.86	0.96	0.96	0.96
Adj. Flow (vph)	0	1334	159	378	1609	6	310	320	163	177	188	149
RTOR Reduction (vph)	0	10	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1483	0	378	1615	0	310	320	163	177	188	149
Confl. Peds. (#/hr)	6					6	5		30	30		5
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	2%	2%	2%	1%	1%	1%
Turn Type				Prot			pm+pt		Perm	Perm		Perm
Protected Phases		2		1	6		7	8			8	
Permitted Phases							8		8	8		8
Actuated Green, G (s)		50.0		35.0	90.0		42.0	30.0	30.0	30.0	30.0	30.0
Effective Green, g (s)		50.0		35.0	90.0		42.0	30.0	30.0	30.0	30.0	30.0
Actuated g/C Ratio		0.34		0.23	0.60		0.28	0.20	0.20	0.20	0.20	0.20
Clearance Time (s)		6.0		5.0	6.0		5.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)		4.0		1.0	4.0		1.0	8.0	8.0	8.0	8.0	8.0
Lane Grp Cap (vph)		1607		384	2837		308	363	301	72	379	316
v/s Ratio Prot		c0.31		c0.23	0.34		c0.08	0.18			0.10	
v/s Ratio Perm							0.20		0.11	c0.49		0.10
v/c Ratio		0.92		0.98	0.57		1.01	0.88	0.54	2.46	0.50	0.47
Uniform Delay, d1		47.6		56.7	17.8		52.3	57.8	53.3	59.5	52.8	52.5
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		10.3		41.4	0.3		52.9	25.0	6.4	696.0	4.3	4.7
Delay (s)		58.0		98.1	18.1		105.2	82.8	59.7	755.5	57.1	57.2
Level of Service		E		F	B		F	F	E	F	E	E
Approach Delay (s)		58.0			33.3			86.8			297.6	
Approach LOS		E			C			F			F	

Intersection Summary

HCM Average Control Delay	78.2	HCM Level of Service	E
HCM Volume to Capacity ratio	1.31		
Actuated Cycle Length (s)	149.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	91.4%	ICU Level of Service	F
Analysis Period (min)	15		

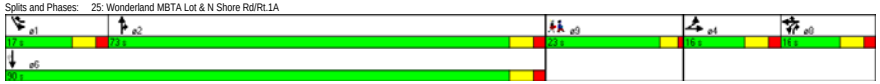
Description: HAS EXCL PED PHASE
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations													
Volume (vph)	0	0	0	67	0	356	0	1371	48	73	972	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		0	0		0	0		175	370		50	
Storage Lanes	1		0	1		1	0		1	1		1	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		452			461			392			1885		
Travel Time (s)		10.3			10.5			8.9			42.8		
Peak Hour Factor	0.92	0.92	0.92	0.73	0.73	0.73	0.96	0.96	0.96	0.92	0.92	0.92	
Heavy Vehicles (%)	2%	2%	2%	5%	5%	5%	1%	1%	1%	2%	2%	2%	
Shared Lane Traffic (%)	0%			10%		49%							
Lane Group Flow (vph)	0	0	0	83	248	249	0	1428	50	79	1057	0	
Turn Type	Split			Split		pt+ov			pt+ov	Prot		Perm	
Protected Phases	4	4		8	8	1 8		2	2 8	1	6		9
Permitted Phases												6	
Detector Phase	4	4		8	8	1 8		2	2 8	1	6	6	
Switch Phase													
Minimum Initial (s)	5.0	5.0		5.0	5.0			10.0		6.0	10.0	10.0	5.0
Minimum Split (s)	11.0	11.0		11.0	11.0			16.0		12.0	16.0	16.0	23.0
Total Split (s)	16.0	16.0	0.0	16.0	16.0	33.0	0.0	73.0	89.0	17.0	90.0	90.0	23.0
Total Split (%)	11.0%	11.0%	0.0%	11.0%	11.0%	22.8%	0.0%	50.3%	61.4%	11.7%	62.1%	62.1%	16%
Yellow Time (s)	4.0	4.0		4.0	4.0			4.0		4.0	4.0	4.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0			2.0		2.0	2.0	2.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0	4.0	6.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	
Lead/Lag								Lag		Lead			
Lead-Lag Optimize?													
Recall Mode	None	None		None	None			C-Min		None	C-Min	C-Min	None
v/c Ratio				0.78	0.79	0.52		0.66	0.05	0.55	0.41		
Control Delay				107.8	26.8	9.5		23.1	3.0	65.9	15.1		
Queue Delay				0.0	0.0	0.0		0.0	0.0	0.0	0.0		
Total Delay				107.8	26.8	9.5		23.1	3.0	65.9	15.1		
Queue Length 50th (ft)				82	8	0		493	4	78	243		
Queue Length 95th (ft)				#121	36	21		623	12	m114	268		
Internal Link Dist (ft)		372			381			312			1805		
Turn Bay Length (ft)									175	370			
Base Capacity (vph)				113	319	479		2152	1095	156	2566		
Starvation Cap Reductn				0	0	0		0	0	0	0		
Spillback Cap Reductn				0	0	0		0	0	0	0		
Storage Cap Reductn				0	0	0		0	0	0	0		
Reduced v/c Ratio				0.73	0.78	0.52		0.66	0.05	0.51	0.41		

Intersection Summary

Area Type: Other
Cycle Length: 145
Actuated Cycle Length: 145
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 100
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 25: Wonderland MBTA Lot & N Shore Rd/Rt.1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	67	0	356	0	1371	48	73	972	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0	6.0		6.0	6.0	6.0	6.0	
Lane Util. Factor				0.95	0.91	0.95		0.95	1.00	1.00	0.95	
Frt				1.00	0.86	0.85		1.00	0.85	1.00	1.00	
Flt Protected				0.95	1.00	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)				1633	1406	1461		3574	1599	1770	3539	
Flt Permitted				0.95	1.00	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (perm)				1633	1406	1461		3574	1599	1770	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.73	0.73	0.73	0.96	0.96	0.96	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	92	0	488	0	1428	50	79	1057	0
RTOR Reduction (vph)	0	0	0	0	223	202	0	0	9	0	0	0
Lane Group Flow (vph)	0	0	0	83	25	47	0	1428	41	79	1057	0
Heavy Vehicles (%)	2%	2%	2%	5%	5%	5%	1%	1%	1%	2%	2%	2%
Turn Type	Split			Split		pt+ov			pt+ov	Prot		Perm
Protected Phases	4	4		8	8	1 8		2	2 8	1	6	
Permitted Phases												6
Actuated Green, G (s)				9.5	9.5	27.3		86.5	96.0	11.8	104.3	
Effective Green, g (s)				9.5	9.5	27.3		86.5	96.0	11.8	104.3	
Actuated g/C Ratio				0.07	0.07	0.19		0.60	0.66	0.08	0.72	
Clearance Time (s)				6.0	6.0			6.0		6.0	6.0	
Vehicle Extension (s)				2.0	2.0			3.0		3.0	3.0	
Lane Grp Cap (vph)				107	92	275		2132	1059	144	2546	
v/s Ratio Prot				c0.05	0.02	0.03		c0.40	0.03	c0.04	0.30	
v/s Ratio Perm												
v/c Ratio				0.78	0.27	0.17		0.67	0.04	0.55	0.42	
Uniform Delay, d1				66.7	64.4	49.4		19.7	8.5	64.0	8.1	
Progression Factor				1.00	1.00	1.00		1.00	1.00	0.87	1.67	
Incremental Delay, d2				26.7	0.6	0.3		1.7	0.0	3.1	0.4	
Delay (s)				93.4	65.0	49.6		21.3	8.5	59.1	13.9	
Level of Service				F	E	D		C	A	E	B	
Approach Delay (s)		0.0			62.5			20.9			17.1	
Approach LOS		A			E			C			B	

Intersection Summary

HCM Average Control Delay	27.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	37.2
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

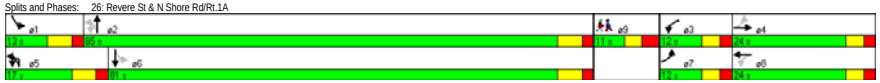
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations														
Volume (vph)	254	129	65	19	218	49	1	287	1501	20	38	880	230	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		0	80		0		200		0	75		0	
Storage Lanes	1		0	1		0		1		0	1		0	
Taper Length (ft)	25		25	25		25		25		25	25		25	
Right Turn on Red			Yes			Yes				Yes			Yes	
Link Speed (mph)		30			30				30			30		
Link Distance (ft)		2000			713				1885			1623		
Travel Time (s)		45.5			16.2				42.8			36.9		
Confl. Bikes (#/hr)			1			3								
Peak Hour Factor	0.79	0.79	0.79	0.80	0.80	0.80	0.90	0.90	0.90	0.90	0.89	0.89	0.89	
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	2%	2%	2%	2%	1%	1%	1%	
Bus Blockages (#/hr)	0	10	0	0	0	0	0	0	0	0	0	0	0	
Shared Lane Traffic (%)														
Lane Group Flow (vph)	322	245	0	24	333	0	0	320	1690	0	43	1247	0	
Turn Type	pm+pt			pm+pt			pm+pt	pm+pt			pm+pt			
Protected Phases	7	4		3	8		5	5	2		1	6		9
Permitted Phases	4			8			2	2			6			
Detector Phase	7	4		3	8		5	5	2		1	6		
Switch Phase														
Minimum Initial (s)	6.0	10.0		6.0	10.0		6.0	6.0	30.0		6.0	30.0		4.0
Minimum Split (s)	11.0	15.0		11.0	15.0		12.0	12.0	36.0		12.0	36.0		27.0
Total Split (s)	12.0	24.0	0.0	12.0	24.0	0.0	17.0	17.0	85.0	0.0	13.0	81.0	0.0	11.0
Total Split (%)	8.3%	16.6%	0.0%	8.3%	16.6%	0.0%	11.7%	11.7%	58.6%	0.0%	9.0%	55.9%	0.0%	8%
Yellow Time (s)	3.0	3.0		3.0	3.0		4.0	4.0	4.0		4.0	4.0		3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0		2.0	2.0		3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lead	Lag		Lead	Lag		
Lead-Lag Optimize?														
Recall Mode	None	None		None	None		None	None	C-Min		None	C-Min		None
v/c Ratio	2.44	0.83		0.16	1.35			1.39	0.88		0.32	0.72		
Control Delay	689.8	78.7		48.1	226.3			228.2	27.4		17.3	30.2		
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0		
Total Delay	689.8	78.7		48.1	226.3			228.2	27.4		17.3	30.2		
Queue Length 50th (ft)	~468	223		18	~408			~308	314		14	443		
Queue Length 95th (ft)	#570	#338		39	#513			m#508	547		30	514		
Internal Link Dist (ft)		1920			633				1805			1543		
Turn Bay Length (ft)				80				200			75			
Base Capacity (vph)	132	294		160	247			230	1926		140	1807		
Starvation Cap Reductn	0	0		0	0			0	0		0	0		
Spillback Cap Reductn	0	0		0	0			0	0		0	0		
Storage Cap Reductn	0	0		0	0			0	0		0	0		
Reduced v/c Ratio	2.44	0.83		0.15	1.35			1.39	0.88		0.31	0.69		

Intersection Summary

Area Type: Other
Cycle Length: 145
Actuated Cycle Length: 145
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 145
Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 26: Revere St & N Shore Rd/Rt.1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	254	129	65	19	218	49	1	287	1501	20	38	880	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.97			1.00	1.00		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1691		1805	1842			1770	3532		1787	3463	
Flt Permitted	0.17	1.00		0.29	1.00			0.10	1.00		0.06	1.00	
Satd. Flow (perm)	308	1691		558	1842			181	3532		108	3463	
Peak-hour factor, PHF	0.79	0.79	0.79	0.80	0.80	0.80	0.90	0.90	0.90	0.90	0.89	0.89	0.89
Adj. Flow (vph)	322	163	82	24	272	61	1	319	1668	22	43	989	258
RTOR Reduction (vph)	0	12	0	0	5	0	0	0	0	0	0	17	0
Lane Group Flow (vph)	322	233	0	24	328	0	0	320	1690	0	43	1230	0
Confl. Bikes (#/hr)			1			3							
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	2%	2%	2%	2%	1%	1%	1%
Bus Blockages (#/hr)	0	10	0	0	0	0	0	0	0	0	0	0	0
Turn Type	pm+pt			pm+pt			pm+pt	pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	5	2		1	6	
Permitted Phases	4			8			2	2			6		
Actuated Green, G (s)	31.4	24.2		25.0	21.0			86.5	75.5		75.3	69.9	
Effective Green, g (s)	31.4	24.2		25.0	21.0			86.5	75.5		75.3	69.9	
Actuated g/C Ratio	0.22	0.17		0.17	0.14			0.60	0.52		0.52	0.48	
Clearance Time (s)	5.0	5.0		5.0	5.0			6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	139	282		131	267			229	1839		119	1669	
v/s Ratio Prot	c0.11	0.14		0.01	0.18			c0.11	0.48		0.01	0.36	
v/s Ratio Perm	c0.39			0.03				c0.73			0.18		
v/c Ratio	2.32	0.83		0.18	1.23			1.40	0.92		0.36	0.74	
Uniform Delay, d1	54.2	58.4		50.7	62.0			33.9	31.9		29.0	30.2	
Progression Factor	1.00	1.00		1.00	1.00			1.53	0.76		1.00	1.00	
Incremental Delay, d2	614.4	17.0		0.2	131.0			198.2	7.2		1.9	2.9	
Delay (s)	668.6	75.4		51.0	193.0			250.2	31.5		30.9	33.1	
Level of Service	F	E		D	F			F	C		C	C	
Approach Delay (s)		412.3			183.5				66.3			33.0	
Approach LOS		F			F				E			C	

Intersection Summary

HCM Average Control Delay	112.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.73		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	35.9
Intersection Capacity Utilization	94.5%	ICU Level of Service	F
Analysis Period (min)	15		

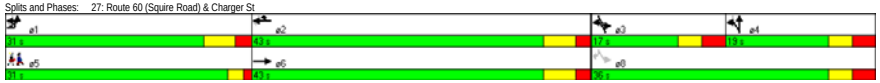
c Critical Lane Group

Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø5	ø8
Lane Configurations															
Volume (vph)	5	153	1495	0	0	1251	166	40	78	33	228	0	115		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)		400		0	0		50	0		0	0		125		
Storage Lanes		1		0	0		1	1		0	1		1		
Taper Length (ft)		25		25	25		25	25		25	25		25		
Right Turn on Red				Yes			Yes			Yes			Yes		
Link Speed (mph)			30			30			30			30			
Link Distance (ft)			930			2104			1965			1139			
Travel Time (s)			21.1			47.8			44.7			25.9			
Confl. Peds. (#/hr)													10		
Confl. Bikes (#/hr)										1					
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	0.84	0.84	0.84	0.81	0.81	0.81		
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%		
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	166	1574	0	0	1317	166	48	132	0	281	0	142		
Turn Type	Prot	Prot					Prot	Prot			custom		custom		
Protected Phases		1	6			2	2	3 4	4		3			5	8
Permitted Phases											8		1 2 4 8		
Detector Phase	1	1	6			2	2	3 4	4		3		1 2 4 8		
Switch Phase															
Minimum Initial (s)	6.0	6.0	20.0			20.0	20.0		6.0		6.0			4.0	6.0
Minimum Split (s)	12.0	12.0	26.0			26.0	26.0		12.0		12.0			30.0	20.0
Total Split (s)	31.0	31.0	43.0	0.0	0.0	43.0	43.0	36.0	19.0	0.0	17.0	0.0	129.0	31.0	36.0
Total Split (%)	28.2%	28.2%	39.1%	0.0%	0.0%	39.1%	39.1%	32.7%	17.3%	0.0%	15.5%	0.0%	117.3%	28%	33%
Yellow Time (s)	4.0	4.0	4.0			4.0	4.0		3.0		3.0			2.0	3.0
All-Red Time (s)	2.0	2.0	2.0			2.0	2.0		3.0		3.0			1.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	6.0	6.0	6.0	4.0	4.0	6.0	6.0	6.0	6.0	4.0	6.0	4.0	6.0		
Lead/Lag	Lead	Lead	Lag			Lag	Lag		Lag		Lead			Lead	
Lead-Lag Optimize?															
Recall Mode	None	None	C-Min			C-Min	C-Min		None		None			None	None
v/c Ratio		0.66	0.67			0.61	0.24	0.10	0.66		0.90		0.09		
Control Delay		43.7	35.5			26.6	15.9	30.9	57.7		69.4		0.1		
Queue Delay		0.0	0.0			0.0	0.0	0.0	0.0		0.0		0.0		
Total Delay		43.7	35.5			26.6	15.9	30.9	57.7		69.4		0.1		
Queue Length 50th (ft)		121	238			257	49	26	79		172		0		
Queue Length 95th (ft)		m156	490			340	106	52	132		#276		0		
Internal Link Dist (ft)			850			2024			1885			1059			
Turn Bay Length (ft)		400					50						125		
Base Capacity (vph)		402	2334			2169	705	513	228		311		1558		
Starvation Cap Reductn		0	0			0	0	0	0		0		0		
Spillback Cap Reductn		0	0			0	0	0	0		0		0		
Storage Cap Reductn		0	0			0	0	0	0		0		0		
Reduced v/c Ratio		0.41	0.67			0.61	0.24	0.09	0.58		0.90		0.09		

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 27: Route 60 (Squire Road) & Charger St



Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	5	153	1495	0	0	1251	166	40	78	33	228	0	115
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0			6.0	6.0	6.0	6.0		6.0		6.0
Lane Util. Factor		1.00	0.91			0.91	1.00	1.00	1.00		1.00		1.00
Frpb, ped/bikes		1.00	1.00			1.00	1.00	1.00	1.00		1.00		0.99
Flpb, ped/bikes		1.00	1.00			1.00	1.00	1.00	1.00		1.00		1.00
Frt		1.00	1.00			1.00	0.85	1.00	0.96		1.00		0.85
Flt Protected		0.95	1.00			1.00	1.00	0.95	1.00		0.95		1.00
Satd. Flow (prot)		1770	5085			5085	1583	1805	1808		1805		1591
Flt Permitted		0.95	1.00			1.00	1.00	0.95	1.00		0.37		1.00
Satd. Flow (perm)		1770	5085			5085	1583	1805	1808		697		1591
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	1.00	0.84	0.84	0.84	0.81	0.81	0.81
Adj. Flow (vph)	5	161	1574	0	0	1317	166	48	93	39	281	0	142
RTOR Reduction (vph)	0	0	0	0	0	0	29	0	14	0	0	0	0
Lane Group Flow (vph)	0	166	1574	0	0	1317	137	48	118	0	281	0	142
Confl. Peds. (#/hr)													10
Confl. Bikes (#/hr)										1			
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	Prot					Prot	Prot			custom		custom
Protected Phases	1	1	6			2	2	3 4	4		3		
Permitted Phases											8		1 2 4 8
Actuated Green, G (s)		15.6	49.3			46.9	46.9	29.5	11.2		29.5		110.0
Effective Green, g (s)		15.6	49.3			46.9	46.9	29.5	11.2		29.5		110.0
Actuated g/C Ratio		0.14	0.45			0.43	0.43	0.27	0.10		0.27		1.00
Clearance Time (s)		6.0	6.0			6.0	6.0		6.0		6.0		
Vehicle Extension (s)		3.0	3.0			3.0	3.0		3.0		3.0		
Lane Grp Cap (vph)		251	2279			2168	675	484	184		311		1591
v/s Ratio Prot		c0.09	c0.31			0.26	0.09	0.03	0.07		c0.10		
v/s Ratio Perm											c0.14		c0.09
v/c Ratio		0.66	0.69			0.61	0.20	0.10	0.64		0.90		0.09
Uniform Delay, d1		44.7	24.3			24.4	19.8	30.3	47.5		36.6		0.0
Progression Factor		0.82	1.30			1.00	1.00	1.00	1.00		1.00		1.00
Incremental Delay, d2		3.7	1.0			1.3	0.7	0.1	7.1		27.8		0.0
Delay (s)		40.4	32.5			25.7	20.5	30.4	54.6		64.4		0.0
Level of Service		D	C			C	C	C	D		E		A
Approach Delay (s)			33.2			25.1			48.1			42.8	
Approach LOS			C			C			D			D	

Intersection Summary

HCM Average Control Delay	31.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	67.5%	ICU Level of Service	C
Analysis Period (min)	15		

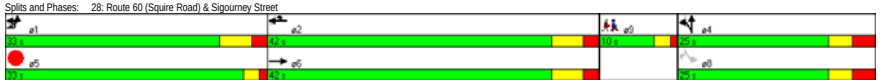
c Critical Lane Group

Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø5	ø9
Lane Configurations															
Volume (vph)	19	237	1429	0	0	1308	103	75	68	17	198	0	153		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)		325		0	0		0	0		0	0		0		
Storage Lanes		1		0	0		1	1		0	1		1		
Taper Length (ft)		25		25	25		25	25		25	25		25		
Right Turn on Red				No			Yes			Yes			Yes		
Link Speed (mph)			30			30			30			30			
Link Distance (ft)			924			930			1560			1008			
Travel Time (s)			21.0			21.1			35.5			22.9			
Confl. Bikes (#/hr)							2						2		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.88	0.88	0.88	0.80	0.80	0.80	0.93	0.93	0.93		
Heavy Vehicles (%)	3%	3%	3%	3%	2%	2%	2%	0%	0%	0%	1%	1%	1%		
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	275	1537	0	0	1486	117	94	106	0	213	0	165		
Turn Type	Prot	Prot					Prot	Split			custom		custom		
Protected Phases	1	1	6			2	2	4	4					5	9
Permitted Phases											8		1 2 4 8		
Detector Phase	1	1	6			2	2	4	4		8		1 2 4 8		
Switch Phase															
Minimum Initial (s)	10.0	10.0	20.0			20.0	20.0	6.0	6.0		12.0			4.0	4.0
Minimum Split (s)	16.0	16.0	26.0			26.0	26.0	12.0	12.0		18.0			33.0	21.0
Total Split (s)	33.0	33.0	42.0	0.0	0.0	42.0	42.0	25.0	25.0	0.0	25.0	0.0	125.0	33.0	10.0
Total Split (%)	30.0%	30.0%	38.2%	0.0%	0.0%	38.2%	38.2%	22.7%	22.7%	0.0%	22.7%	0.0%	113.6%	30%	9%
Yellow Time (s)	4.0	4.0	4.0			4.0	4.0	3.0	3.0		3.0			2.0	2.0
All-Red Time (s)	2.0	2.0	2.0			2.0	2.0	3.0	3.0		3.0			1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	6.0	6.0	6.0	4.0	4.0	6.0	6.0	6.0	6.0	4.0	6.0	4.0	6.0		
Lead/Lag	Lead	Lead	Lag			Lag	Lag							Lead	
Lead-Lag Optimize?															
Recall Mode	None	None	C-Min			C-Min	C-Min	None	None		None			None	None
v/c Ratio		0.79	0.81			1.03	0.17	0.24	0.26		0.77		0.11		
Control Delay		58.1	29.6			53.6	1.6	37.8	34.5		60.0		0.3		
Queue Delay		0.0	0.0			0.0	0.0	0.0	0.0		0.0		0.0		
Total Delay		58.1	29.6			53.6	1.6	37.8	34.5		60.0		0.3		
Queue Length 50th (ft)		185	324			~633	5	53	55		137		0		
Queue Length 95th (ft)		267	#884			#838	m12	95	98		#299		7		
Internal Link Dist (ft)			844			850			1480			928			
Turn Bay Length (ft)		325													
Base Capacity (vph)		430	1887			1436	690	387	403		278		1523		
Starvation Cap Reductn		0	0			0	0	0	0		0		0		
Spillback Cap Reductn		0	0			0	0	0	0		0		0		
Storage Cap Reductn		0	0			0	0	0	0		0		0		
Reduced v/c Ratio		0.64	0.81			1.03	0.17	0.24	0.26		0.77		0.11		

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 25 (23%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 28: Route 60 (Squire Road) & Sigourney Street



Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	19	237	1429	0	0	1308	103	75	68	17	198	0	153
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0			6.0	6.0	6.0	6.0		6.0		6.0
Lane Util. Factor		1.00	0.95			0.95	1.00	1.00	1.00		1.00		1.00
Frpb, ped/bikes		1.00	1.00			1.00	1.00	1.00	1.00		1.00		0.99
Flpb, ped/bikes		1.00	1.00			1.00	1.00	1.00	1.00		1.00		1.00
Frt		1.00	1.00			1.00	0.85	1.00	0.97		1.00		0.85
Flt Protected		0.95	1.00			1.00	1.00	0.95	1.00		0.95		1.00
Satd. Flow (prot)		1752	3505			3539	1583	1805	1844		1787		1579
Flt Permitted		0.95	1.00			1.00	1.00	0.95	1.00		0.69		1.00
Satd. Flow (perm)		1752	3505			3539	1583	1805	1844		1295		1579
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.88	0.88	0.88	0.80	0.80	0.80	0.93	0.93	0.93
Adj. Flow (vph)	20	255	1537	0	0	1486	117	94	85	21	213	0	165
RTOR Reduction (vph)	0	0	0	0	0	0	49	0	8	0	0	0	16
Lane Group Flow (vph)	0	275	1537	0	0	1486	68	94	98	0	213	0	149
Confl. Bikes (#/hr)							2						2
Heavy Vehicles (%)	3%	3%	3%	3%	2%	2%	2%	0%	0%	0%	1%	1%	1%
Turn Type	Prot	Prot					Prot	Split			custom		custom
Protected Phases	1	1	6			2	2	4	4				
Permitted Phases											8		1 2 4 8
Actuated Green, G (s)		21.8	55.0			42.2	42.2	23.6	23.6		23.6		99.6
Effective Green, g (s)		21.8	55.0			42.2	42.2	23.6	23.6		23.6		99.6
Actuated g/C Ratio		0.20	0.50			0.38	0.38	0.21	0.21		0.21		0.91
Clearance Time (s)		6.0	6.0			6.0	6.0	6.0	6.0		6.0		
Vehicle Extension (s)		3.0	3.0			3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		347	1753			1358	607	387	396		278		1430
v/s Ratio Prot		c0.16	c0.44			c0.42	0.04	0.05	0.05				
v/s Ratio Perm											c0.16		0.09
v/c Ratio		0.79	0.88			1.09	0.11	0.24	0.25		0.77		0.10
Uniform Delay, d1		41.9	24.5			33.9	21.8	35.8	35.8		40.6		0.5
Progression Factor		1.00	1.00			0.53	0.12	1.00	1.00		1.00		1.00
Incremental Delay, d2		11.7	6.5			53.1	0.3	0.3	0.3		11.9		0.0
Delay (s)		53.7	31.0			71.0	2.9	36.1	36.2		52.5		0.6
Level of Service		D	C			E	A	D	D		D		A
Approach Delay (s)			34.5			66.0			36.1			29.8	
Approach LOS			C			E			D			C	

Intersection Summary

HCM Average Control Delay	46.8	HCM Level of Service	D
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	28.4
Intersection Capacity Utilization	84.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	ø2	ø3	ø9
Lane Configurations									
Volume (vph)	404	1194	980	237	145	323			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	11	11	11	12	15	12			
Storage Length (ft)	120			0	0	150			
Storage Lanes	1			0	1	1			
Taper Length (ft)	25			25	25	25			
Right Turn on Red				Yes		Yes			
Link Speed (mph)		30	30		30				
Link Distance (ft)		1857	236		865				
Travel Time (s)		42.2	5.4		19.7				
Peak Hour Factor	0.91	0.91	0.86	0.86	0.79	0.79			
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%			
Bus Blockages (#/hr)	0	2	0	0	0	0			
Shared Lane Traffic (%)									
Lane Group Flow (vph)	444	1312	1416	0	184	409			
Turn Type	Prot					custom			
Protected Phases	5	2 3 5	2 3		7	7	2	3	9
Permitted Phases						2 3 5			
Detector Phase	5	2 3 5	2 3		7	7			
Switch Phase									
Minimum Initial (s)	3.0				2.0	2.0	3.0	3.0	1.0
Minimum Split (s)	8.0				8.0	8.0	12.0	8.0	7.0
Total Split (s)	30.0	95.0	65.0	0.0	25.0	25.0	30.0	35.0	20.0
Total Split (%)	21.4%	67.9%	46.4%	0.0%	17.9%	17.9%	21%	25%	14%
Yellow Time (s)	4.0				4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0				1.0	1.0	2.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-2.0	-2.0	0.0	-1.0	-1.0			
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lag				Lead	Lead	Lag	Lead	
Lead-Lag Optimize?	Yes				Yes	Yes	Yes	Yes	
Recall Mode	None				C-Max	C-Max	Max	None	None
v/c Ratio	1.38	0.41	0.67		0.32	0.26			
Control Delay	232.5	12.1	38.7		40.6	0.4			
Queue Delay	0.0	0.2	25.3		0.3	0.0			
Total Delay	232.5	12.4	63.9		40.9	0.4			
Queue Length 50th (ft)	~536	195	369		131	0			
Queue Length 95th (ft)	#751	224	394		173	0			
Internal Link Dist (ft)		1777	156		785				
Turn Bay Length (ft)	120					150			
Base Capacity (vph)	321	3218	2129		570	1583			
Starvation Cap Reductn	0	0	769		0	0			
Spillback Cap Reductn	0	981	0		111	0			
Storage Cap Reductn	0	0	0		0	0			
Reduced v/c Ratio	1.38	0.59	1.04		0.40	0.26			

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 116 (83%), Referenced to phase 7:SBL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 41: Route 145 & N Shore Rd



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	404	1194	980	237	145	323
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	15	12
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.91	0.91		1.00	1.00
Frt	1.00	1.00	0.97		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1728	4951	4819		1947	1583
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1728	4951	4819		1947	1583
Peak-hour factor, PHF	0.91	0.91	0.86	0.86	0.79	0.79
Adj. Flow (vph)	444	1312	1140	276	184	409
RTOR Reduction (vph)	0	0	29	0	0	38
Lane Group Flow (vph)	444	1312	1387	0	184	371
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Bus Blockages (#/hr)	0	2	0	0	0	0
Turn Type	Prot					custom
Protected Phases	5	2 3 5	2 3		7	7
Permitted Phases						2 3 5
Actuated Green, G (s)	25.0	90.0	60.0		40.0	130.0
Effective Green, g (s)	26.0	89.0	62.0		41.0	127.0
Actuated g/C Ratio	0.19	0.64	0.44		0.29	0.91
Clearance Time (s)	5.0				5.0	5.0
Vehicle Extension (s)	3.0				3.0	3.0
Lane Grp Cap (vph)	321	3147	2134		570	1526
v/s Ratio Prot	c0.26	0.26	c0.29		c0.09	0.07
v/s Ratio Perm						0.16
v/c Ratio	1.38	0.42	0.65		0.32	0.24
Uniform Delay, d1	57.0	12.6	30.5		38.7	0.8
Progression Factor	1.00	1.00	1.22		1.00	1.00
Incremental Delay, d2	190.7	0.1	0.7		1.5	0.1
Delay (s)	247.7	12.7	38.0		40.2	0.9
Level of Service	F	B	D		D	A
Approach Delay (s)		72.1	38.0		13.1	
Approach LOS		E	D		B	

Intersection Summary

HCM Average Control Delay	50.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	64.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2	ø7	ø9
Lane Configurations															
Volume (vph)	0	1132	207	147	938	0	279	0	413	0	0	0			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	12	11	11	9	11	12	10	12	12	12	12	16			
Storage Length (ft)	0		0	100		0	0		100	0		0			
Storage Lanes	0		0	1		0	1		1	0		1			
Taper Length (ft)	25		25	25		25	25		25	25		25			
Right Turn on Red			No			Yes			No			No			
Link Speed (mph)		30			30			30			30				
Link Distance (ft)		236			635			5227			589				
Travel Time (s)		5.4			14.4			118.8			13.4				
Peak Hour Factor	0.85	0.85	0.85	0.83	0.83	0.83	0.91	0.91	0.91	1.00	1.00	1.00			
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	2%	2%	2%	0%	0%	0%			
Bus Blockages (#/hr)	0	0	0	0	2	0	0	0	0	0	0	0			
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	1576	0	177	1130	0	307	0	454	0	0	0			
Turn Type				Prot			Prot		custom			custom			
Protected Phases		2 7		5	2 5 7		3		3				2	7	9
Permitted Phases									2 5 7			3			
Detector Phase		2 7		5	2 5 7		3		3			3			
Switch Phase															
Minimum Initial (s)				3.0			3.0		3.0			3.0	3.0	2.0	1.0
Minimum Split (s)				8.0			8.0		8.0			8.0	12.0	8.0	7.0
Total Split (s)	0.0	55.0	0.0	30.0	85.0	0.0	35.0	0.0	35.0	0.0	0.0	35.0	30.0	25.0	20.0
Total Split (%)	0.0%	39.3%	0.0%	21.4%	60.7%	0.0%	25.0%	0.0%	25.0%	0.0%	0.0%	25.0%	21%	18%	14%
Yellow Time (s)				4.0			4.0		4.0			4.0	4.0	4.0	2.0
All-Red Time (s)				1.0			1.0		1.0			1.0	2.0	1.0	1.0
Lost Time Adjust (s)	0.0	-2.0	0.0	-1.0	-2.0	0.0	-1.0	0.0	-1.0	0.0	0.0	-1.0			
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			
Lead/Lag				Lag			Lead		Lead			Lead	Lag	Lead	
Lead-Lag Optimize?				Yes			Yes		Yes			Yes	Yes	Yes	
Recall Mode				None			None		None			None	Max	C-Max	None
v/c Ratio		0.64		0.59	0.31		0.43		0.29						
Control Delay		22.9		61.0	7.3		49.2		0.5						
Queue Delay		71.3		0.0	2.0		0.0		0.0						
Total Delay		94.2		61.0	9.3		49.2		0.5						
Queue Length 50th (ft)		305		149	122		125		0						
Queue Length 95th (ft)		323		210	128		172		0						
Internal Link Dist (ft)		156			555			5147			509				
Turn Bay Length (ft)				100					100						
Base Capacity (vph)		2460		302	3608		709		1583						
Starvation Cap Reductn		1093		0	0		0		0						
Spillback Cap Reductn		0		0	2267		0		0						
Storage Cap Reductn		0		0	0		0		0						
Reduced v/c Ratio		1.15		0.59	0.84		0.43		0.29						

Intersection Summary	
Area Type:	Other
Cycle Length: 140	
Actuated Cycle Length: 140	
Offset: 116 (83%), Referenced to phase 7:SBL, Start of Green	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	

Splits and Phases: 42: Winthrop Ave & Suffolk Downs



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1132	207	147	938	0	279	0	413	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	9	11	12	10	12	12	12	12	16
Total Lost time (s)		4.0		4.0	4.0		4.0		4.0			
Lane Util. Factor		0.91		1.00	0.91		0.97		1.00			
Frt		0.98		1.00	1.00		1.00		0.85			
Flt Protected		1.00		0.95	1.00		0.95		1.00			
Satd. Flow (prot)		4849		1624	5001		3204		1583			
Flt Permitted		1.00		0.95	1.00		0.95		1.00			
Satd. Flow (perm)		4849		1624	5001		3204		1583			
Peak-hour factor, PHF	0.85	0.85	0.85	0.83	0.83	0.83	0.91	0.91	0.91	1.00	1.00	1.00
Adj. Flow (vph)	0	1332	244	177	1130	0	307	0	454	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1576	0	177	1130	0	307	0	454	0	0	0
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	2	0	0	0	0	0	0	0
Turn Type				Prot			Prot		custom			custom
Protected Phases		2 7		5	2 5 7		3		3			
Permitted Phases									2 5 7			3
Actuated Green, G (s)		69.0		25.0	99.0		30.0		129.0			
Effective Green, g (s)		68.0		26.0	95.0		31.0		131.0			
Actuated g/C Ratio		0.49		0.19	0.68		0.22		0.94			
Clearance Time (s)				5.0			5.0		5.0			
Vehicle Extension (s)				3.0			3.0		3.0			
Lane Grp Cap (vph)		2355		302	3394		709		1526			
v/s Ratio Prot		c0.33		c0.11	0.23		c0.10		0.07			
v/s Ratio Perm									0.22			
v/c Ratio		0.67		0.59	0.33		0.43		0.30			
Uniform Delay, d1		27.4		52.1	9.3		46.9		0.4			
Progression Factor		0.85		1.00	1.00		1.00		1.00			
Incremental Delay, d2		1.4		2.9	0.1		0.4		0.1			
Delay (s)		24.8		55.0	9.4		47.4		0.5			
Level of Service		C		D	A		D		A			
Approach Delay (s)		24.8			15.6			19.4			0.0	
Approach LOS		C			B			B			A	

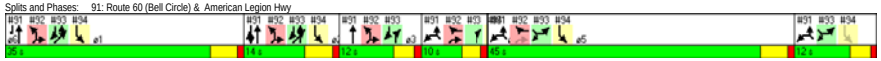
Intersection Summary			
HCM Average Control Delay	20.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	58.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NWL	NWR	NEL	NER	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations																
Volume (vph)	0	1053	0	0	715	299	1000	339	0	0						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900						
Lane Width (ft)	12	13	12	12	13	16	16	16	12	12						
Storage Length (ft)	0		0	0		130	0	0	0	0						
Storage Lanes	0		0	0		1	2	1	0	0						
Taper Length (ft)	25		25	25		25	25	25	25	25						
Right Turn on Red			No			Yes		Yes								
Link Speed (mph)		30			30		30		30							
Link Distance (ft)		324			508		202		225							
Travel Time (s)		7.4			11.5		4.6		5.1							
Peak Hour Factor	0.92	0.94	0.92	0.92	0.78	0.77	0.91	0.91	0.92	0.92						
Heavy Vehicles (%)	2%	4%	2%	2%	7%	3%	5%	5%	2%	2%						
Shared Lane Traffic (%)																
Lane Group Flow (vph)	0	1120	0	0	917	388	1099	373	0	0						
Turn Type						Prot		Prot								
Protected Phases		1 2 3			1 2	1 2	4 5 6	4 5 6			1	2	3	4	5	6
Permitted Phases																
Minimum Split (s)											35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	0.0	61.0	0.0	0.0	49.0	49.0	67.0	67.0	0.0	0.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	0.0%	47.7%	0.0%	0.0%	38.3%	38.3%	52.3%	52.3%	0.0%	0.0%	27%	11%	9%	8%	35%	9%
Yellow Time (s)											4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)											1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	-1.0	0.0	0.0	-1.0	-1.0	-1.0	-1.0	0.0	0.0						
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	4.0	4.0						
Lead/Lag											Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?											Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio		0.70			0.75	0.52	0.58	0.36								
Control Delay		0.6			41.1	18.7	21.8	15.6								
Queue Delay		2.3			0.0	0.0	1.2	2.0								
Total Delay		2.9			41.1	18.7	23.0	17.5								
Queue Length 50th (ft)		0			350	125	344	134								
Queue Length 95th (ft)		m0			352	159	427	194								
Internal Link Dist (ft)		244			428		122		145							
Turn Bay Length (ft)						130										
Base Capacity (vph)		1597			1226	749	1890	1044								
Starvation Cap Reductn		332			0	0	527	507								
Spillback Cap Reductn		0			0	0	0	0								
Storage Cap Reductn		0			0	0	0	0								
Reduced v/c Ratio		0.89			0.75	0.52	0.81	0.69								

Intersection Summary	
Area Type:	Other
Cycle Length: 128	
Actuated Cycle Length: 128	
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green	
Natural Cycle: 150	
Control Type: Pretimed	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 91: Route 60 (Bell Circle) & American Legion Hwy



Movement	NBL	NBT	NBR	SBL	SBT	SBR	NWL	NWR	NEL	NER
Lane Configurations										
Volume (vph)	0	1053	0	0	715	299	1000	339	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	13	12	12	13	16	16	16	12	12
Total Lost time (s)		4.0			4.0	4.0	3.0	3.0		
Lane Util. Factor		0.95			0.95	1.00	0.97	1.00		
Frt		1.00			1.00	0.85	1.00	1.00		
Flt Protected		1.00			1.00	1.00	0.95	1.00		
Satd. Flow (prot)		3587			3486	1777	3780	2051		
Flt Permitted		1.00			1.00	1.00	1.00	1.00		
Satd. Flow (perm)		3587			3486	1777	3979	2051		
Peak-hour factor, PHF	0.92	0.94	0.92	0.92	0.78	0.77	0.91	0.91	0.92	0.92
Adj. Flow (vph)	0	1120	0	0	917	388	1099	373	0	0
RTOR Reduction (vph)	0	0	0	0	0	124	0	20	0	0
Lane Group Flow (vph)	0	1120	0	0	917	264	1099	353	0	0
Heavy Vehicles (%)	2%	4%	2%	2%	7%	3%	5%	5%	2%	2%
Turn Type						Prot		Prot		
Protected Phases		1 2 3			1 2	1 2	4 5 6	4 5 6		
Permitted Phases										
Actuated Green, G (s)		57.0			44.0	44.0	63.0	63.0		
Effective Green, g (s)		58.0			45.0	45.0	60.0	60.0		
Actuated g/C Ratio		0.45			0.35	0.35	0.47	0.47		
Clearance Time (s)										
Lane Grp Cap (vph)		1625			1226	625	1772	961		
v/s Ratio Prot		c0.31			c0.26	0.15	c0.29	0.17		
v/s Ratio Perm										
v/c Ratio		0.69			0.75	0.42	0.62	0.37		
Uniform Delay, d1		27.8			36.5	31.6	25.5	21.8		
Progression Factor		0.01			1.00	1.00	0.90	0.84		
Incremental Delay, d2		0.2			4.2	2.1	1.5	1.0		
Delay (s)		0.6			40.7	33.7	24.5	19.2		
Level of Service		A			D	C	C	B		
Approach Delay (s)		0.6			38.6		23.1		0.0	
Approach LOS		A			D		C		A	

Intersection Summary					
HCM Average Control Delay		21.8	HCM Level of Service		C
HCM Volume to Capacity ratio		0.67			
Actuated Cycle Length (s)		128.0	Sum of lost time (s)		10.0
Intersection Capacity Utilization		64.3%	ICU Level of Service		C
Analysis Period (min)		15			

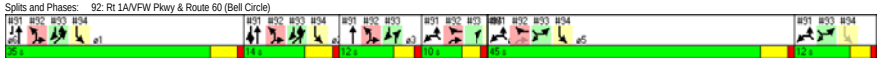
c Critical Lane Group

Lane Group	WBL	WBR	SEL	SER	NEL	NER	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations												
Volume (vph)	0	947	0	0	314	1455						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900						
Lane Width (ft)	16	16	12	12	16	14						
Right Turn on Red		Yes		Yes	Yes	Yes						
Link Speed (mph)	30		30		30							
Link Distance (ft)	646		202		216							
Travel Time (s)	14.7		4.6		4.9							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.73	0.85						
Heavy Vehicles (%)	2%	3%	2%	2%	5%	5%						
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1029	0	0	430	1712						
Turn Type		custom				custom						
Protected Phases		4 5			1 2 3	1 2 3 4	1	2	3	4	5	6
Permitted Phases						5						
Minimum Split (s)							35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	0.0	55.0	0.0	0.0	61.0	71.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	0.0%	43.0%	0.0%	0.0%	47.7%	55.5%	27%	11%	9%	8%	35%	9%
Yellow Time (s)							4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)							1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	-1.0	0.0	0.0	-1.0	0.0						
Total Lost Time (s)	4.0	3.0	4.0	4.0	4.0	5.0						
Lead/Lag							Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio		0.53			0.22	0.54						
Control Delay		8.1			3.6	0.1						
Queue Delay		0.1			1.6	1.3						
Total Delay		8.2			5.2	1.3						
Queue Length 50th (ft)		84			10	0						
Queue Length 95th (ft)		148			m4	m0						
Internal Link Dist (ft)	566		122		136							
Turn Bay Length (ft)												
Base Capacity (vph)		1939			1979	3173						
Starvation Cap Reductn		0			1335	1159						
Spillback Cap Reductn		208			733	0						
Storage Cap Reductn		0			0	0						
Reduced v/c Ratio		0.59			0.67	0.85						

Intersection Summary

Area Type: Other
Cycle Length: 128
Actuated Cycle Length: 128
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green
Natural Cycle: 150
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 92: Rt 1A/VFW Pkwy & Route 60 (Bell Circle)



Movement	WBL	WBR	SEL	SER	NEL	NER
Lane Configurations						
Volume (vph)	0	947	0	0	314	1455
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	16	16	12	12	16	14
Total Lost time (s)		3.0			4.0	5.0
Lane Util. Factor		0.88			0.97	0.88
Frt		1.00			1.00	1.00
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		3679			3979	3397
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		3679			3979	3397
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.73	0.85
Adj. Flow (vph)	0	1029	0	0	430	1712
RTOR Reduction (vph)	0	450	0	0	204	334
Lane Group Flow (vph)	0	579	0	0	226	1378
Heavy Vehicles (%)	2%	3%	2%	2%	5%	5%
Turn Type		custom				custom
Protected Phases		4 5			1 2 3	1 2 3 4
Permitted Phases						5
Actuated Green, G (s)		50.0			57.0	107.0
Effective Green, g (s)		51.0			58.0	103.0
Actuated g/C Ratio		0.40			0.45	0.80
Clearance Time (s)						
Lane Grp Cap (vph)		1466			1803	2734
v/s Ratio Prot		0.16			0.06	c0.25
v/s Ratio Perm						0.16
v/c Ratio		0.39			0.13	0.50
Uniform Delay, d1		27.5			20.3	4.1
Progression Factor		1.00			1.02	0.00
Incremental Delay, d2		0.8			0.0	0.1
Delay (s)		28.3			20.7	0.1
Level of Service		C			C	A
Approach Delay (s)	28.3		0.0		4.2	
Approach LOS	C		A		A	

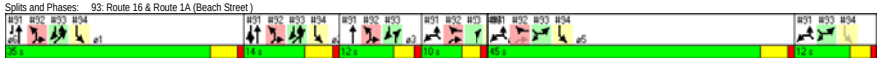
Intersection Summary			
HCM Average Control Delay	12.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	27.0
Intersection Capacity Utilization	55.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	NBR	SBR	SEL	SER2	NEL	NET	ø2	ø3	ø4	ø5	ø6
Lane Configurations											
Volume (vph)	661	715	540	719	1053	661					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900					
Lane Width (ft)	12	13	12	14	12	16					
Storage Length (ft)	0	0	100		0						
Storage Lanes	2	2	0		2						
Taper Length (ft)	25	25	25		25						
Right Turn on Red	No			Yes							
Link Speed (mph)			30			30					
Link Distance (ft)			186			610					
Travel Time (s)			4.2			13.9					
Peak Hour Factor	0.86	0.78	0.85	0.93	0.73	0.73					
Heavy Vehicles (%)	2%	7%	3%	5%	2%	2%					
Shared Lane Traffic (%)											
Lane Group Flow (vph)	769	917	635	773	1442	905					
Turn Type	custom	custom		Prot	Prot						
Protected Phases	2 3 4	1 2 3	5 6	5 6	1 2	1	2	3	4	5	6
Permitted Phases											
Minimum Split (s)						35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	36.0	61.0	57.0	57.0	49.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	28.1%	47.7%	44.5%	44.5%	38.3%	27.3%	11%	9%	8%	35%	9%
Yellow Time (s)						4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)						1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0					
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0					
Lead/Lag						Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio	0.94	0.75	0.43	0.48	1.13	1.77					
Control Delay	66.7	7.8	18.0	7.0	109.3	385.1					
Queue Delay	0.0	0.8	6.3	1.6	0.0	0.0					
Total Delay	66.7	8.6	24.4	8.6	109.3	385.1					
Queue Length 50th (ft)	356	98	117	38	~716	~1119					
Queue Length 95th (ft)	#449	15	144	64	#585	#1028					
Internal Link Dist (ft)			106			530					
Turn Bay Length (ft)			100	100							
Base Capacity (vph)	820	1222	1482	1598	1271	511					
Starvation Cap Reductn	0	98	783	613	0	0					
Spillback Cap Reductn	0	0	0	0	0	0					
Storage Cap Reductn	0	0	0	0	0	0					
Reduced v/c Ratio	0.94	0.82	0.91	0.78	1.13	1.77					

Intersection Summary	
Area Type:	Other
Cycle Length: 128	
Actuated Cycle Length: 128	
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green	
Natural Cycle: 150	
Control Type: Pretimed	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 93: Route 16 & Route 1A (Beach Street)



Movement	NBR	SBR	SEL	SER2	NEL	NET
Lane Configurations						
Volume (vph)	661	715	540	719	1053	661
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	13	12	14	12	16
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.88	0.88	0.97	0.88	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	1.00
Flt Protected	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	3278	2745	3579	3397	3614	2111
Flt Permitted	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	3278	2745	3579	3397	3614	2111
Peak-hour factor, PHF	0.86	0.78	0.85	0.93	0.73	0.73
Adj. Flow (vph)	769	917	635	773	1442	905
RTOR Reduction (vph)	0	0	0	188	0	0
Lane Group Flow (vph)	769	917	635	585	1442	905
Heavy Vehicles (%)	2%	7%	3%	5%	2%	2%
Turn Type	custom	custom		Prot	Prot	
Protected Phases	2 3 4	1 2 3	5 6	5 6	1 2	1
Permitted Phases						
Actuated Green, G (s)	32.0	57.0	53.0	53.0	44.0	30.0
Effective Green, g (s)	30.0	58.0	54.0	54.0	45.0	31.0
Actuated g/C Ratio	0.23	0.45	0.42	0.42	0.35	0.24
Clearance Time (s)						5.0
Lane Grp Cap (vph)	768	1244	1510	1433	1271	511
v/s Ratio Prot	c0.23	0.33	c0.18	0.17	c0.40	c0.43
v/s Ratio Perm						
v/c Ratio	1.00	0.74	0.42	0.41	1.13	1.77
Uniform Delay, d1	49.0	28.7	26.0	25.8	41.5	48.5
Progression Factor	1.00	0.17	0.64	0.39	1.00	1.00
Incremental Delay, d2	32.8	2.6	0.8	0.8	70.8	354.9
Delay (s)	81.8	7.4	17.4	11.0	112.3	403.4
Level of Service	F	A	B	B	F	F
Approach Delay (s)			13.9			224.5
Approach LOS			B			F

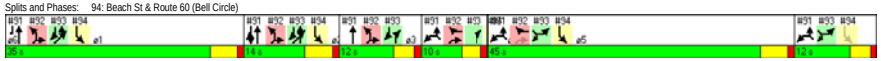
Intersection Summary			
HCM Average Control Delay	113.2	HCM Level of Service	F
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	Err%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	SBL	SBR	NWL	NWR	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations												
Volume (vph)	0	313	940	369	0	0						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900						
Lane Width (ft)	12	16	16	16	12	12						
Right Turn on Red		Yes	Yes	Yes		Yes						
Link Speed (mph)	30		30		30							
Link Distance (ft)	999		225		186							
Travel Time (s)	22.7		5.1		4.2							
Confl. Peds. (#/hr)		100			100							
Peak Hour Factor	0.92	0.84	0.87	0.95	0.92	0.92						
Heavy Vehicles (%)	2%	3%	3%	4%	2%	2%						
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	373	1080	388	0	0						
Turn Type		Free		Free								
Protected Phases			1 2 4 5				1	2	3	4	5	6
Permitted Phases		Free	6	Free								
Minimum Split (s)							35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	0.0	0.0	104.0	0.0	0.0	0.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	0.0%	0.0%	81.3%	0.0%	0.0%	0.0%	27%	11%	9%	8%	35%	9%
Yellow Time (s)							4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)							1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	-1.0	0.0	0.0	0.0						
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0						
Lead/Lag							Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio		0.22	0.32	0.22								
Control Delay		0.3	0.2	0.2								
Queue Delay		0.0	0.1	0.0								
Total Delay		0.3	0.4	0.2								
Queue Length 50th (ft)		0	0	0								
Queue Length 95th (ft)		0	0	0								
Internal Link Dist (ft)	919		145		106							
Turn Bay Length (ft)												
Base Capacity (vph)		1734	3390	1760								
Starvation Cap Reductn		0	1147	0								
Spillback Cap Reductn		213	369	0								
Storage Cap Reductn		0	0	0								
Reduced v/c Ratio		0.25	0.48	0.22								

Intersection Summary	
Area Type:	Other
Cycle Length: 128	
Actuated Cycle Length: 128	
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green	
Natural Cycle: 150	
Control Type: Pretimed	

Splits and Phases: 94: Beach St & Route 60 (Bell Circle)



Movement	EBL	EBR	SBL	SBR	NWL	NWR
Lane Configurations						
Volume (vph)	0	313	940	369	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	16	16	16	12	12
Total Lost time (s)		4.0	4.0	4.0		
Lane Util. Factor		1.00	0.97	1.00		
Frpb, ped/bikes		0.96	1.00	1.00		
Flpb, ped/bikes		1.00	1.00	1.00		
Frt		0.86	1.00	0.85		
Flt Protected		1.00	0.95	1.00		
Satd. Flow (prot)		1734	3853	1760		
Flt Permitted		1.00	1.00	1.00		
Satd. Flow (perm)		1734	4056	1760		
Peak-hour factor, PHF	0.92	0.84	0.87	0.95	0.92	0.92
Adj. Flow (vph)	0	373	1080	388	0	0
RTOR Reduction (vph)	0	0	219	0	0	0
Lane Group Flow (vph)	0	373	861	388	0	0
Confl. Peds. (#/hr)		100			100	
Heavy Vehicles (%)	2%	3%	3%	4%	2%	2%
Turn Type		Free		Free		
Protected Phases			1 2 4 5			
Permitted Phases		Free	6	Free		
Actuated Green, G (s)		128.0	102.0	128.0		
Effective Green, g (s)		128.0	102.0	128.0		
Actuated g/C Ratio		1.00	0.80	1.00		
Clearance Time (s)						
Lane Grp Cap (vph)		1734	3085	1760		
v/s Ratio Prot			c0.20			
v/s Ratio Perm		0.22	0.02	c0.22		
v/c Ratio		0.22	0.28	0.22		
Uniform Delay, d1		0.0	3.4	0.0		
Progression Factor		1.00	1.00	1.00		
Incremental Delay, d2		0.3	0.2	0.2		
Delay (s)		0.3	3.6	0.2		
Level of Service		A	A	A		
Approach Delay (s)	0.3		2.7		0.0	
Approach LOS	A		A		A	

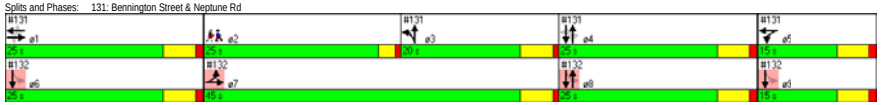
Intersection Summary			
HCM Average Control Delay	2.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	46.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2	ø6	ø7	ø8	ø9
Lane Configurations																	
Volume (vph)	22	547	154	336	387	61	246	334	8	23	102	64					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900					
Lane Width (ft)	12	12	10	12	12	12	11	11	11	11	11	11					
Right Turn on Red			Yes			Yes			Yes			Yes					
Link Speed (mph)		30			30			30			30						
Link Distance (ft)		669			3390			98			119						
Travel Time (s)		15.2			77.0			2.2			2.7						
Confl. Peds. (#/hr)										23		101					
Peak Hour Factor	0.89	0.89	0.89	0.95	0.95	0.95	0.93	0.93	0.93	0.86	0.86	0.86					
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	8%	8%	8%	4%	4%	4%					
Bus Blockages (#/hr)	0	0	0	0	0	8	0	0	0	0	0	0					
Parking (#/hr)					0	0					10	10					
Shared Lane Traffic (%)																	
Lane Group Flow (vph)	0	813	0	354	471	0	0	633	0	0	220	0					
Turn Type	Perm			D.P+P			D.P+P			Perm							
Protected Phases		1		5	1 5		3	3 4			4		2	6	7	8	9
Permitted Phases	1			1			4			4							
Detector Phase	1	1		5	1 5		3	3 4		4	4						
Switch Phase																	
Minimum Initial (s)	8.0	8.0		8.0			6.0			6.0	6.0		6.0	8.0	6.0	8.0	6.0
Minimum Split (s)	13.0	13.0		13.0			13.0			11.0	11.0		25.0	13.0	19.0	17.0	11.0
Total Split (s)	25.0	25.0	0.0	15.0	40.0	0.0	20.0	45.0	0.0	25.0	25.0	0.0	25.0	25.0	45.0	25.0	15.0
Total Split (%)	22.7%	22.7%	0.0%	13.6%	36.4%	0.0%	18.2%	40.9%	0.0%	22.7%	22.7%	0.0%	23%	23%	41%	23%	14%
Yellow Time (s)	4.0	4.0		4.0			4.0			4.0	4.0		2.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0			1.0			1.0	1.0		1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0					
Lead/Lag							Lag						Lead		Lead	Lag	
Lead-Lag Optimize?							Yes						Yes		Yes	Yes	
Recall Mode	C-Min	C-Min		None			None			None	None		None	None	None	None	None
v/c Ratio		2.21		0.89	0.70			0.59			0.36						
Control Delay		576.4		56.9	35.9			9.5			24.7						
Queue Delay		0.0		0.0	0.0			2.4			0.0						
Total Delay		576.4		56.9	35.9			11.9			24.7						
Queue Length 50th (ft)		~485		192	276			24			41						
Queue Length 95th (ft)		#603		#481	#512			234			83						
Internal Link Dist (ft)		589			3310			18			39						
Turn Bay Length (ft)																	
Base Capacity (vph)		368		397	670			1082			605						
Starvation Cap Reductn		0		0	0			311			0						
Spillback Cap Reductn		0		0	0			0			0						
Storage Cap Reductn		0		0	0			0			0						
Reduced v/c Ratio		2.21		0.89	0.70			0.82			0.36						

Intersection Summary	
Area Type:	Other
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green	
Natural Cycle: 140	
Control Type: Actuated-Coordinated	
Description: Bennington WB defacto left recoded	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 131: Bennington Street & Neptune Rd



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	22	547	154	336	387	61	246	334	8	23	102	64
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	10	12	12	12	11	11	11	11	11	11
Total Lost time (s)		5.0		5.0	5.0			5.0			5.0	
Lane Util. Factor		0.95		1.00	1.00			0.95			0.95	
Frpb, ped/bikes		1.00		1.00	1.00			1.00			0.93	
Flpb, ped/bikes		1.00		1.00	1.00			1.00			1.00	
Frt		0.97		1.00	0.98			1.00			0.95	
Flt Protected		1.00		0.95	1.00			0.98			0.99	
Satd. Flow (prot)		3421		1736	1611			3158			2710	
Flt Permitted		0.55		0.23	1.00			0.73			0.83	
Satd. Flow (perm)		1900		415	1611			2360			2274	
Peak-hour factor, PHF	0.89	0.89	0.89	0.95	0.95	0.95	0.93	0.93	0.93	0.86	0.86	0.86
Adj. Flow (vph)	25	615	173	354	407	64	265	359	9	27	119	74
RTOR Reduction (vph)	0	23	0	0	5	0	0	1	0	0	53	0
Lane Group Flow (vph)	0	790	0	354	466	0	0	632	0	0	167	0
Confl. Peds. (#/hr)										23		101
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	8%	8%	8%	4%	4%	4%
Bus Blockages (#/hr)	0	0	0	0	0	8	0	0	0	0	0	0
Parking (#/hr)					0	0					10	10
Turn Type	Perm			D.P+P			D.P+P			Perm		
Protected Phases		1		5	1 5		3	3 4			4	
Permitted Phases	1			1			4			4		
Actuated Green, G (s)		17.6		38.0	43.0			44.6			27.4	
Effective Green, g (s)		17.6		38.0	43.0			44.6			27.4	
Actuated g/C Ratio		0.16		0.35	0.39			0.41			0.25	
Clearance Time (s)		5.0		5.0							5.0	
Vehicle Extension (s)		2.5		2.5							2.5	
Lane Grp Cap (vph)		304		388	630			1082			566	
v/s Ratio Prot				c0.17	0.29			c0.09				
v/s Ratio Perm		c0.42		0.15				c0.15			0.07	
v/c Ratio		2.60		0.91	0.74			0.58			0.30	
Uniform Delay, d1		46.2		30.6	28.7			25.5			33.5	
Progression Factor		1.00		1.00	1.00			0.36			1.00	
Incremental Delay, d2		729.4		25.2	4.3			0.5			0.2	
Delay (s)		775.6		55.9	33.0			9.7			33.7	
Level of Service		F		E	C			A			C	
Approach Delay (s)		775.6			42.8			9.7			33.7	
Approach LOS		F			D			A			C	

Intersection Summary					
HCM Average Control Delay	272.7	HCM Level of Service	F		
HCM Volume to Capacity ratio	1.09				
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	27.4		
Intersection Capacity Utilization	91.2%	ICU Level of Service	F		
Analysis Period (min)	15				
Description: Bennington WB defacto left recoded					

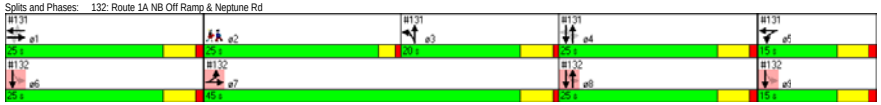
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø2	ø3	ø4	ø5	ø6	ø9
Lane Configurations																			
Volume (vph)	472	415	13	0	0	0	0	160	309	0	64	0							
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900							
Lane Width (ft)	11	11	12	12	12	12	11	11	11	11	11	11							
Right Turn on Red			Yes			Yes			Yes			Yes							
Link Speed (mph)		30			30			30			30								
Link Distance (ft)		80			312			647			104								
Travel Time (s)		1.8			7.1			14.7			2.4								
Peak Hour Factor	0.97	0.97	0.97	0.92	0.92	0.92	0.90	0.90	0.90	0.75	0.75	0.75							
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	6%	6%	6%	8%	8%	8%							
Shared Lane Traffic (%)																			
Lane Group Flow (vph)	487	441	0	0	0	0	0	521	0	0	85	0							
Turn Type	Split									Perm									
Protected Phases	7	7						8			6 8 9		1	2	3	4	5	6	9
Permitted Phases										6 8 9									
Detector Phase	7	7						8		6 8 9	6 8 9								
Switch Phase																			
Minimum Initial (s)	6.0	6.0						8.0					8.0	6.0	6.0	6.0	8.0	8.0	6.0
Minimum Split (s)	19.0	19.0						17.0					13.0	25.0	13.0	11.0	13.0	13.0	11.0
Total Split (s)	45.0	45.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	65.0	65.0	0.0	25.0	25.0	20.0	25.0	15.0	25.0	15.0
Total Split (%)	40.9%	40.9%	0.0%	0.0%	0.0%	0.0%	0.0%	22.7%	0.0%	59.1%	59.1%	0.0%	23%	23%	18%	23%	14%	23%	14%
Yellow Time (s)	4.0	4.0						4.0					4.0	2.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0						1.0					1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0							
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	5.0	5.0	4.0							
Lead/Lag	Lead	Lead						Lag						Lead	Lag				
Lead-Lag Optimize?	Yes	Yes						Yes						Yes	Yes				
Recall Mode	None	None						None					C-Min	None	None	None	None	None	None
v/c Ratio	0.88	0.76						0.79			0.05								
Control Delay	52.4	41.4						24.5			7.0								
Queue Delay	6.9	0.0						0.1			0.0								
Total Delay	59.3	41.4						24.6			7.0								
Queue Length 50th (ft)	309	264						63			8								
Queue Length 95th (ft)	#473	378						116			m6								
Internal Link Dist (ft)		1			232			567			24								
Turn Bay Length (ft)																			
Base Capacity (vph)	610	641						820			1689								
Starvation Cap Reductn	0	0						0			0								
Spillback Cap Reductn	86	0						17			0								
Storage Cap Reductn	0	0						0			0								
Reduced v/c Ratio	0.93	0.69						0.65			0.05								

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 132: Route 1A NB Off Ramp & Neptune Rd



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	472	415	13	0	0	0	0	160	309	0	64	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)	5.0	5.0						5.0			5.0	
Lane Util. Factor	1.00	1.00						0.95			0.95	
Frt	1.00	1.00						0.90			1.00	
Flt Protected	0.95	1.00						1.00			1.00	
Satd. Flow (prot)	1678	1758						2967			3231	
Flt Permitted	0.95	1.00						1.00			1.00	
Satd. Flow (perm)	1678	1758						2967			3231	
Peak-hour factor, PHF	0.97	0.97	0.97	0.92	0.92	0.92	0.90	0.90	0.90	0.75	0.75	0.75
Adj. Flow (vph)	487	428	13	0	0	0	0	178	343	0	85	0
RTOR Reduction (vph)	0	1	0	0	0	0	0	294	0	0	0	0
Lane Group Flow (vph)	487	440	0	0	0	0	0	227	0	0	85	0
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	6%	6%	6%	8%	8%	8%
Turn Type	Split									Perm		
Protected Phases	7	7						8			6 8 9	
Permitted Phases										6 8 9		
Actuated Green, G (s)	36.4	36.4						15.6			63.6	
Effective Green, g (s)	36.4	36.4						15.6			63.6	
Actuated g/C Ratio	0.33	0.33						0.14			0.58	
Clearance Time (s)	5.0	5.0						5.0				
Vehicle Extension (s)	2.5	2.5						2.5				
Lane Grp Cap (vph)	555	582						421			1868	
v/s Ratio Prot	c0.29	0.25						c0.08			c0.03	
v/s Ratio Perm												
v/c Ratio	0.88	0.76						0.54			0.05	
Uniform Delay, d1	34.7	32.8						43.9			10.1	
Progression Factor	1.00	1.00						1.00			0.62	
Incremental Delay, d2	14.5	5.3						1.0			0.0	
Delay (s)	49.2	38.1						44.9			6.2	
Level of Service	D	D						D			A	
Approach Delay (s)		43.9			0.0			44.9			6.2	
Approach LOS		D			A			D			A	

Intersection Summary

HCM Average Control Delay	42.2	HCM Level of Service		D	
HCM Volume to Capacity ratio	0.42				
Actuated Cycle Length (s)	110.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	48.9%	ICU Level of Service		A	
Analysis Period (min)	15				

c Critical Lane Group



Movement	WBL	WBR	NBU	NBT	NBR	SBU	SBL	SBT
Lane Configurations								
Volume (veh/h)	19	13	19	2007	200	11	19	1716
Sign Control	Stop			Free				Free
Grade	0%			0%				0%
Peak Hour Factor	0.89	0.89	0.98	0.98	0.98	0.97	0.97	0.97
Hourly flow rate (vph)	21	15	0	2048	204	0	20	1769
Pedestrians								
Lane Width (ft)								
Walking Speed (ft/s)								
Percent Blockage								
Right turn flare (veh)								
Median type				None				None
Median storage veh)								
Upstream signal (ft)								405
pX, platoon unblocked	0.56		0.00			0.00		
vC, conflicting volume	3074	1126	0			0	2252	
vC1, stage 1 conf vol								
vC2, stage 2 conf vol								
vCu, unblocked vol	3131	1126	0			0	2252	
tC, single (s)	7.0	7.1	0.0			0.0	4.2	
tC, 2 stage (s)								
tF (s)	3.6	3.4	0.0			0.0	2.2	
p0 queue free %	0	92	0			0	91	
cM capacity (veh/h)	4	188	0			0	215	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	21	15	1365	887	20	885	885
Volume Left	21	0	0	0	20	0	0
Volume Right	0	15	0	204	0	0	0
cSH	4	188	1700	1700	215	1700	1700
Volume to Capacity	5.53	0.08	0.80	0.52	0.09	0.52	0.52
Queue Length 95th (ft)	Err	6	0	0	7	0	0
Control Delay (s)	Err	25.7	0.0	0.0	23.4	0.0	0.0
Lane LOS	F	D			C		
Approach Delay (s)	5947.4		0.0		0.3		
Approach LOS	F						

Intersection Summary				
Average Delay	52.6			
Intersection Capacity Utilization	85.3%	ICU Level of Service		E
Analysis Period (min)	15			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	108	2031	100	0	1853
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.79	0.79	0.94	0.94	0.96	0.96
Hourly flow rate (vph)	0	137	2161	106	0	1930
Pedestrians	3					
Lane Width (ft)	16.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	3182	1137			2270	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3182	1137			2270	
tC, single (s)	6.9	7.0			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.3	
p0 queue free %	100	29			100	
cM capacity (veh/h)	8	192			208	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	137	1440	827	965	965
Volume Left	0	0	0	0	0
Volume Right	137	0	106	0	0
cSH	192	1700	1700	1700	1700
Volume to Capacity	0.71	0.85	0.49	0.57	0.57
Queue Length 95th (ft)	112	0	0	0	0
Control Delay (s)	60.0	0.0	0.0	0.0	0.0
Lane LOS	F				
Approach Delay (s)	60.0	0.0		0.0	
Approach LOS	F				

Intersection Summary				
Average Delay	1.9			
Intersection Capacity Utilization	72.7%	ICU Level of Service		C
Analysis Period (min)	15			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	149	2077	119	0	1754
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.89	0.89	0.94	0.94	0.95	0.95
Hourly flow rate (vph)	0	167	2210	127	0	1846
Pedestrians	3					
Lane Width (ft)	16.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			925			880
pX, platoon unblocked	0.69	0.45			0.45	
vC, conflicting volume	3199	1171			2339	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	184	0			1540	
tC, single (s)	6.9	7.0			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	65			100	
cM capacity (veh/h)	537	485			189	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	167	1473	863	923	923
Volume Left	0	0	0	0	0
Volume Right	167	0	127	0	0
cSH	485	1700	1700	1700	1700
Volume to Capacity	0.35	0.87	0.51	0.54	0.54
Queue Length 95th (ft)	38	0	0	0	0
Control Delay (s)	16.3	0.0	0.0	0.0	0.0
Lane LOS	C				
Approach Delay (s)	16.3	0.0		0.0	
Approach LOS	C				

Intersection Summary				
Average Delay		0.6		
Intersection Capacity Utilization		77.1%	ICU Level of Service	D
Analysis Period (min)		15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	63	153	739	0	0	410
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.83	0.83	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	76	184	821	0	0	456
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						233
pX, platoon unblocked						
vC, conflicting volume	1049	411			821	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1049	411			821	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	66	69			100	
cM capacity (veh/h)	225	593			817	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	76	184	411	411	228	228
Volume Left	76	0	0	0	0	0
Volume Right	0	184	0	0	0	0
cSH	225	593	1700	1700	1700	1700
Volume to Capacity	0.34	0.31	0.24	0.24	0.13	0.13
Queue Length 95th (ft)	36	33	0	0	0	0
Control Delay (s)	29.0	13.8	0.0	0.0	0.0	0.0
Lane LOS	D	B				
Approach Delay (s)	18.2		0.0		0.0	
Approach LOS	C					

Intersection Summary				
Average Delay		3.1		
Intersection Capacity Utilization		36.6%	ICU Level of Service	A
Analysis Period (min)		15		

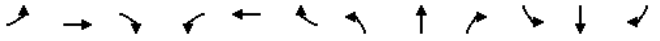


Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	410	0	0	1703	129
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.97	0.97
Hourly flow rate (vph)	0	446	0	0	1756	133
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1822	652	1889			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1822	652	1889			
tC, single (s)	7.0	7.1	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.2			
p0 queue free %	100	0	100			
cM capacity (veh/h)	62	390	313			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3
Volume Total	446	702	702	484
Volume Left	0	0	0	0
Volume Right	446	0	0	133
cSH	390	1700	1700	1700
Volume to Capacity	1.14	0.41	0.41	0.28
Queue Length 95th (ft)	422	0	0	0
Control Delay (s)	122.5	0.0	0.0	0.0
Lane LOS	F			
Approach Delay (s)	122.5	0.0		
Approach LOS	F			

Intersection Summary			
Average Delay	23.4		
Intersection Capacity Utilization	67.8%	ICU Level of Service	C
Analysis Period (min)	15		

Intersection Sign configuration not allowed in HCM analysis.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	18	80	6	8	388	21	5	171	49
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.84	0.84	0.84	0.88	0.88	0.88	0.78	0.78	0.78
Hourly flow rate (vph)	0	0	0	21	95	7	9	441	24	6	219	63
Pedestrians		3			28			3			24	
Lane Width (ft)		0.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			2			0			2	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								119				
pX, platoon unblocked												
vC, conflicting volume	584	777	147	624	797	284	285			493		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	584	777	147	624	797	284	285			493		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	94	69	99	99			99		
cM capacity (veh/h)	284	314	871	354	310	688	1281			1028		

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	124	230	244	116	172
Volume Left	21	9	0	6	0
Volume Right	7	0	24	0	63
cSH	327	1281	1700	1028	1700
Volume to Capacity	0.38	0.01	0.14	0.01	0.10
Queue Length 95th (ft)	43	1	0	0	0
Control Delay (s)	22.5	0.4	0.0	0.5	0.0
Lane LOS	C	A		A	
Approach Delay (s)	22.5	0.2		0.2	
Approach LOS	C				

Intersection Summary				
Average Delay	3.3			
Intersection Capacity Utilization	33.8%	ICU Level of Service		A
Analysis Period (min)	15			

Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

Synchro 7 Capacity Analysis
2012 Existing Condition
Saturday Afternoon Peak Hour

Signalized and Unsignalized Synchro Analysis

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1016	99	185	1038	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	9	11	12	12
Storage Length (ft)		0	130		0	0
Storage Lanes		0	1		0	0
Taper Length (ft)		25	25		25	25
Right Turn on Red		Yes				Yes
Link Speed (mph)	30			30	30	
Link Distance (ft)	572			1857	345	
Travel Time (s)	13.0			42.2	7.8	
Peak Hour Factor	0.95	0.95	0.91	0.91	0.95	0.95
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Bus Blockages (#/hr)	0	0	0	2	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1173	0	203	1141	0	0
Turn Type			Prot			
Protected Phases	2		1	1 2		
Permitted Phases						
Detector Phase	2		1	1 2		
Switch Phase						
Minimum Initial (s)	4.0		4.0			
Minimum Split (s)	20.0		20.0			
Total Split (s)	75.0	0.0	30.0	105.0	0.0	0.0
Total Split (%)	71.4%	0.0%	28.6%	100.0%	0.0%	0.0%
Yellow Time (s)	3.5		3.5			
All-Red Time (s)	0.5		0.5			
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	Max		None			
v/c Ratio	0.34		0.57	0.23		
Control Delay	6.5		41.7	0.1		
Queue Delay	0.0		0.0	0.0		
Total Delay	6.5		41.7	0.1		
Queue Length 50th (ft)	105		118	0		
Queue Length 95th (ft)	129		192	0		
Internal Link Dist (ft)	492			1777	265	
Turn Bay Length (ft)			130			
Base Capacity (vph)	3434		411	4951		
Starvation Cap Reductn	0		0	0		
Spillback Cap Reductn	0		0	0		
Storage Cap Reductn	0		0	0		
Reduced v/c Ratio	0.34		0.49	0.23		

Intersection Summary	
Area Type:	Other
Cycle Length: 105	
Actuated Cycle Length: 101.8	
Natural Cycle: 40	
Control Type: Semi Act-Uncoord	

Splits and Phases: 3: Route 145 & Route 1A on-ramp



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1016	99	185	1038	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	11	11	9	11	12	12
Total Lost time (s)	4.0		4.0	4.0		
Lane Util. Factor	0.91		1.00	0.91		
Frt	0.99		1.00	1.00		
Flt Protected	1.00		0.95	1.00		
Satd. Flow (prot)	4898		1608	4951		
Flt Permitted	1.00		0.95	1.00		
Satd. Flow (perm)	4898		1608	4951		
Peak-hour factor, PHF	0.95	0.95	0.91	0.91	0.95	0.95
Adj. Flow (vph)	1069	104	203	1141	0	0
RTOR Reduction (vph)	10	0	0	0	0	0
Lane Group Flow (vph)	1163	0	203	1141	0	0
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Bus Blockages (#/hr)	0	0	0	2	0	0
Turn Type			Prot			
Protected Phases	2		1	1 2		
Permitted Phases						
Actuated Green, G (s)	71.1		22.6	101.7		
Effective Green, g (s)	71.1		22.6	101.7		
Actuated g/C Ratio	0.70		0.22	1.00		
Clearance Time (s)	4.0		4.0			
Vehicle Extension (s)	3.0		3.0			
Lane Grp Cap (vph)	3424		357	4951		
v/s Ratio Prot	c0.24		c0.13	0.23		
v/s Ratio Perm						
v/c Ratio	0.34		0.57	0.23		
Uniform Delay, d1	6.0		35.2	0.0		
Progression Factor	1.00		1.00	1.00		
Incremental Delay, d2	0.3		2.1	0.0		
Delay (s)	6.3		37.3	0.0		
Level of Service	A		D	A		
Approach Delay (s)	6.3			5.7	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM Average Control Delay	6.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	101.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	38.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations													
Volume (vph)	83	278	242	0	0	0	314	160	81	38	129	127	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	10	12	12	12	10	11	12	12	12	12	
Storage Length (ft)	0		50	0		0	0		0	0		0	
Storage Lanes	0		1	0		0	1		0	0		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		988			531			233			338		
Travel Time (s)		22.5			12.1			5.3			7.7		
Peak Hour Factor	0.93	0.93	0.93	0.92	0.92	0.92	0.96	0.96	0.96	0.94	0.94	0.94	
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	1%	1%	1%	
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	2	
Parking (#/hr)									0				
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	388	260	0	0	0	327	251	0	0	312	0	
Turn Type	Split		Prot				D.P+P			Perm			
Protected Phases	4	4	4				2	2 6			6		9
Permitted Phases							6			6			
Detector Phase	4	4	4				2	2 6		6	6		
Switch Phase													
Minimum Initial (s)	1.0	1.0	1.0				1.0			1.0	1.0		1.0
Minimum Split (s)	7.0	7.0	7.0				6.0			7.0	7.0		5.0
Total Split (s)	29.0	29.0	29.0	0.0	0.0	0.0	13.0	31.0	0.0	18.0	18.0	0.0	22.0
Total Split (%)	35.4%	35.4%	35.4%	0.0%	0.0%	0.0%	15.9%	37.8%	0.0%	22.0%	22.0%	0.0%	27%
Yellow Time (s)	4.0	4.0	4.0				4.0			5.0	5.0		3.5
All-Red Time (s)	2.0	2.0	2.0				1.0			1.0	1.0		0.5
Lost Time Adjust (s)	-2.0	-2.0	-2.0	0.0	0.0	0.0	-1.0	-1.0	0.0	-2.0	-2.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lag	Lag	Lag				Lead			Lag	Lag		Lead
Lead-Lag Optimize?	Yes	Yes	Yes				Yes			Yes	Yes		Yes
Recall Mode	None	None	None				None			Max	Max		None
v/c Ratio		0.68	0.49				0.76	0.34			0.42		
Control Delay		26.6	13.0				31.0	13.9			15.3		
Queue Delay		0.0	0.0				0.0	0.0			0.0		
Total Delay		26.6	13.0				31.0	13.9			15.3		
Queue Length 50th (ft)		102	30				67	41			25		
Queue Length 95th (ft)		#336	134				#285	166			87		
Internal Link Dist (ft)		908			451			153			258		
Turn Bay Length (ft)			50										
Base Capacity (vph)		719	644				432	739			740		
Starvation Cap Reductn		0	0				0	0			0		
Spillback Cap Reductn		0	0				0	0			0		
Storage Cap Reductn		0	0				0	0			0		
Reduced v/c Ratio		0.54	0.40				0.76	0.34			0.42		

Intersection Summary	
Area Type:	CBD
Cycle Length: 82	
Actuated Cycle Length: 60.5	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 5: Winthrop Avenue & State Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	83	278	242	0	0	0	314	160	81	38	129	127
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	10	12	12	12	10	11	12	12	12	12
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	
Lane Util. Factor		1.00	1.00				1.00	1.00			0.95	
Frt		1.00	0.85				1.00	0.95			0.94	
Flt Protected		0.99	1.00				0.95	1.00			0.99	
Satd. Flow (prot)		1674	1332				1501	1554			2989	
Flt Permitted		0.99	1.00				0.52	1.00			0.88	
Satd. Flow (perm)		1674	1332				829	1554			2652	
Peak-hour factor, PHF	0.93	0.93	0.93	0.92	0.92	0.92	0.96	0.96	0.96	0.94	0.94	0.94
Adj. Flow (vph)	89	299	260	0	0	0	327	167	84	40	137	135
RTOR Reduction (vph)	0	0	86	0	0	0	0	19	0	0	104	0
Lane Group Flow (vph)	0	388	174	0	0	0	327	232	0	0	208	0
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	2
Parking (#/hr)									0			
Turn Type	Split		Prot				D.P+P			Perm		
Protected Phases	4	4	4				2	2 6			6	
Permitted Phases							6			6		
Actuated Green, G (s)		18.4	18.4				20.8	25.8			12.5	
Effective Green, g (s)		20.4	20.4				22.8	26.8			14.5	
Actuated g/C Ratio		0.32	0.32				0.36	0.42			0.23	
Clearance Time (s)		6.0	6.0				5.0				6.0	
Vehicle Extension (s)		3.0	3.0				3.0				3.0	
Lane Grp Cap (vph)		539	429				397	658			607	
v/s Ratio Prot		c0.23	0.13				c0.12	0.15				
v/s Ratio Perm							c0.18				0.08	
v/c Ratio		0.72	0.41				0.82	0.35			0.34	
Uniform Delay, d1		18.9	16.7				16.9	12.4			20.4	
Progression Factor		1.00	1.00				1.00	1.00			1.00	
Incremental Delay, d2		4.6	0.6				13.0	0.3			1.5	
Delay (s)		23.5	17.4				29.8	12.7			21.9	
Level of Service		C	B				C	B			C	
Approach Delay (s)		21.0			0.0			22.4			21.9	
Approach LOS		C			A			C			C	

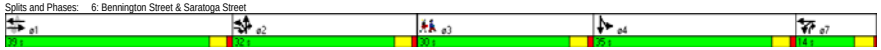
Intersection Summary					
HCM Average Control Delay	21.7	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.76				
Actuated Cycle Length (s)	63.3	Sum of lost time (s)		19.1	
Intersection Capacity Utilization	60.4%	ICU Level of Service		B	
Analysis Period (min)	15				
c Critical Lane Group					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø3
Lane Configurations													
Volume (vph)	301	272	157	35	296	3	129	242	72	35	179	346	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	10	12	12	10	12	12	10	16	12	12	12	
Storage Length (ft)	0		0	0		0	250		305	0		150	
Storage Lanes	0		1	0		0	1		1	0		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			No			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		3390			1736			677			1166		
Travel Time (s)		77.0			39.5			15.4			26.5		
Peak Hour Factor	0.95	0.95	0.95	0.86	0.86	0.86	0.93	0.93	0.93	0.90	0.90	0.90	
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	2%	2%	2%	1%	1%	1%	
Parking (#/hr)			1			1				1			
Shared Lane Traffic (%)							10%						
Lane Group Flow (vph)	0	603	165	0	388	0	125	274	77	0	622	0	
Turn Type	Perm		pm+ov	D.P+P			Split		pt+ov	Split			
Protected Phases		1	2	7	1 7		2	2	2 7	4	4		3
Permitted Phases	1		1	1									
Detector Phase	1	1	2	7	1 7		2	2	2 7	4	4		
Switch Phase													
Minimum Initial (s)	4.0	4.0	4.0	4.0			4.0	4.0		4.0	4.0		4.0
Minimum Split (s)	13.0	13.0	20.0	8.0			20.0	20.0		20.0	20.0		30.0
Total Split (s)	39.0	39.0	32.0	14.0	53.0	0.0	32.0	32.0	46.0	35.0	35.0	0.0	30.0
Total Split (%)	26.0%	26.0%	21.3%	9.3%	35.3%	0.0%	21.3%	21.3%	30.7%	23.3%	23.3%	0.0%	20%
Yellow Time (s)	3.0	3.0	3.0	3.5			3.0	3.0		3.0	3.0		3.0
All-Red Time (s)	1.0	1.0	1.0	0.5			1.0	1.0		1.0	1.0		1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lead	Lag				Lag	Lag		Lag	Lag		Lead
Lead-Lag Optimize?	Yes	Yes	Yes				Yes	Yes		Yes	Yes		Yes
Recall Mode	None	None	None	None			None	None		Max	Max		None
v/c Ratio		2.80	0.25		0.55		0.38	0.86	0.15		1.54		
Control Delay		843.6	22.0		36.6		51.7	76.5	5.3		285.0		
Queue Delay		0.0	0.0		0.0		0.0	0.0	0.0		0.0		
Total Delay		843.6	22.0		36.6		51.7	76.5	5.3		285.0		
Queue Length 50th (ft)		~784	62		105		85	211	0		~626		
Queue Length 95th (ft)		#1273	159		193		188	#486	25		#1109		
Internal Link Dist (ft)		3310			1656			597			1086		
Turn Bay Length (ft)							250		305				
Base Capacity (vph)		215	668		707		325	318	525		405		
Starvation Cap Reductn		0	0		0		0	0	0		0		
Spillback Cap Reductn		0	0		0		0	0	0		0		
Storage Cap Reductn		0	0		0		0	0	0		0		
Reduced v/c Ratio		2.80	0.25		0.55		0.38	0.86	0.15		1.54		

Intersection Summary	
Area Type:	CBD
Cycle Length: 150	
Actuated Cycle Length: 132	
Natural Cycle: 145	
Control Type: Actuated-Uncoordinated	

– Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Bennington Street & Saratoga Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	301	272	157	35	296	3	129	242	72	35	179	346
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	10	12	12	10	16	12	12	12
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00		0.95		0.95	0.95	1.00		1.00	
Frt		1.00	0.85		1.00		1.00	1.00	0.85		0.92	
Flt Protected		0.97	1.00		0.99		0.95	1.00	1.00		1.00	
Satd. Flow (prot)		1555	1301		2983		1513	1483	1615		1547	
Flt Permitted		0.50	1.00		0.59		0.95	1.00	1.00		1.00	
Satd. Flow (perm)		801	1301		1777		1513	1483	1615		1547	
Peak-hour factor, PHF	0.95	0.95	0.95	0.86	0.86	0.86	0.93	0.93	0.93	0.90	0.90	0.90
Adj. Flow (vph)	317	286	165	41	344	3	139	260	77	39	199	384
RTOR Reduction (vph)	0	0	0	0	1	0	0	0	55	0	38	0
Lane Group Flow (vph)	0	603	165	0	387	0	125	274	22	0	584	0
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	2%	2%	2%	1%	1%	1%
Parking (#/hr)						1			1			
Turn Type	Perm		pm+ov	D.P+P			Split		pt+ov	Split		
Protected Phases		1	2	7	1 7		2	2	2 7	4	4	
Permitted Phases	1		1	1								
Actuated Green, G (s)		35.4	63.7		45.5		28.3	28.3	38.4		31.4	
Effective Green, g (s)		35.4	63.7		45.5		28.3	28.3	38.4		31.4	
Actuated g/C Ratio		0.26	0.47		0.34		0.21	0.21	0.29		0.23	
Clearance Time (s)		4.0	4.0				4.0	4.0			4.0	
Vehicle Extension (s)		3.0	3.0				3.0	3.0			3.0	
Lane Grp Cap (vph)		211	655		692		319	312	461		361	
v/s Ratio Prot			0.05		c0.04		0.08	c0.18	0.01		c0.38	
v/s Ratio Perm		c0.75	0.07		0.15							
v/c Ratio		2.86	0.25		0.56		0.39	0.88	0.05		1.62	
Uniform Delay, d1		49.5	21.1		36.3		45.6	51.4	34.8		51.5	
Progression Factor		1.00	1.00		1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2		848.9	0.2		1.0		0.8	23.2	0.0		291.0	
Delay (s)		898.4	21.3		37.3		46.4	74.5	34.8		342.5	
Level of Service		F	C		D		D	E	C		F	
Approach Delay (s)		710.0			37.3			60.7			342.5	
Approach LOS		F			D			E			F	

Intersection Summary					
HCM Average Control Delay		355.7	HCM Level of Service		F
HCM Volume to Capacity ratio		1.73			
Actuated Cycle Length (s)		134.4	Sum of lost time (s)		29.2
Intersection Capacity Utilization		108.4%	ICU Level of Service		G
Analysis Period (min)		15			

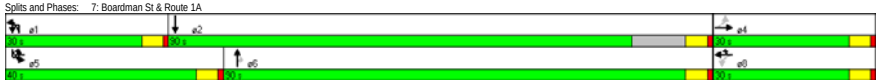
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Volume (vph)	34	9	33	184	11	256	18	11	1555	239	36	90	1474	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	12	12	10	10	12	11	11	11	12	11	11	12
Storage Length (ft)	130		0	0		250		400		500		380		0
Storage Lanes	1		0	0		1		1		1		1		0
Taper Length (ft)	25		25	25		25		25		25		25		25
Right Turn on Red			Yes			No				Yes				Yes
Link Speed (mph)		30			30				30				30	
Link Distance (ft)		537			1355				733				976	
Travel Time (s)		12.2			30.8				16.7				22.2	
Confl. Peds. (#/hr)														2
Peak Hour Factor	0.66	0.66	0.66	0.81	0.81	0.81	0.92	0.91	0.91	0.91	0.92	0.91	0.91	0.91
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	2%	1%	1%	1%	3%	3%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	8	0
Shared Lane Traffic (%)														
Lane Group Flow (vph)	52	64	0	0	241	316	0	32	1709	263	0	138	1647	0
Turn Type	Perm			Perm		pt+ov	Prot	Prot		Perm	Prot	Prot		
Protected Phases		4			8	8 5!	1	1	6		5!	5	2	
Permitted Phases	4			8						6				
Detector Phase	4	4		8	8	8 5	1	1	6	6	5	5	2	
Switch Phase														
Minimum Initial (s)	10.0	10.0		10.0	10.0		8.0	8.0	20.0	20.0	8.0	8.0	20.0	
Minimum Split (s)	29.0	29.0		32.0	32.0		13.0	13.0	31.0	31.0	13.0	13.0	29.0	
Total Split (s)	30.0	30.0	0.0	30.0	30.0	70.0	30.0	30.0	90.0	90.0	40.0	40.0	90.0	0.0
Total Split (%)	18.8%	18.8%	0.0%	18.8%	18.8%	43.8%	18.8%	18.8%	56.3%	56.3%	25.0%	25.0%	56.3%	0.0%
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	-1.0	-1.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	5.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0
Lead/Lag							Lead	Lead	Lag	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None		None	None		None	None	None	None	None	None	None	
v/c Ratio	0.57	0.20			1.10	0.64		0.27	0.82	0.25		0.67	0.71	
Control Delay	79.5	20.0			141.8	46.6		69.9	26.3	2.1		75.1	15.7	
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0	0.0		0.0	0.0	
Total Delay	79.5	20.0			141.8	46.6		69.9	26.3	2.1		75.1	15.7	
Queue Length 50th (ft)	44	11			~255	249		29	603	0		123	488	
Queue Length 95th (ft)	69	29			#388	308		66	798	38		198	600	
Internal Link Dist (ft)		457			1275				653				896	
Turn Bay Length (ft)	130					250		400		500		380		
Base Capacity (vph)	92	322			219	700		325	2164	1066		444	2377	
Starvation Cap Reductn	0	0			0	0		0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0		0	0	0		0	0	
Storage Cap Reductn	0	0			0	0		0	0	0		0	0	
Reduced v/c Ratio	0.57	0.20			1.10	0.45		0.10	0.79	0.25		0.31	0.69	

Intersection Summary

Area Type: Other
Cycle Length: 160
Actuated Cycle Length: 138
Natural Cycle: 90
Control Type: Semi Act-Uncoord
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
! Phase conflict between lane groups.

Splits and Phases: 7: Boardman St & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Volume (vph)	34	9	33	184	11	256	18	11	1555	239	36	90	1474	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	12	12	10	10	12	11	11	11	12	11	11	12
Total Lost time (s)	5.0	5.0			5.0	5.0		4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00	1.00		1.00	0.95	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.88			1.00	0.85		1.00	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00			0.96	1.00		0.95	1.00	1.00		0.95	1.00	
Satd. Flow (prot)	1604	1544			1660	1478		1717	3455	1546		1694	3324	
Flt Permitted	0.30	1.00			0.69	1.00		0.95	1.00	1.00		0.95	1.00	
Satd. Flow (perm)	506	1544			1203	1478		1717	3455	1546		1694	3324	
Peak-hour factor, PHF	0.66	0.66	0.66	0.81	0.81	0.81	0.92	0.91	0.91	0.91	0.92	0.91	0.91	0.91
Adj. Flow (vph)	52	14	50	227	14	316	20	12	1709	263	39	99	1620	27
RTOR Reduction (vph)	0	41	0	0	0	0	0	0	0	103	0	0	1	0
Lane Group Flow (vph)	52	23	0	0	241	316	0	32	1709	160	0	138	1646	0
Confl. Peds. (#/hr)														2
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	2%	1%	1%	1%	3%	3%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	8	0
Turn Type	Perm			Perm		pt+ov	Prot	Prot		Perm	Prot	Prot		
Protected Phases		4			8	8 5!	1	1	6		5!	5	2	
Permitted Phases	4			8						6				
Actuated Green, G (s)	25.1	25.1			25.1	45.8		5.0	84.2	84.2		15.7	94.9	
Effective Green, g (s)	25.1	25.1			25.1	45.8		6.0	85.2	85.2		16.7	95.9	
Actuated g/C Ratio	0.18	0.18			0.18	0.33		0.04	0.61	0.61		0.12	0.69	
Clearance Time (s)	5.0	5.0			5.0			5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	2.5	2.5			2.5			2.0	5.0	5.0		2.0	5.0	
Lane Grp Cap (vph)	91	277			216	484		74	2103	941		202	2277	
v/s Ratio Prot		0.01				c0.21		0.02	c0.49			c0.08	0.50	
v/s Ratio Perm	0.10				c0.20					0.10				
v/c Ratio	0.57	0.08			1.12	0.65		0.43	0.81	0.17		0.68	0.72	
Uniform Delay, d1	52.5	47.9			57.5	40.3		65.3	21.2	12.0		59.1	13.8	
Progression Factor	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.9	0.1			95.8	2.8		1.5	2.8	0.2		7.4	1.4	
Delay (s)	59.5	48.0			153.2	43.1		66.8	24.1	12.1		66.5	15.2	
Level of Service	E	D			F	D		E	C	B		E	B	
Approach Delay (s)		53.1			90.8				23.2				19.2	
Approach LOS		D			F				C				B	

Intersection Summary

HCM Average Control Delay	30.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	89.1%	ICU Level of Service	E
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBT	NBR	SBT	SBR	SEL2	SEL	SER	SER2
Lane Configurations															
Volume (vph)	7	175	8	675	261	31	72	539	855	452	13	19	85	7	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	10	16	12	12	12	12	12	14	16	12	12	12	12	12
Storage Length (ft)	50		0	0		0			0		0		0	0	
Storage Lanes	1		1	2		0			1		0		1	0	
Taper Length (ft)	25		25	25		25			25		25		25	25	
Right Turn on Red			Yes				No		Yes						Yes
Link Speed (mph)		30			30			30		30			30		
Link Distance (ft)		485			572			480		673			302		
Travel Time (s)		11.0			13.0			10.9		15.3			6.9		
Peak Hour Factor	0.75	0.75	0.75	0.92	0.92	0.92	0.92	0.97	0.97	0.81	0.81	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	0%	1%	1%	1%	1%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	242	11	734	396	0	0	556	881	574	0	0	137	0	0
Turn Type	Split		Prot	Split					custom			Split			
Protected Phases	4	4	4	8	8			2	2	6		12	12		
Permitted Phases									4 8 12						
Detector Phase	4	4	4	8	8			2	2	6		12	12		
Switch Phase															
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0	4.0		4.0	4.0		
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0			21.0	21.0	21.0		21.0	21.0		
Total Split (s)	35.0	35.0	35.0	80.0	80.0	0.0	0.0	70.0	70.0	70.0	0.0	30.0	30.0	0.0	0.0
Total Split (%)	16.3%	16.3%	16.3%	37.2%	37.2%	0.0%	0.0%	32.6%	32.6%	32.6%	0.0%	14.0%	14.0%	0.0%	0.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0	4.0		4.0	4.0		
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0			1.0	1.0	1.0		1.0	1.0		
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	0.0	0.0	-1.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag															
Lead-Lag Optimize?															
Recall Mode	None	None	None	None	None			Max	Max	Max		None	None		
v/c Ratio		0.64	0.05	0.76	0.79			0.39	0.52	0.36			0.67		
Control Delay		81.1	31.4	61.2	68.6			39.4	1.1	38.6			89.1		
Queue Delay		0.0	0.0	0.1	0.3			0.0	0.0	0.0			0.0		
Total Delay		81.1	31.4	61.3	68.9			39.4	1.1	38.6			89.1		
Queue Length 50th (ft)		134	0	378	401			224	0	228			143		
Queue Length 95th (ft)		173	17	498	581			363	0	323			240		
Internal Link Dist (ft)		405			492			400		593			222		
Turn Bay Length (ft)															
Base Capacity (vph)		626	347	1615	839			1432	1706	1616			284		
Starvation Cap Reductn		0	0	178	103			0	0	0			0		
Spillback Cap Reductn		0	0	0	0			0	0	0			0		
Storage Cap Reductn		0	0	0	0			0	0	0			0		
Reduced v/c Ratio		0.39	0.03	0.51	0.54			0.39	0.52	0.36			0.48		

Intersection Summary	
Area Type:	Other
Cycle Length: 215	
Actuated Cycle Length: 167.1	
Natural Cycle: 85	
Control Type: Semi Act-Uncoord	

Splits and Phases: 8: Winthrop Avenue & Route 16



Movement	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBT	NBR	SBT	SBR	SEL2	SEL	SER	SER2
Lane Configurations															
Volume (vph)	7	175	8	675	261	31	72	539	855	452	13	19	85	7	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	16	12	12	12	12	12	14	16	12	12	12	12	12
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0	4.0	4.0			4.0		
Lane Util. Factor		0.95	1.00	0.97	1.00			0.95	1.00	0.95			1.00		
Frt		1.00	0.85	1.00	0.96			1.00	0.85	1.00			0.98		
Flt Protected		1.00	1.00	0.95	1.00			1.00	1.00	1.00			0.96		
Satd. Flow (prot)		3330	1798	3502	1819			3574	1706	4034			1791		
Flt Permitted		1.00	1.00	0.95	1.00			1.00	1.00	1.00			0.96		
Satd. Flow (perm)		3330	1798	3502	1819			3574	1706	4034			1791		
Peak-hour factor, PHF	0.75	0.75	0.75	0.92	0.92	0.92	0.92	0.97	0.97	0.81	0.81	0.86	0.86	0.86	0.86
Adj. Flow (vph)	9	233	11	734	284	34	78	556	881	558	16	22	99	8	8
RTOR Reduction (vph)	0	0	10	0	0	0	0	0	0	0	0	0	1	0	0
Lane Group Flow (vph)	0	242	1	734	396	0	0	556	881	574	0	0	136	0	0
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	0%	1%	1%	1%	1%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Turn Type	Split		Prot	Split					custom			Split			
Protected Phases	4	4	4	8	8			2	2	6		12	12		
Permitted Phases									4 8 12						
Actuated Green, G (s)		17.9	17.9	45.0	45.0			65.9	156.8	65.9			18.0		
Effective Green, g (s)		18.9	18.9	46.0	46.0			66.9	158.8	66.9			19.0		
Actuated g/C Ratio		0.11	0.11	0.28	0.28			0.40	0.95	0.40			0.11		
Clearance Time (s)		5.0	5.0	5.0	5.0			5.0	5.0	5.0			5.0		
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0	3.0	3.0			3.0		
Lane Grp Cap (vph)		377	204	966	502			1433	1706	1618			204		
v/s Ratio Prot		c0.07	0.00	0.21	c0.22			0.16	c0.21	0.14			c0.08		
v/s Ratio Perm									0.31						
v/c Ratio		0.64	0.01	0.76	0.79			0.39	0.52	0.35			0.67		
Uniform Delay, d1		70.7	65.6	55.3	55.9			35.4	0.4	34.9			70.9		
Progression Factor		1.00	1.00	1.00	1.00			1.00	1.00	1.00			1.00		
Incremental Delay, d2		3.7	0.0	3.5	8.1			0.8	0.3	0.6			8.0		
Delay (s)		74.4	65.6	58.8	64.0			36.2	0.6	35.5			78.9		
Level of Service		E	E	E	E			D	A	D			E		
Approach Delay (s)		74.0			60.6			14.4		35.5			78.9		
Approach LOS		E			E			B		D			E		

Intersection Summary			
HCM Average Control Delay	39.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	166.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	64.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations											
Volume (vph)	194	27	41	0	101	657	240	143	172	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	16	12	12	12	12	12	12	12	12
Storage Length (ft)		0	0	0		0	115		200	0	0
Storage Lanes		1	1	0		2	1		1	0	0
Taper Length (ft)		25	25	25		25	25		25	25	25
Right Turn on Red			Yes			Yes			Yes		
Link Speed (mph)		30			30			30		30	
Link Distance (ft)		335			262			919		278	
Travel Time (s)		7.6			6.0			20.9		6.3	
Peak Hour Factor	0.97	0.97	0.97	0.96	0.96	0.96	0.90	0.90	0.90	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	0%	0%
Shared Lane Traffic (%)	50%										
Lane Group Flow (vph)	100	128	42	0	105	684	267	159	191	0	0
Turn Type	Split		Prot			Free	Prot		Prot		
Protected Phases	8	8	8		6		1	1 6	1 6		
Permitted Phases						Free					
Detector Phase	8	8	8		6		1	1 6	1 6		
Switch Phase											
Minimum Initial (s)	4.0	4.0	4.0		4.0		4.0				
Minimum Split (s)	20.0	20.0	20.0		20.0		8.0				
Total Split (s)	20.0	20.0	20.0	0.0	45.0	0.0	20.0	65.0	65.0	0.0	0.0
Total Split (%)	23.5%	23.5%	23.5%	0.0%	52.9%	0.0%	23.5%	76.5%	76.5%	0.0%	0.0%
Yellow Time (s)	3.0	3.0	3.0		3.0		3.0				
All-Red Time (s)	1.0	1.0	1.0		1.0		1.0				
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lag	Lag		Lead						
Lead-Lag Optimize?	Yes	Yes	Yes		Yes						
Recall Mode	None	None	None		Max		None				
v/c Ratio	0.47	0.30	0.15		0.06	0.42	0.79	0.06	0.15		
Control Delay	39.3	32.7	11.5		10.2	0.8	48.8	2.6	0.8		
Queue Delay	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		
Total Delay	39.3	32.7	11.5		10.2	0.8	48.8	2.6	0.8		
Queue Length 50th (ft)	51	31	0		12	0	125	7	0		
Queue Length 95th (ft)	101	58	27		27	0	#252	17	14		
Internal Link Dist (ft)		255			182			839		198	
Turn Bay Length (ft)							115		200		
Base Capacity (vph)	338	676	410		1903	1615	368	2718	1262		
Starvation Cap Reductn	0	0	0		0	0	0	0	0		
Spillback Cap Reductn	0	0	0		0	0	0	0	0		
Storage Cap Reductn	0	0	0		0	0	0	0	0		
Reduced v/c Ratio	0.30	0.19	0.10		0.06	0.42	0.73	0.06	0.15		

Intersection Summary

Area Type: Other
Cycle Length: 85
Actuated Cycle Length: 78
Natural Cycle: 55
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 10: State Road & Ocean Avenue



Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations											
Volume (vph)	194	27	41	0	101	657	240	143	172	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	16	12	12	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0		
Lane Util. Factor	0.91	0.91	1.00		0.95	1.00	1.00	0.95	1.00		
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85		
Flt Protected	0.95	0.95	1.00		1.00	1.00	0.95	1.00	1.00		
Satd. Flow (prot)	1643	3285	1830		3610	1615	1787	3574	1599		
Flt Permitted	0.95	0.95	1.00		1.00	1.00	0.95	1.00	1.00		
Satd. Flow (perm)	1643	3285	1830		3610	1615	1787	3574	1599		
Peak-hour factor, PHF	0.97	0.97	0.97	0.96	0.96	0.96	0.90	0.90	0.90	0.92	0.92
Adj. Flow (vph)	200	28	42	0	105	684	267	159	191	0	0
RTOR Reduction (vph)	0	0	37	0	0	0	0	0	44	0	0
Lane Group Flow (vph)	100	128	5	0	105	684	267	159	147	0	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	0%	0%
Turn Type	Split		Prot			Free	Prot		Prot		
Protected Phases	8	8	8		6		1	1 6	1 6		
Permitted Phases						Free					
Actuated Green, G (s)	10.1	10.1	10.1		41.1	78.0	14.8	59.9	59.9		
Effective Green, g (s)	10.1	10.1	10.1		41.1	78.0	14.8	59.9	59.9		
Actuated g/C Ratio	0.13	0.13	0.13		0.53	1.00	0.19	0.77	0.77		
Clearance Time (s)	4.0	4.0	4.0		4.0		4.0				
Vehicle Extension (s)	3.0	3.0	3.0		3.0		3.0				
Lane Grp Cap (vph)	213	425	237		1902	1615	339	2745	1228		
v/s Ratio Prot	0.06	0.04	0.00		0.03		c0.15	0.04	0.09		
v/s Ratio Perm						c0.42					
v/c Ratio	0.47	0.30	0.02		0.06	0.42	0.79	0.06	0.12		
Uniform Delay, d1	31.5	30.8	29.6		9.0	0.0	30.1	2.2	2.3		
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00		
Incremental Delay, d2	1.6	0.4	0.0		0.1	0.8	11.5	0.0	0.0		
Delay (s)	33.1	31.2	29.7		9.0	0.8	41.6	2.2	2.4		
Level of Service	C	C	C		A	A	D	A	A		
Approach Delay (s)		31.6			1.9			19.3		0.0	
Approach LOS		C			A			B		A	

Intersection Summary

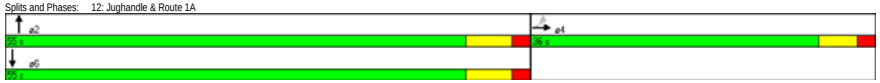
HCM Average Control Delay	13.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	78.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	32.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	49	8	7	0	0	0	0	1752	2	0	1586	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	16	12	12	12	11	11	11	11	11	11
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		149			363			405			217	
Travel Time (s)		3.4			8.3			9.2			4.9	
Peak Hour Factor	0.84	0.84	0.84	0.92	0.92	0.92	0.96	0.96	0.96	0.95	0.95	0.95
Heavy Vehicles (%)	14%	14%	14%	0%	0%	0%	2%	2%	2%	3%	3%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	76	0	0	0	0	0	1827	0	0	1669	0
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Detector Phase	4	4						2			6	
Switch Phase												
Minimum Initial (s)	4.0	4.0						4.0			4.0	
Minimum Split (s)	14.0	14.0						27.0			27.0	
Total Split (s)	36.0	36.0	0.0	0.0	0.0	0.0	0.0	55.0	0.0	0.0	55.0	0.0
Total Split (%)	39.6%	39.6%	0.0%	0.0%	0.0%	0.0%	0.0%	60.4%	0.0%	0.0%	60.4%	0.0%
Yellow Time (s)	4.0	4.0						5.0			5.0	
All-Red Time (s)	2.0	2.0						2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	4.0	4.0	4.0	4.0	4.0	7.0	4.0	4.0	7.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None						Max			Max	
v/c Ratio		0.36						0.71			0.66	
Control Delay		30.7						8.6			7.6	
Queue Delay		0.0						0.0			0.0	
Total Delay		30.7						8.6			7.6	
Queue Length 50th (ft)		27						215			180	
Queue Length 95th (ft)		60						351			293	
Internal Link Dist (ft)		69			283			325			137	
Turn Bay Length (ft)												
Base Capacity (vph)		776						2570			2545	
Starvation Cap Reductn		0						0			0	
Spillback Cap Reductn		0						0			0	
Storage Cap Reductn		0						0			0	
Reduced v/c Ratio		0.10						0.71			0.66	

Intersection Summary	
Area Type:	Other
Cycle Length: 91	
Actuated Cycle Length: 69.8	
Natural Cycle: 60	
Control Type: Semi Act-Uncoord	

Splits and Phases: 12: Jughandle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	49	8	7	0	0	0	0	1752	2	0	1586	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	16	16	16	12	12	12	11	11	11	11	11	11
Total Lost time (s)		6.0						7.0			7.0	
Lane Util. Factor		1.00						0.95			0.95	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1794						3421			3388	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1794						3421			3388	
Peak-hour factor, PHF	0.84	0.84	0.84	0.92	0.92	0.92	0.96	0.96	0.96	0.95	0.95	0.95
Adj. Flow (vph)	58	10	8	0	0	0	0	1825	2	0	1669	0
RTOR Reduction (vph)	0	6	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	70	0	0	0	0	0	1827	0	0	1669	0
Heavy Vehicles (%)	14%	14%	14%	0%	0%	0%	2%	2%	2%	3%	3%	3%
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Actuated Green, G (s)		6.9						51.0			51.0	
Effective Green, g (s)		6.9						51.0			51.0	
Actuated g/C Ratio		0.10						0.72			0.72	
Clearance Time (s)		6.0						7.0			7.0	
Vehicle Extension (s)		3.0						3.0			3.0	
Lane Grp Cap (vph)		175						2461			2437	
v/s Ratio Prot								c0.53			0.49	
v/s Ratio Perm		0.04										
v/c Ratio		0.40						0.74			0.68	
Uniform Delay, d1		30.1						6.0			5.5	
Progression Factor		1.00						1.00			1.00	
Incremental Delay, d2		1.5						2.1			1.6	
Delay (s)		31.5						8.1			7.1	
Level of Service		C						A			A	
Approach Delay (s)		31.5			0.0			8.1			7.1	
Approach LOS		C			A			A			A	

Intersection Summary					
HCM Average Control Delay	8.1	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.70				
Actuated Cycle Length (s)	70.9	Sum of lost time (s)		13.0	
Intersection Capacity Utilization	62.9%	ICU Level of Service		B	
Analysis Period (min)	15				
c Critical Lane Group					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Volume (vph)	20	242	52	85	157	30	14	95	959	83	27	365	1057	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	50		0		150		0		800		0
Storage Lanes	1		0	1		0		1		0		1		0
Taper Length (ft)	25		25	25		25		25		25		25		25
Right Turn on Red			Yes			Yes				Yes				Yes
Link Speed (mph)		30			30				30				30	
Link Distance (ft)		1202			2003				910				1421	
Travel Time (s)		27.3			45.5				20.7				32.3	
Confl. Peds. (#/hr)	8		18	18		8				1				4
Confl. Bikes (#/hr)														1
Peak Hour Factor	0.91	0.91	0.91	0.85	0.85	0.85	0.95	0.95	0.95	0.95	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	3%	3%	3%	3%	2%	2%	2%	2%
Shared Lane Traffic (%)														
Lane Group Flow (vph)	22	323	0	100	220	0	0	115	1096	0	0	417	1139	0
Turn Type	Perm			Perm				Prot				Prot		
Protected Phases		4			8			1	6			5	2	
Permitted Phases	4			8										
Detector Phase	4	4		8	8			1	6			5	2	
Switch Phase														
Minimum Initial (s)	4.0	4.0		4.0	4.0			4.0	4.0			4.0	4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0			31.0	11.0			11.0	11.0	
Total Split (s)	36.0	36.0	0.0	36.0	36.0	0.0	0.0	36.0	56.0	0.0	0.0	36.0	56.0	0.0
Total Split (%)	28.1%	28.1%	0.0%	28.1%	28.1%	0.0%	0.0%	28.1%	43.8%	0.0%	0.0%	28.1%	43.8%	0.0%
Yellow Time (s)	4.0	4.0		4.0	4.0			4.0	4.0			4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0			2.0	2.0			2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	4.0	6.0	6.0	4.0	4.0	6.0	6.0	4.0	4.0	6.0	6.0	4.0
Lead/Lag								Lead	Lag			Lead	Lag	
Lead-Lag Optimize?								Yes	Yes			Yes	Yes	
Recall Mode	None	None		None	None			None	Max			None	Max	
v/c Ratio	0.12	0.81		1.02	0.55			no cap	0.79			no cap	0.81	
Control Delay	40.8	61.6		146.0	47.8				38.5				39.5	
Queue Delay	0.0	0.0		0.0	0.0				0.0				0.0	
Total Delay	40.8	61.6		146.0	47.8			Error	38.5			Error	39.5	
Queue Length 50th (ft)	14	245		82	155			~198	419			~718	442	
Queue Length 95th (ft)	39	#360		#183	222			#324	510			#924	534	
Internal Link Dist (ft)		1122			1923				830				1341	
Turn Bay Length (ft)	50			50				150				800		
Base Capacity (vph)	198	438		107	435			1	1384			1	1409	
Starvation Cap Reductn	0	0		0	0			0	0			0	0	
Spillback Cap Reductn	0	0		0	0			0	0			0	0	
Storage Cap Reductn	0	0		0	0			0	0			0	0	
Reduced v/c Ratio	0.11	0.74		0.93	0.51			115.00	0.79			417.00	0.81	

Intersection Summary

Area Type: Other
Cycle Length: 128
Actuated Cycle Length: 125.5
Natural Cycle: 90
Control Type: Semi Act-Uncoord
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 15: Revere St & Route 60



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Volume (vph)	20	242	52	85	157	30	14	95	959	83	27	365	1057	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	0.95			1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00			1.00	1.00			1.00	1.00	
Flpb, ped/bikes	0.99	1.00		0.99	1.00			1.00	1.00			1.00	1.00	
Frt	1.00	0.97		1.00	0.98			1.00	0.99			1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00			0.95	1.00	
Satd. Flow (prot)	1757	1802		1733	1794			1752	3457			1770	3531	
Flt Permitted	0.45	1.00		0.25	1.00			0.13	1.00			0.13	1.00	
Satd. Flow (perm)	827	1802		449	1794			246	3457			248	3531	
Peak-hour factor, PHF	0.91	0.91	0.91	0.85	0.85	0.85	0.95	0.95	0.95	0.95	0.94	0.94	0.94	0.94
Adj. Flow (vph)	22	266	57	100	185	35	15	100	1009	87	29	388	1124	15
RTOR Reduction (vph)	0	6	0	0	5	0	0	0	5	0	0	0	1	0
Lane Group Flow (vph)	22	317	0	100	215	0	0	115	1091	0	0	417	1138	0
Confl. Peds. (#/hr)	8		18	18		8				1				4
Confl. Bikes (#/hr)														1
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	3%	3%	3%	3%	2%	2%	2%	2%
Turn Type	Perm			Perm				Prot				Prot		
Protected Phases		4			8			1	6			5	2	
Permitted Phases	4			8										
Actuated Green, G (s)	27.4	27.4		27.4	27.4			30.0	50.1			30.0	50.1	
Effective Green, g (s)	27.4	27.4		27.4	27.4			30.0	50.1			30.0	50.1	
Actuated g/C Ratio	0.22	0.22		0.22	0.22			0.24	0.40			0.24	0.40	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			3.0	3.0	
Lane Grp Cap (vph)	181	393		98	392			59	1380			59	1410	
v/s Ratio Prot		0.18			0.12				0.32				c0.32	
v/s Ratio Perm	0.03			c0.22				0.47				c1.68		
v/c Ratio	0.12	0.81		1.02	0.55			1.95	0.79			7.07	0.81	
Uniform Delay, d1	39.4	46.5		49.0	43.5			47.8	33.1			47.8	33.4	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00			1.00	1.00	
Incremental Delay, d2	0.3	11.4		96.5	1.6			482.6	4.7			2765.6	5.1	
Delay (s)	39.7	58.0		145.6	45.1			530.3	37.8			2813.3	38.5	
Level of Service	D	E		F	D			F	D			F	D	
Approach Delay (s)		56.8			76.5				84.6				782.1	
Approach LOS		E			E				F				F	

Intersection Summary

HCM Average Control Delay	397.3	HCM Level of Service	F
HCM Volume to Capacity ratio	2.60		
Actuated Cycle Length (s)	125.5	Sum of lost time (s)	18.0
Intersection Capacity Utilization	91.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø3
Lane Configurations													
Volume (vph)	0	1068	109	358	1328	6	203	238	134	169	168	105	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	10	10	10	11	11	12	12	12	12	
Storage Length (ft)	0		0	200		0	300		50	0		80	
Storage Lanes	0		0	1		0	1		1	1		1	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			No			No	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		2232			2756			1675			1148		
Travel Time (s)		50.7			62.6			38.1			26.1		
Confl. Peds. (#/hr)	5					5	3		18	18		3	
Peak Hour Factor	0.95	0.95	0.95	0.97	0.97	0.97	0.89	0.89	0.89	0.93	0.93	0.93	
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	1239	0	369	1375	0	228	267	151	182	181	113	
Turn Type				Prot			D.P+P		Perm	Perm		Perm	
Protected Phases		2		1	1 2		4	4 9			9		3
Permitted Phases							9		4 9	9		9	
Detector Phase		2		1	1 2		4	4 9	4 9	9	9	9	
Switch Phase													
Minimum Initial (s)		4.0		4.0			4.0			4.0	4.0	4.0	4.0
Minimum Split (s)		55.0		13.0			13.0			15.0	15.0	15.0	29.0
Total Split (s)	0.0	55.0	0.0	40.0	95.0	0.0	17.0	52.0	52.0	35.0	35.0	35.0	29.0
Total Split (%)	0.0%	31.3%	0.0%	22.7%	54.0%	0.0%	9.7%	29.5%	29.5%	19.9%	19.9%	19.9%	16%
Yellow Time (s)		5.0		4.0			4.0			6.0	6.0	6.0	4.0
All-Red Time (s)		1.0		1.0			1.0			1.0	1.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.0	6.0	4.0	5.0	5.0	4.0	5.0	5.0	5.0	7.0	7.0	7.0	
Lead/Lag		Lag		Lead			Lag						Lead
Lead-Lag Optimize?													
Recall Mode		Max		None			None			None	None	None	None
v/c Ratio		0.77		0.94	0.48		0.73	0.47	0.31	0.89	0.51	0.38	
Control Delay		48.8		89.1	17.5		57.6	44.9	41.7	98.2	61.0	58.3	
Queue Delay		0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		48.8		89.1	17.5		57.6	44.9	41.7	98.2	61.0	58.3	
Queue Length 50th (ft)		384		349	250		172	204	109	171	157	96	
Queue Length 95th (ft)		493		#609	346		#290	320	188	#349	257	171	
Internal Link Dist (ft)		2152			2676			1595			1068		
Turn Bay Length (ft)				200			300		50			80	
Base Capacity (vph)		1614		391	2889		314	573	488	205	353	295	
Starvation Cap Reductn		0		0	0		0	0	0	0	0	0	
Spillback Cap Reductn		0		0	0		0	0	0	0	0	0	
Storage Cap Reductn		0		0	0		0	0	0	0	0	0	
Reduced v/c Ratio		0.77		0.94	0.48		0.73	0.47	0.31	0.89	0.51	0.38	

Intersection Summary

Area Type: Other
Cycle Length: 176
Actuated Cycle Length: 149.3
Natural Cycle: 145
Control Type: Semi Act-Uncoord
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 19: Route 16 (Revere Beach Pkwy) & Garfield Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1068	109	358	1328	6	203	238	134	169	168	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	10	10	10	11	11	12	12	12	12
Total Lost time (s)		6.0		5.0	5.0		5.0	5.0	5.0	7.0	7.0	7.0
Lane Util. Factor		0.91		1.00	0.91		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes		1.00		1.00	1.00		1.00	1.00	0.97	1.00	1.00	0.98
Flpb, ped/bikes		1.00		1.00	1.00		1.00	1.00	1.00	0.98	1.00	1.00
Frt		0.99		1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		4895		1668	4790		1726	1818	1551	1750	1881	1572
Flt Permitted		1.00		0.95	1.00		0.48	1.00	1.00	0.59	1.00	1.00
Satd. Flow (perm)		4895		1668	4790		873	1818	1551	1096	1881	1572
Peak-hour factor, PHF	0.95	0.95	0.95	0.97	0.97	0.97	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	0	1124	115	369	1369	6	228	267	151	182	181	113
RTOR Reduction (vph)	0	7	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1232	0	369	1375	0	228	267	151	182	181	113
Confl. Peds. (#/hr)	5					5	3		18	18		3
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type				Prot			D.P+P		Perm	Perm		Perm
Protected Phases		2		1	1 2		4	4 9			9	
Permitted Phases							9		4 9	9		9
Actuated Green, G (s)		49.0		35.0	89.0		40.0	45.0	45.0	28.0	28.0	28.0
Effective Green, g (s)		49.0		35.0	89.0		40.0	45.0	45.0	28.0	28.0	28.0
Actuated g/C Ratio		0.32		0.23	0.58		0.26	0.29	0.29	0.18	0.18	0.18
Clearance Time (s)		6.0		5.0			5.0			7.0	7.0	7.0
Vehicle Extension (s)		3.0		3.0			3.0			3.0	3.0	3.0
Lane Grp Cap (vph)		1558		379	2768		293	531	453	199	342	286
v/s Ratio Prot		c0.25		c0.22	0.29		c0.06	0.15			0.10	
v/s Ratio Perm							0.14		0.10	c0.17		0.07
v/c Ratio		0.79		0.97	0.50		0.78	0.50	0.33	0.91	0.53	0.40
Uniform Delay, d1		47.8		59.0	19.2		51.2	45.2	42.7	61.8	57.0	55.5
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		4.2		39.0	0.1		12.2	0.8	0.4	40.4	1.5	0.9
Delay (s)		52.0		98.0	19.4		63.4	46.0	43.2	102.2	58.5	56.4
Level of Service		D		F	B		E	D	D	F	E	E
Approach Delay (s)		52.0			36.0			51.5			74.7	
Approach LOS		D			D			D			E	

Intersection Summary

HCM Average Control Delay	47.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	154.0	Sum of lost time (s)	30.0
Intersection Capacity Utilization	84.3%	ICU Level of Service	E
Analysis Period (min)	15		

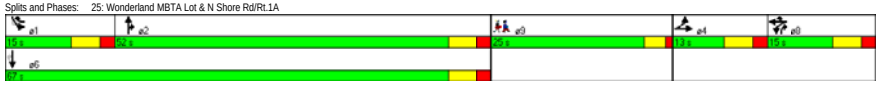
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR	ø9
Lane Configurations														
Volume (vph)	0	0	0	14	0	57	0	1118	17	1	42	1030	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		0	0		0	0		175		370		50	
Storage Lanes	1		0	1		1	0		1		1		1	
Taper Length (ft)	25		25	25		25	25		25		25		25	
Right Turn on Red			Yes			Yes			Yes				Yes	
Link Speed (mph)		30			30			30				30		
Link Distance (ft)		452			461			392				1885		
Travel Time (s)		10.3			10.5			8.9				42.8		
Peak Hour Factor	0.92	0.92	0.92	0.81	0.81	0.81	0.90	0.90	0.90	0.89	0.89	0.89	0.89	
Heavy Vehicles (%)	2%	2%	2%	16%	16%	16%	1%	1%	1%	1%	1%	1%	1%	
Shared Lane Traffic (%)	0%			10%		49%								
Lane Group Flow (vph)	0	0	0	15	36	36	0	1242	19	0	48	1157	0	
Turn Type	Split			Split		pt+ov			pt+ov	custom	Prot		Perm	
Protected Phases	4	4		8	8	1 8!		2	2 8		1	6		9
Permitted Phases										1!			6	
Detector Phase	4	4		8	8	1 8		2	2 8	1	1	6	6	
Switch Phase														
Minimum Initial (s)	5.0	5.0		5.0	5.0			10.0		6.0	6.0	10.0	10.0	5.0
Minimum Split (s)	11.0	11.0		11.0	11.0			16.0		12.0	12.0	16.0	16.0	25.0
Total Split (s)	13.0	13.0	0.0	15.0	15.0	30.0	0.0	52.0	67.0	15.0	15.0	67.0	67.0	25.0
Total Split (%)	10.8%	10.8%	0.0%	12.5%	12.5%	25.0%	0.0%	43.3%	55.8%	12.5%	12.5%	55.8%	55.8%	21%
Yellow Time (s)	4.0	4.0		4.0	4.0			4.0		4.0	4.0	4.0	4.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0			2.0		2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0	4.0	6.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lead/Lag								Lag		Lead	Lead			
Lead-Lag Optimize?														
Recall Mode	None	None		None	None			C-Min		None	None	C-Min	C-Min	None
v/c Ratio				0.20	0.37	0.12		0.59	0.02		0.69	0.44		
Control Delay				59.8	29.2	11.4		22.8	4.1		36.2	26.7		
Queue Delay				0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Total Delay				59.8	29.2	11.4		22.8	4.1		36.2	26.7		
Queue Length 50th (ft)				11	2	0		373	1		39	460		
Queue Length 95th (ft)				32	31	22		519	7		m39	m424		
Internal Link Dist (ft)		372			381			312				1805		
Turn Bay Length (ft)									175		370			
Base Capacity (vph)				111	127	262		2109	1044		72	2611		
Starvation Cap Reductn				0	0	0		0	0		0	0		
Spillback Cap Reductn				0	0	0		0	0		0	0		
Storage Cap Reductn				0	0	0		0	0		0	0		
Reduced v/c Ratio				0.14	0.28	0.14		0.59	0.02		0.67	0.44		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.
! Phase conflict between lane groups.

Splits and Phases: 25: Wonderland MBTA Lot & N Shore Rd/Rt.1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	0	0	0	14	0	57	0	1118	17	1	42	1030	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor				0.95	0.91	0.95		0.95	1.00		1.00	0.95	
Frt				1.00	0.86	0.85		1.00	0.85		1.00	1.00	
Flt Protected				0.95	1.00	1.00		1.00	1.00		0.95	1.00	
Satd. Flow (prot)				1478	1276	1323		3574	1599		1787	3574	
Flt Permitted				0.95	1.00	1.00		1.00	1.00		0.33	1.00	
Satd. Flow (perm)				1478	1276	1323		3574	1599		622	3574	
Peak-hour factor, PHF	0.92	0.92	0.92	0.81	0.81	0.81	0.90	0.90	0.90	0.89	0.89	0.89	0.89
Adj. Flow (vph)	0	0	0	17	0	70	0	1242	19	1	47	1157	0
RTOR Reduction (vph)	0	0	0	0	33	29	0	0	5	0	0	0	0
Lane Group Flow (vph)	0	0	0	15	3	7	0	1242	14	0	48	1157	0
Heavy Vehicles (%)	2%	2%	2%	16%	16%	16%	1%	1%	1%	1%	1%	1%	1%
Turn Type	Split			Split		pt+ov			pt+ov	custom	Prot		Perm
Protected Phases	4	4		8	8	1 8!		2	2 8		1	6	
Permitted Phases										1!			6
Actuated Green, G (s)				5.1	5.1	23.2		66.4	71.5		12.1	84.5	
Effective Green, g (s)				5.1	5.1	23.2		66.4	71.5		12.1	84.5	
Actuated g/C Ratio				0.04	0.04	0.19		0.55	0.60		0.10	0.70	
Clearance Time (s)				6.0	6.0			6.0			6.0	6.0	
Vehicle Extension (s)				2.0	2.0			3.0			3.0	3.0	
Lane Grp Cap (vph)				63	54	256		1978	953		63	2517	
v/s Ratio Prot				c0.01	0.00	0.01		c0.35	0.01			0.32	
v/s Ratio Perm											c0.08		
v/c Ratio				0.24	0.06	0.03		0.63	0.01		0.76	0.46	
Uniform Delay, d1				55.6	55.2	39.2		18.3	9.9		52.5	7.8	
Progression Factor				1.00	1.00	1.00		1.00	1.00		0.62	3.01	
Incremental Delay, d2				0.7	0.2	0.0		1.5	0.0		4.9	0.1	
Delay (s)				56.3	55.3	39.3		19.9	9.9		37.5	23.4	
Level of Service				E	E	D		B	A		D	C	
Approach Delay (s)		0.0			48.9			19.7				24.0	
Approach LOS		A			D			B				C	

Intersection Summary

HCM Average Control Delay	22.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	36.4
Intersection Capacity Utilization	50.7%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations														
Volume (vph)	245	190	63	25	310	38	4	130	1095	16	91	981	288	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		0	80		0		200		0	75		0	
Storage Lanes	1		0	1		0		1		0	1		0	
Taper Length (ft)	25		25	25		25		25		25	25		25	
Right Turn on Red			Yes			Yes				Yes			Yes	
Link Speed (mph)		30			30				30			30		
Link Distance (ft)		2000			713				1885			1623		
Travel Time (s)		45.5			16.2				42.8			36.9		
Confl. Bikes (#/hr)			2			1								
Peak Hour Factor	0.80	0.80	0.80	0.86	0.86	0.86	0.88	0.88	0.88	0.88	0.92	0.92	0.92	
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	2%	2%	2%	2%	1%	1%	1%	
Bus Blockages (#/hr)	0	10	0	0	0	0	0	0	0	0	0	0	0	
Shared Lane Traffic (%)														
Lane Group Flow (vph)	306	317	0	29	404	0	0	153	1262	0	99	1379	0	
Turn Type	pm+pt			pm+pt			pm+pt	pm+pt			pm+pt			
Protected Phases	7	4		3	8		5	5	2		1	6		9
Permitted Phases	4			8			2	2			6			
Detector Phase	7	4		3	8		5	5	2		1	6		
Switch Phase														
Minimum Initial (s)	6.0	10.0		6.0	10.0		6.0	6.0	30.0		6.0	30.0		4.0
Minimum Split (s)	11.0	15.0		11.0	15.0		12.0	12.0	36.0		12.0	36.0		24.0
Total Split (s)	13.0	32.0	0.0	13.0	32.0	0.0	17.0	17.0	47.0	0.0	17.0	47.0	0.0	11.0
Total Split (%)	10.8%	26.7%	0.0%	10.8%	26.7%	0.0%	14.2%	14.2%	39.2%	0.0%	14.2%	39.2%	0.0%	9%
Yellow Time (s)	3.0	3.0		3.0	3.0		4.0	4.0	4.0		4.0	4.0		3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0		2.0	2.0		3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lead	Lag		Lead	Lag		
Lead-Lag Optimize?														
Recall Mode	None	None		None	None		None	None	C-Min		None	C-Min		None
v/c Ratio	1.48	0.62		0.10	0.96			0.70	0.99		0.49	1.12		
Control Delay	268.0	43.8		28.3	82.0			57.2	62.7		26.2	100.1		
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0		
Total Delay	268.0	43.8		28.3	82.0			57.2	62.7		26.2	100.1		
Queue Length 50th (ft)	~312	219		15	307			100	335		41	~652		
Queue Length 95th (ft)	#423	284		36	#468			#176	#645		73	#793		
Internal Link Dist (ft)		1920			633				1805			1543		
Turn Bay Length (ft)				80				200			75			
Base Capacity (vph)	207	513		302	424			230	1278		232	1235		
Starvation Cap Reductn	0	0		0	0			0	0		0	0		
Spillback Cap Reductn	0	0		0	0			0	0		0	0		
Storage Cap Reductn	0	0		0	0			0	0		0	0		
Reduced v/c Ratio	1.48	0.62		0.10	0.95			0.67	0.99		0.43	1.12		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 26: Revere St & N Shore Rd/Rt.1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	245	190	63	25	310	38	4	130	1095	16	91	981	288
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.98			1.00	1.00		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1787	1733		1805	1866			1770	3532		1787	3453	
Flt Permitted	0.12	1.00		0.43	1.00			0.10	1.00		0.10	1.00	
Satd. Flow (perm)	223	1733		817	1866			185	3532		193	3453	
Peak-hour factor, PHF	0.80	0.80	0.80	0.86	0.86	0.86	0.88	0.88	0.88	0.88	0.92	0.92	0.92
Adj. Flow (vph)	306	238	79	29	360	44	5	148	1244	18	99	1066	313
RTOR Reduction (vph)	0	9	0	0	4	0	0	0	1	0	0	24	0
Lane Group Flow (vph)	306	308	0	29	400	0	0	153	1261	0	99	1355	0
Confl. Bikes (#/hr)			2			1							
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	2%	2%	2%	2%	1%	1%	1%
Bus Blockages (#/hr)	0	10	0	0	0	0	0	0	0	0	0	0	0
Turn Type	pm+pt			pm+pt			pm+pt	pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	5	2		1	6	
Permitted Phases	4			8			2	2			6		
Actuated Green, G (s)	43.9	34.9		32.7	28.7			50.4	40.2		47.8	38.9	
Effective Green, g (s)	43.9	34.9		32.7	28.7			50.4	40.2		47.8	38.9	
Actuated g/C Ratio	0.37	0.29		0.27	0.24			0.42	0.34		0.40	0.32	
Clearance Time (s)	5.0	5.0		5.0	5.0			6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	215	504		256	446			212	1183		195	1119	
v/s Ratio Prot	c0.12	0.18		0.00	0.21			c0.06	0.36		0.04	c0.39	
v/s Ratio Perm	c0.40			0.03				0.24			0.16		
v/c Ratio	1.42	0.61		0.11	0.90			0.72	1.07		0.51	1.21	
Uniform Delay, d1	31.5	36.7		32.5	44.2			28.0	39.9		28.4	40.5	
Progression Factor	1.00	1.00		1.00	1.00			1.85	1.10		1.00	1.00	
Incremental Delay, d2	215.4	1.5		0.1	19.8			10.0	44.1		2.1	103.5	
Delay (s)	246.9	38.2		32.6	64.0			61.9	88.1		30.4	144.1	
Level of Service	F	D		C	E			E	F		C	F	
Approach Delay (s)		140.7			61.9				85.3			136.5	
Approach LOS		F			E				F			F	

Intersection Summary

HCM Average Control Delay	110.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	27.0
Intersection Capacity Utilization	94.3%	ICU Level of Service	F
Analysis Period (min)	15		

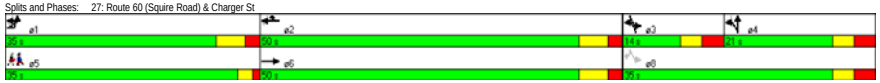
c Critical Lane Group

Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø5	ø8
Lane Configurations															
Volume (vph)	3	166	1413	0	0	1545	199	33	64	30	220	0	165		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)		400		0	0		50	0		0	0		125		
Storage Lanes		1		0	0		1	1		0	1		1		
Taper Length (ft)		25		25	25		25	25		25	25		25		
Right Turn on Red				Yes			Yes			Yes			Yes		
Link Speed (mph)			30			30			30			30			
Link Distance (ft)			930			2104			1965			1139			
Travel Time (s)			21.1			47.8			44.7			25.9			
Confl. Peds. (#/hr)													7		
Confl. Bikes (#/hr)													2		
Peak Hour Factor	0.98	0.98	0.98	0.98	0.90	0.90	0.90	0.96	0.96	0.96	0.92	0.92	0.92		
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%	1%	0%	0%	0%	0%	0%	0%		
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	172	1442	0	0	1717	221	34	98	0	239	0	179		
Turn Type	Prot	Prot					Prot	Prot			custom		custom		
Protected Phases		1	6			2	2	3 4	4		3			5	8
Permitted Phases											8		1 2 4 8		
Detector Phase	1	1	6			2	2	3 4	4		3		1 2 4 8		
Switch Phase															
Minimum Initial (s)	6.0	6.0	20.0			20.0	20.0		6.0		6.0			4.0	6.0
Minimum Split (s)	12.0	12.0	26.0			26.0	26.0		12.0		12.0			30.0	20.0
Total Split (s)	35.0	35.0	50.0	0.0	0.0	50.0	50.0	35.0	21.0	0.0	14.0	0.0	141.0	35.0	35.0
Total Split (%)	29.2%	29.2%	41.7%	0.0%	0.0%	41.7%	41.7%	29.2%	17.5%	0.0%	11.7%	0.0%	117.5%	29%	29%
Yellow Time (s)	4.0	4.0	4.0			4.0	4.0		3.0		3.0			2.0	3.0
All-Red Time (s)	2.0	2.0	2.0			2.0	2.0		3.0		3.0			1.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	6.0	6.0	6.0	4.0	4.0	6.0	6.0	6.0	6.0	4.0	6.0	4.0	6.0		
Lead/Lag	Lead	Lead	Lag			Lag	Lag		Lag		Lead			Lead	
Lead-Lag Optimize?															
Recall Mode	None	None	C-Min			C-Min	C-Min		None		None			None	None
v/c Ratio		0.69	0.53			0.67	0.27	0.09	0.56		0.98		0.11		
Control Delay		51.4	32.6			25.5	15.8	37.7	55.0		98.2		0.1		
Queue Delay		0.0	0.0			0.0	0.0	0.0	0.0		0.0		0.0		
Total Delay		51.4	32.6			25.5	15.8	37.7	55.0		98.2		0.1		
Queue Length 50th (ft)		135	201			353	72	22	62		~174		0		
Queue Length 95th (ft)		m185	481			484	148	48	115		#320		0		
Internal Link Dist (ft)			850			2024			1885			1059			
Turn Bay Length (ft)		400					50						125		
Base Capacity (vph)		428	2740			2555	821	445	240		244		1577		
Starvation Cap Reductn		0	0			0	0	0	0		0		0		
Spillback Cap Reductn		0	0			0	0	0	0		0		0		
Storage Cap Reductn		0	0			0	0	0	0		0		0		
Reduced v/c Ratio		0.40	0.53			0.67	0.27	0.08	0.41		0.98		0.11		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 27: Route 60 (Squire Road) & Charger St



Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	3	166	1413	0	0	1545	199	33	64	30	220	0	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0			6.0	6.0	6.0	6.0		6.0		6.0
Lane Util. Factor		1.00	0.91			0.91	1.00	1.00	1.00		1.00		1.00
Frpb, ped/bikes		1.00	1.00			1.00	1.00	1.00	1.00		1.00		0.99
Flpb, ped/bikes		1.00	1.00			1.00	1.00	1.00	1.00		1.00		1.00
Frt		1.00	1.00			1.00	0.85	1.00	0.95		1.00		0.85
Flt Protected		0.95	1.00			1.00	1.00	0.95	1.00		0.95		1.00
Satd. Flow (prot)		1770	5085			5136	1599	1805	1810		1805		1592
Flt Permitted		0.95	1.00			1.00	1.00	0.95	1.00		0.43		1.00
Satd. Flow (perm)		1770	5085			5136	1599	1805	1810		821		1592
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.90	0.90	0.90	0.96	0.96	0.96	0.92	0.92	0.92
Adj. Flow (vph)	3	169	1442	0	0	1717	221	34	67	31	239	0	179
RTOR Reduction (vph)	0	0	0	0	0	0	25	0	15	0	0	0	0
Lane Group Flow (vph)	0	172	1442	0	0	1717	196	34	83	0	239	0	179
Confl. Peds. (#/hr)													7
Confl. Bikes (#/hr)													2
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	Prot					Prot	Prot			custom		custom
Protected Phases	1	1	6			2	2	3 4	4		3		
Permitted Phases											8		1 2 4 8
Actuated Green, G (s)		17.0	63.5			59.7	59.7	25.3	10.7		25.3		120.0
Effective Green, g (s)		17.0	63.5			59.7	59.7	25.3	10.7		25.3		120.0
Actuated g/C Ratio		0.14	0.53			0.50	0.50	0.21	0.09		0.21		1.00
Clearance Time (s)		6.0	6.0			6.0	6.0		6.0		6.0		
Vehicle Extension (s)		3.0	3.0			3.0	3.0		3.0		3.0		
Lane Grp Cap (vph)		251	2691			2555	796	381	161		244		1592
v/s Ratio Prot		c0.10	c0.28			c0.33	0.12	0.02	0.05		c0.07		
v/s Ratio Perm											c0.14		0.11
v/c Ratio		0.69	0.54			0.67	0.25	0.09	0.52		0.98		0.11
Uniform Delay, d1		49.0	18.6			22.8	17.3	38.1	52.2		46.2		0.0
Progression Factor		0.86	1.52			1.00	1.00	1.00	1.00		1.00		1.00
Incremental Delay, d2		5.2	0.5			1.4	0.7	0.1	2.8		51.2		0.0
Delay (s)		47.2	28.7			24.2	18.0	38.2	55.0		97.4		0.0
Level of Service		D	C			C	B	D	D		F		A
Approach Delay (s)			30.7			23.5			50.7			55.7	
Approach LOS			C			C			D			E	

Intersection Summary			
HCM Average Control Delay	30.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		

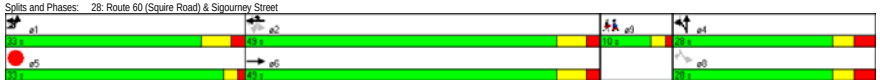
c Critical Lane Group

Lane Group	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø5	ø9
Lane Configurations																
Volume (vph)	4	271	1321	0	11	0	1588	147	97	49	34	221	0	183		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)		325		0		0		0	0		0	0		0		
Storage Lanes		1		0		0		1	1		0	1		1		
Taper Length (ft)		25		25		25		25	25		25	25		25		
Right Turn on Red				No				Yes			Yes			Yes		
Link Speed (mph)			30				30			30			30			
Link Distance (ft)			924				930			1560			1008			
Travel Time (s)			21.0				21.1			35.5			22.9			
Confl. Peds. (#/hr)														2		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.93	0.93	0.93	0.93	0.88	0.88	0.88	0.88	0.88	0.88		
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%		
Shared Lane Traffic (%)																
Lane Group Flow (vph)	0	283	1362	0	0	0	1720	158	110	95	0	251	0	208		
Turn Type	Prot	Prot			Perm	Perm		Prot	Split			custom		custom		
Protected Phases	1	1	6				2	2	4	4					5	9
Permitted Phases					2	2						8		1 2 4 8		
Detector Phase	1	1	6		2	2	2	2	4	4		8		1 2 4 8		
Switch Phase																
Minimum Initial (s)	10.0	10.0	20.0		20.0	20.0	20.0	20.0	6.0	6.0		12.0			4.0	4.0
Minimum Split (s)	16.0	16.0	26.0		26.0	26.0	26.0	26.0	12.0	12.0		18.0			33.0	21.0
Total Split (s)	33.0	33.0	49.0	0.0	49.0	49.0	49.0	49.0	28.0	28.0	0.0	28.0	0.0	138.0	33.0	10.0
Total Split (%)	27.5%	27.5%	40.8%	0.0%	40.8%	40.8%	40.8%	40.8%	23.3%	23.3%	0.0%	23.3%	0.0%	115.0%	28%	8%
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0	3.0	3.0		3.0			2.0	2.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0	2.0	3.0	3.0		3.0			1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	6.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	4.0	6.0	4.0	6.0		
Lead/Lag	Lead	Lead	Lag		Lag	Lag	Lag	Lag							Lead	
Lead-Lag Optimize?																
Recall Mode	None	None	C-Min		C-Min	C-Min	C-Min	C-Min	None	None		None			None	None
v/c Ratio		0.82	0.73				1.33	0.23	0.25	0.21		0.77		0.13		
Control Delay		65.7	28.4				173.2	2.5	39.1	28.3		59.1		0.3		
Queue Delay		0.0	0.0				0.0	0.0	0.0	0.0		0.0		0.0		
Total Delay		65.7	28.4				173.2	2.5	39.1	28.3		59.1		0.3		
Queue Length 50th (ft)		210	305				~928	25	67	41		177		0		
Queue Length 95th (ft)		303	#751				#1106	m4	128	94		#366		7		
Internal Link Dist (ft)			844				850			1480			928			
Turn Bay Length (ft)		325														
Base Capacity (vph)		402	1871				1295	674	447	461		327		1535		
Starvation Cap Reductn		0	0				0	0	0	0		0		0		
Spillback Cap Reductn		0	0				0	0	0	0		0		0		
Storage Cap Reductn		0	0				0	0	0	0		0		0		
Reduced v/c Ratio		0.70	0.73				1.33	0.23	0.25	0.21		0.77		0.14		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 21 (18%), Referenced to phase 2:WBTL and 6:EBT, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 28: Route 60 (Squire Road) & Sigourney Street



Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Volume (vph)	4	271	1321	0	11	0	1588	147	97	49	34	221	0	183
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0				6.0	6.0	6.0	6.0		6.0		6.0
Lane Util. Factor		1.00	0.95				0.95	1.00	1.00	1.00		1.00		1.00
Frpb, ped/bikes		1.00	1.00				1.00	1.00	1.00	1.00		1.00		0.99
Flpb, ped/bikes		1.00	1.00				1.00	1.00	1.00	1.00		1.00		1.00
Frt		1.00	1.00				1.00	0.85	1.00	0.94		1.00		0.85
Flt Protected		0.95	1.00				1.00	1.00	0.95	1.00		0.95		1.00
Satd. Flow (prot)		1787	3574				3538	1583	1787	1765		1787		1579
Flt Permitted		0.95	1.00				0.94	1.00	0.95	1.00		0.70		1.00
Satd. Flow (perm)		1787	3574				3314	1583	1787	1765		1308		1579
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.93	0.93	0.93	0.93	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	4	279	1362	0	12	0	1708	158	110	56	39	251	0	208
RTOR Reduction (vph)	0	0	0	0	0	0	0	57	0	20	0	0	0	18
Lane Group Flow (vph)	0	283	1362	0	0	0	1720	101	110	76	0	251	0	190
Confl. Peds. (#/hr)														2
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Turn Type	Prot	Prot			Perm	Perm		Prot	Split			custom		custom
Protected Phases	1	1	6				2	2	4	4				
Permitted Phases					2	2						8		1 2 4 8
Actuated Green, G (s)		23.1	58.6				44.5	44.5	30.0	30.0		30.0		109.6
Effective Green, g (s)		23.1	58.6				44.5	44.5	30.0	30.0		30.0		109.6
Actuated g/C Ratio		0.19	0.49				0.37	0.37	0.25	0.25		0.25		0.91
Clearance Time (s)		6.0	6.0				6.0	6.0	6.0	6.0		6.0		
Vehicle Extension (s)		3.0	3.0				3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		344	1745				1229	587	447	441		327		1442
v/s Ratio Prot		c0.16	c0.38					0.06	0.06	0.04				
v/s Ratio Perm							c0.52					c0.19		0.12
v/c Ratio		0.82	0.78				1.40	0.17	0.25	0.17		0.77		0.13
Uniform Delay, d1		46.5	25.4				37.8	25.4	36.0	35.3		41.8		0.5
Progression Factor		1.00	1.00				0.47	0.15	1.00	1.00		1.00		1.00
Incremental Delay, d2		14.6	3.5				183.8	0.5	0.3	0.2		10.3		0.0
Delay (s)		61.1	28.9				201.6	4.4	36.3	35.4		52.1		0.6
Level of Service		E	C				F	A	D	D		D		A
Approach Delay (s)			34.5				185.0			35.9			28.7	
Approach LOS			C				F			D			C	

Intersection Summary

HCM Average Control Delay	101.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	28.4
Intersection Capacity Utilization	117.8%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	ø2	ø3	ø9
Lane Configurations									
Volume (vph)	207	717	864	171	126	185			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	11	11	11	12	15	12			
Storage Length (ft)	120			0	0	150			
Storage Lanes	1			0	1	1			
Taper Length (ft)	25			25	25	25			
Right Turn on Red				Yes		Yes			
Link Speed (mph)		30	30		30				
Link Distance (ft)		1857	236		865				
Travel Time (s)		42.2	5.4		19.7				
Peak Hour Factor	0.92	0.92	0.90	0.90	0.88	0.88			
Heavy Vehicles (%)	0%	0%	1%	1%	1%	1%			
Bus Blockages (#/hr)	0	2	0	0	0	0			
Shared Lane Traffic (%)									
Lane Group Flow (vph)	225	779	1150	0	143	210			
Turn Type	Prot					custom			
Protected Phases	5	2 3 5	2 3		7	7	2	3	9
Permitted Phases						2 3 5			
Detector Phase	5	2 3 5	2 3		7	7			
Switch Phase									
Minimum Initial (s)	3.0				2.0	2.0	3.0	3.0	1.0
Minimum Split (s)	8.0				8.0	8.0	12.0	8.0	7.0
Total Split (s)	30.0	95.0	65.0	0.0	25.0	25.0	30.0	35.0	20.0
Total Split (%)	21.4%	67.9%	46.4%	0.0%	17.9%	17.9%	21%	25%	14%
Yellow Time (s)	4.0				4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0				1.0	1.0	2.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-2.0	-2.0	0.0	-1.0	-1.0			
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lag				Lead	Lead	Lag	Lead	
Lead-Lag Optimize?	Yes				Yes	Yes	Yes	Yes	
Recall Mode	None				C-Max	C-Max	Max	None	None
v/c Ratio	0.72	0.24	0.54		0.24	0.13			
Control Delay	68.1	10.7	28.3		38.8	0.2			
Queue Delay	0.0	0.0	3.3		0.1	0.0			
Total Delay	68.1	10.7	31.7		38.9	0.2			
Queue Length 50th (ft)	194	101	219		100	0			
Queue Length 95th (ft)	288	121	252		155	0			
Internal Link Dist (ft)		1777	156		785				
Turn Bay Length (ft)	120					150			
Base Capacity (vph)	324	3251	2130		590	1599			
Starvation Cap Reductn	0	0	856		0	0			
Spillback Cap Reductn	0	19	0		63	0			
Storage Cap Reductn	0	0	0		0	0			
Reduced v/c Ratio	0.69	0.24	0.90		0.27	0.13			

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 116 (83%), Referenced to phase 7:SBL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 41: Route 145 & N Shore Rd



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	207	717	864	171	126	185
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	15	12
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.91	0.91		1.00	1.00
Frt	1.00	1.00	0.98		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1745	5001	4841		1966	1599
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1745	5001	4841		1966	1599
Peak-hour factor, PHF	0.92	0.92	0.90	0.90	0.88	0.88
Adj. Flow (vph)	225	779	960	190	143	210
RTOR Reduction (vph)	0	0	21	0	0	20
Lane Group Flow (vph)	225	779	1129	0	143	191
Heavy Vehicles (%)	0%	0%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	2	0	0	0	0
Turn Type	Prot					custom
Protected Phases	5	2 3 5	2 3		7	7
Permitted Phases						2 3 5
Actuated Green, G (s)	24.0	89.0	60.0		41.0	130.0
Effective Green, g (s)	25.0	88.0	62.0		42.0	127.0
Actuated g/C Ratio	0.18	0.63	0.44		0.30	0.91
Clearance Time (s)	5.0				5.0	5.0
Vehicle Extension (s)	3.0				3.0	3.0
Lane Grp Cap (vph)	312	3143	2144		590	1542
v/s Ratio Prot	c0.13	0.16	c0.23		c0.07	0.04
v/s Ratio Perm						0.08
v/c Ratio	0.72	0.25	0.53		0.24	0.12
Uniform Delay, d1	54.2	11.4	28.3		37.0	0.7
Progression Factor	1.00	1.00	0.97		1.00	1.00
Incremental Delay, d2	8.0	0.0	0.2		1.0	0.0
Delay (s)	62.2	11.5	27.7		38.0	0.7
Level of Service	E	B	C		D	A
Approach Delay (s)		22.8	27.7		15.8	
Approach LOS		C	C		B	

Intersection Summary

HCM Average Control Delay	24.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	49.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2	ø7	ø9
Lane Configurations															
Volume (vph)	0	628	215	133	621	0	414	0	393	0	0	0			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	12	11	11	9	11	12	10	12	12	12	12	16			
Storage Length (ft)	0		0	100		0	0		100	0		0			
Storage Lanes	0		0	1		0	1		1	0		1			
Taper Length (ft)	25		25	25		25	25		25	25		25			
Right Turn on Red			No			Yes			No			No			
Link Speed (mph)		30			30			30			30				
Link Distance (ft)		236			635			5227			589				
Travel Time (s)		5.4			14.4			118.8			13.4				
Peak Hour Factor	0.92	0.92	0.92	0.80	0.80	0.80	0.90	0.90	0.90	0.65	0.65	0.65			
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	0%	0%	0%			
Bus Blockages (#/hr)	0	0	0	0	2	0	0	0	0	0	0	0			
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	917	0	166	776	0	460	0	437	0	0	0			
Turn Type				Prot			Prot		custom			custom			
Protected Phases		2 7		5	2 5 7		3		3				2	7	9
Permitted Phases									2 5 7			3			
Detector Phase		2 7		5	2 5 7		3		3			3			
Switch Phase															
Minimum Initial (s)				3.0			3.0		3.0			3.0	3.0	2.0	1.0
Minimum Split (s)				8.0			8.0		8.0			8.0	12.0	8.0	7.0
Total Split (s)	0.0	55.0	0.0	30.0	85.0	0.0	35.0	0.0	35.0	0.0	0.0	35.0	30.0	25.0	20.0
Total Split (%)	0.0%	39.3%	0.0%	21.4%	60.7%	0.0%	25.0%	0.0%	25.0%	0.0%	0.0%	25.0%	21%	18%	14%
Yellow Time (s)				4.0			4.0		4.0			4.0	4.0	4.0	2.0
All-Red Time (s)				1.0			1.0		1.0			1.0	2.0	1.0	1.0
Lost Time Adjust (s)	0.0	-2.0	0.0	-1.0	-2.0	0.0	-1.0	0.0	-1.0	0.0	0.0	-1.0			
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			
Lead/Lag				Lag			Lead		Lead			Lead	Lag	Lead	
Lead-Lag Optimize?				Yes			Yes		Yes			Yes	Yes	Yes	
Recall Mode				None			None		None			None	Max	C-Max	None
v/c Ratio		0.37		0.58	0.22		0.64		0.27						
Control Delay		17.4		61.1	6.6		54.2		0.4						
Queue Delay		3.0		0.0	0.1		0.0		0.0						
Total Delay		20.4		61.1	6.7		54.2		0.4						
Queue Length 50th (ft)		138		139	77		197		0						
Queue Length 95th (ft)		167		189	80		257		0						
Internal Link Dist (ft)		156			555			5147			509				
Turn Bay Length (ft)				100					100						
Base Capacity (vph)		2480		299	3572		717		1599						
Starvation Cap Reductn		1423		0	0		0		0						
Spillback Cap Reductn		0		0	1280		0		0						
Storage Cap Reductn		0		0	0		0		0						
Reduced v/c Ratio		0.87		0.56	0.34		0.64		0.27						

Intersection Summary	
Area Type:	Other
Cycle Length: 140	
Actuated Cycle Length: 140	
Offset: 116 (83%), Referenced to phase 7:SBL, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	

Splits and Phases: 42: Winthrop Ave & Suffolk Downs



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	628	215	133	621	0	414	0	393	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	9	11	12	10	12	12	12	12	16
Total Lost time (s)		4.0		4.0	4.0		4.0		4.0			
Lane Util. Factor		0.91		1.00	0.91		0.97		1.00			
Frt		0.96		1.00	1.00		1.00		0.85			
Flt Protected		1.00		0.95	1.00		0.95		1.00			
Satd. Flow (prot)		4822		1608	4951		3236		1599			
Flt Permitted		1.00		0.95	1.00		0.95		1.00			
Satd. Flow (perm)		4822		1608	4951		3236		1599			
Peak-hour factor, PHF	0.92	0.92	0.92	0.80	0.80	0.80	0.90	0.90	0.90	0.65	0.65	0.65
Adj. Flow (vph)	0	683	234	166	776	0	460	0	437	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	917	0	166	776	0	460	0	437	0	0	0
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	2	0	0	0	0	0	0	0
Turn Type				Prot			Prot		custom			custom
Protected Phases		2 7		5	2 5 7		3		3			
Permitted Phases									2 5 7			3
Actuated Green, G (s)		70.0		24.0	99.0		30.0		129.0			
Effective Green, g (s)		69.0		25.0	95.0		31.0		131.0			
Actuated g/C Ratio		0.49		0.18	0.68		0.22		0.94			
Clearance Time (s)				5.0			5.0		5.0			
Vehicle Extension (s)				3.0			3.0		3.0			
Lane Grp Cap (vph)		2377		287	3360		717		1542			
v/s Ratio Prot		c0.19		c0.10	0.16		c0.14		0.06			
v/s Ratio Perm									0.21			
v/c Ratio		0.39		0.58	0.23		0.64		0.28			
Uniform Delay, d1		22.2		52.7	8.6		49.5		0.4			
Progression Factor		0.82		1.00	1.00		1.00		1.00			
Incremental Delay, d2		0.5		2.8	0.0		2.0		0.1			
Delay (s)		18.7		55.5	8.6		51.4		0.5			
Level of Service		B		E	A		D		A			
Approach Delay (s)		18.7			16.9			26.6			0.0	
Approach LOS		B			B			C			A	

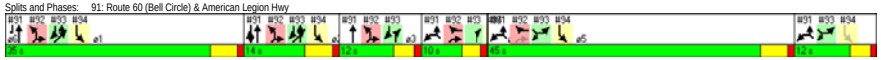
Intersection Summary			
HCM Average Control Delay	20.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	47.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NWL	NWR	NEL	NER	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations																
Volume (vph)	0	782	0	0	709	503	1201	367	0	0						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900						
Lane Width (ft)	12	13	12	12	13	16	16	16	12	12						
Storage Length (ft)	0		0	0		130	0	0	0	0						
Storage Lanes	0		0	0		1	2	1	0	0						
Taper Length (ft)	25		25	25		25	25	25	25	25						
Right Turn on Red			No			Yes		Yes								
Link Speed (mph)		30			30		30		30							
Link Distance (ft)		324			508		202		252							
Travel Time (s)		7.4			11.5		4.6		5.7							
Peak Hour Factor	0.92	0.87	0.92	0.92	0.87	0.68	0.97	0.64	0.92	0.92						
Heavy Vehicles (%)	2%	4%	2%	2%	2%	0%	2%	10%	2%	2%						
Shared Lane Traffic (%)																
Lane Group Flow (vph)	0	899	0	0	815	740	1238	573	0	0						
Turn Type						Prot		Prot								
Protected Phases		1 2 3			1 2	1 2	4 5 6	4 5 6			1	2	3	4	5	6
Permitted Phases																
Minimum Split (s)											35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	0.0	61.0	0.0	0.0	49.0	49.0	67.0	67.0	0.0	0.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	0.0%	47.7%	0.0%	0.0%	38.3%	38.3%	52.3%	52.3%	0.0%	0.0%	27%	11%	9%	8%	35%	9%
Yellow Time (s)											4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)											1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	-1.0	0.0	0.0	-1.0	-1.0	-1.0	-1.0	0.0	0.0						
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	4.0	4.0						
Lead/Lag											Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?											Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio		0.56			0.63	0.98	0.64	0.56								
Control Delay		0.7			37.3	59.3	19.8	15.8								
Queue Delay		0.5			0.0	0.0	7.9	4.9								
Total Delay		1.2			37.3	59.3	27.7	20.7								
Queue Length 50th (ft)		0			295	496	395	204								
Queue Length 95th (ft)		0			348	399	427	134								
Internal Link Dist (ft)		244			428		122		172							
Turn Bay Length (ft)						130										
Base Capacity (vph)		1597			1286	757	1946	1016								
Starvation Cap Reductn		288			0	0	669	366								
Spillback Cap Reductn		0			0	0	0	0								
Storage Cap Reductn		0			0	0	0	0								
Reduced v/c Ratio		0.69			0.63	0.98	0.97	0.88								

Intersection Summary	
Area Type:	Other
Cycle Length: 128	
Actuated Cycle Length: 128	
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green	
Natural Cycle: 130	
Control Type: Pretimed	

Splits and Phases: 91: Route 60 (Bell Circle) & American Legion Hwy



Movement	NBL	NBT	NBR	SBL	SBT	SBR	NWL	NWR	NEL	NER
Lane Configurations										
Volume (vph)	0	782	0	0	709	503	1201	367	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	13	12	12	13	16	16	16	12	12
Total Lost time (s)		4.0			4.0	4.0	3.0	3.0		
Lane Util. Factor		0.95			0.95	1.00	0.97	1.00		
Frt		1.00			1.00	0.85	1.00	1.00		
Flt Protected		1.00			1.00	1.00	0.95	1.00		
Satd. Flow (prot)		3587			3657	1830	3891	1958		
Flt Permitted		1.00			1.00	1.00	1.00	1.00		
Satd. Flow (perm)		3587			3657	1830	4096	1958		
Peak-hour factor, PHF	0.92	0.87	0.92	0.92	0.87	0.68	0.97	0.64	0.92	0.92
Adj. Flow (vph)	0	899	0	0	815	740	1238	573	0	0
RTOR Reduction (vph)	0	0	0	0	0	113	0	39	0	0
Lane Group Flow (vph)	0	899	0	0	815	627	1238	534	0	0
Heavy Vehicles (%)	2%	4%	2%	2%	2%	0%	2%	10%	2%	2%
Turn Type						Prot		Prot		
Protected Phases		1 2 3			1 2	1 2	4 5 6	4 5 6		
Permitted Phases										
Actuated Green, G (s)		57.0			44.0	44.0	63.0	63.0		
Effective Green, g (s)		58.0			45.0	45.0	60.0	60.0		
Actuated g/C Ratio		0.45			0.35	0.35	0.47	0.47		
Clearance Time (s)										
Lane Grp Cap (vph)		1625			1286	643	1824	918		
v/s Ratio Prot		c0.25			0.22	c0.34	c0.32	0.27		
v/s Ratio Perm										
v/c Ratio		0.55			0.63	0.97	0.68	0.58		
Uniform Delay, d1		25.5			34.6	40.9	26.5	24.8		
Progression Factor		0.00			1.00	1.00	0.78	0.72		
Incremental Delay, d2		0.7			2.4	29.7	1.7	2.2		
Delay (s)		0.7			37.0	70.7	22.4	20.0		
Level of Service		A			D	E	C	B		
Approach Delay (s)		0.7			53.0		21.6		0.0	
Approach LOS		A			D		C		A	

Intersection Summary					
HCM Average Control Delay		28.7	HCM Level of Service		C
HCM Volume to Capacity ratio		0.77			
Actuated Cycle Length (s)		128.0	Sum of lost time (s)		10.0
Intersection Capacity Utilization		62.5%	ICU Level of Service		B
Analysis Period (min)		15			

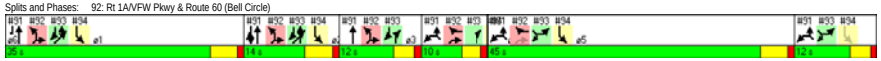
c Critical Lane Group

Lane Group	WBL	WBR	SEL	SER	NEL	NER	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations												
Volume (vph)	0	1123	0	0	434	1449						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900						
Lane Width (ft)	16	16	12	12	16	14						
Right Turn on Red		Yes		Yes	Yes	Yes						
Link Speed (mph)	30		30		30							
Link Distance (ft)	646		202		216							
Travel Time (s)	14.7		4.6		4.9							
Peak Hour Factor	0.92	0.86	0.92	0.92	0.79	0.89						
Heavy Vehicles (%)	2%	0%	2%	2%	6%	2%						
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1306	0	0	549	1628						
Turn Type		custom				custom						
Protected Phases		4 5			1 2 3	1 2 3 4	1	2	3	4	5	6
Permitted Phases						5						
Minimum Split (s)							35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	0.0	55.0	0.0	0.0	61.0	71.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	0.0%	43.0%	0.0%	0.0%	47.7%	55.5%	27%	11%	9%	8%	35%	9%
Yellow Time (s)							4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)							1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	-1.0	0.0	0.0	-1.0	0.0						
Total Lost Time (s)	4.0	3.0	4.0	4.0	4.0	5.0						
Lead/Lag							Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio		0.69			0.28	0.50						
Control Delay		17.8			9.7	0.3						
Queue Delay		0.4			3.0	0.6						
Total Delay		18.2			12.8	0.9						
Queue Length 50th (ft)		272			49	0						
Queue Length 95th (ft)		321			m46	m0						
Internal Link Dist (ft)	566		122		136							
Turn Bay Length (ft)												
Base Capacity (vph)		1900			1941	3249						
Starvation Cap Reductn		0			1259	1099						
Spillback Cap Reductn		188			793	0						
Storage Cap Reductn		0			0	0						
Reduced v/c Ratio		0.76			0.80	0.76						

Intersection Summary	
Area Type:	Other
Cycle Length: 128	
Actuated Cycle Length: 128	
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green	
Natural Cycle: 130	
Control Type: Pretimed	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 92: Rt 1A/VFW Pkwy & Route 60 (Bell Circle)



Movement	WBL	WBR	SEL	SER	NEL	NER
Lane Configurations						
Volume (vph)	0	1123	0	0	434	1449
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	16	16	12	12	16	14
Total Lost time (s)		3.0			4.0	5.0
Lane Util. Factor		0.88			0.97	0.88
Frt		1.00			1.00	1.00
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		3790			3941	3497
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		3790			3941	3497
Peak-hour factor, PHF	0.92	0.86	0.92	0.92	0.79	0.89
Adj. Flow (vph)	0	1306	0	0	549	1628
RTOR Reduction (vph)	0	365	0	0	184	318
Lane Group Flow (vph)	0	941	0	0	365	1310
Heavy Vehicles (%)	2%	0%	2%	2%	6%	2%
Turn Type		custom				custom
Protected Phases		4 5			1 2 3	1 2 3 4
Permitted Phases						5
Actuated Green, G (s)		50.0			57.0	107.0
Effective Green, g (s)		51.0			58.0	103.0
Actuated g/C Ratio		0.40			0.45	0.80
Clearance Time (s)						
Lane Grp Cap (vph)		1510			1786	2814
v/s Ratio Prot		c0.25			0.09	c0.23
v/s Ratio Perm						0.15
v/c Ratio		0.62			0.20	0.47
Uniform Delay, d1		30.8			21.1	3.9
Progression Factor		1.00			1.15	0.00
Incremental Delay, d2		1.9			0.1	0.3
Delay (s)		32.8			24.5	0.3
Level of Service		C			C	A
Approach Delay (s)	32.8		0.0		6.4	
Approach LOS	C		A		A	

Intersection Summary			
HCM Average Control Delay	16.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	54.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

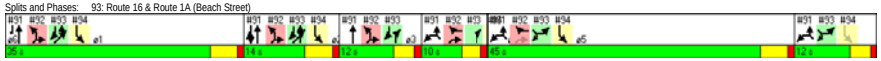
Lane Group	NBR	SBR	SEL	SER2	NEL	NET	ø2	ø3	ø4	ø5	ø6
Lane Configurations											
Volume (vph)	634	709	636	1064	782	613					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900					
Lane Width (ft)	12	13	12	14	12	16					
Storage Length (ft)	0	0	100		0						
Storage Lanes	2	2	0		2						
Taper Length (ft)	25	25	25		25						
Right Turn on Red	No			Yes							
Link Speed (mph)			30			30					
Link Distance (ft)			189			610					
Travel Time (s)			4.3			13.9					
Peak Hour Factor	0.94	0.94	0.79	0.93	0.73	0.94					
Heavy Vehicles (%)	3%	4%	2%	2%	4%	3%					
Shared Lane Traffic (%)											
Lane Group Flow (vph)	674	754	805	1144	1071	652					
Turn Type	custom	custom		Prot	Prot						
Protected Phases	2 3 4	1 2 3	5 6	5 6	1 2	1	2	3	4	5	6
Permitted Phases											
Minimum Split (s)						35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	36.0	61.0	57.0	57.0	49.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	28.1%	47.7%	44.5%	44.5%	38.3%	27.3%	11%	9%	8%	35%	9%
Yellow Time (s)						4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)						1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0					
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0					
Lead/Lag						Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio	0.83	0.60	0.54	0.68	0.86	1.29					
Control Delay	55.5	3.9	23.3	14.7	46.9	183.7					
Queue Delay	0.0	0.2	13.5	2.5	0.0	0.0					
Total Delay	55.5	4.1	36.8	17.2	46.9	183.7					
Queue Length 50th (ft)	302	48	212	137	423	~687					
Queue Length 95th (ft)	383	50	210	268	379	#921					
Internal Link Dist (ft)			109			530					
Turn Bay Length (ft)			100	100							
Base Capacity (vph)	812	1258	1496	1682	1246	506					
Starvation Cap Reductn	0	101	678	396	0	0					
Spillback Cap Reductn	0	0	0	0	0	0					
Storage Cap Reductn	0	0	0	0	0	0					
Reduced v/c Ratio	0.83	0.65	0.98	0.89	0.86	1.29					

Intersection Summary	
Area Type:	Other
Cycle Length: 128	
Actuated Cycle Length: 128	
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green	
Natural Cycle: 130	
Control Type: Pretimed	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 93: Route 16 & Route 1A (Beach Street)



Movement	NBR	SBR	SEL	SER2	NEL	NET
Lane Configurations						
Volume (vph)	634	709	636	1064	782	613
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	13	12	14	12	16
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.88	0.88	0.97	0.88	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	1.00
Flt Protected	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	3247	2824	3614	3497	3544	2091
Flt Permitted	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	3247	2824	3614	3497	3544	2091
Peak-hour factor, PHF	0.94	0.94	0.79	0.93	0.73	0.94
Adj. Flow (vph)	674	754	805	1144	1071	652
RTOR Reduction (vph)	0	0	0	231	0	0
Lane Group Flow (vph)	674	754	805	913	1071	652
Heavy Vehicles (%)	3%	4%	2%	2%	4%	3%
Turn Type	custom	custom		Prot	Prot	
Protected Phases	2 3 4	1 2 3	5 6	5 6	1 2	1
Permitted Phases						
Actuated Green, G (s)	32.0	57.0	53.0	53.0	44.0	30.0
Effective Green, g (s)	30.0	58.0	54.0	54.0	45.0	31.0
Actuated g/C Ratio	0.23	0.45	0.42	0.42	0.35	0.24
Clearance Time (s)						5.0
Lane Grp Cap (vph)	761	1280	1525	1475	1246	506
v/s Ratio Prot	c0.21	0.27	0.22	c0.26	c0.30	c0.31
v/s Ratio Perm						
v/c Ratio	0.89	0.59	0.53	0.62	0.86	1.29
Uniform Delay, d1	47.3	26.1	27.5	29.0	38.6	48.5
Progression Factor	1.00	0.08	0.77	0.65	1.00	1.00
Incremental Delay, d2	14.3	1.5	1.2	1.9	7.9	144.2
Delay (s)	61.7	3.7	22.4	20.8	46.4	192.7
Level of Service	E	A	C	C	D	F
Approach Delay (s)			21.5			101.8
Approach LOS			C			F

Intersection Summary			
HCM Average Control Delay	51.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	Err%	ICU Level of Service	H
Analysis Period (min)	15		

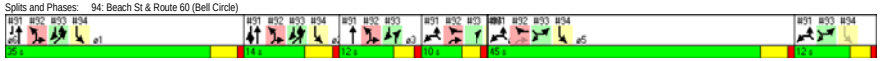
c Critical Lane Group

Lane Group	EBL	EBR	SBL	SBR	NWL	NWR	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations												
Volume (vph)	0	411	1289	415	0	0						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900						
Lane Width (ft)	12	16	16	16	12	12						
Right Turn on Red		Yes	Yes	Yes		Yes						
Link Speed (mph)	30		30		30							
Link Distance (ft)	1028		252		189							
Travel Time (s)	23.4		5.7		4.3							
Confl. Peds. (#/hr)		100			100							
Peak Hour Factor	0.92	0.89	0.92	0.92	0.92	0.92						
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	462	1401	451	0	0						
Turn Type		Free		Free								
Protected Phases			1 2 4 5				1	2	3	4	5	6
Permitted Phases		Free	6	Free								
Minimum Split (s)							35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	0.0	0.0	104.0	0.0	0.0	0.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	0.0%	0.0%	81.3%	0.0%	0.0%	0.0%	27%	11%	9%	8%	35%	9%
Yellow Time (s)							4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)							1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	-1.0	0.0	0.0	0.0						
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0						
Lead/Lag							Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio		0.26	0.41	0.25								
Control Delay		0.4	0.2	0.2								
Queue Delay		0.2	0.3	0.0								
Total Delay		0.6	0.5	0.2								
Queue Length 50th (ft)		0	0	0								
Queue Length 95th (ft)		0	m0	m0								
Internal Link Dist (ft)	948		172		109							
Turn Bay Length (ft)												
Base Capacity (vph)		1751	3394	1794								
Starvation Cap Reductn		0	1096	0								
Spillback Cap Reductn		572	931	0								
Storage Cap Reductn		0	0	0								
Reduced v/c Ratio		0.39	0.61	0.25								

Intersection Summary	
Area Type:	Other
Cycle Length: 128	
Actuated Cycle Length: 128	
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green	
Natural Cycle: 130	
Control Type: Pretimed	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 94: Beach St & Route 60 (Bell Circle)



Movement	EBL	EBR	SBL	SBR	NWL	NWR
Lane Configurations						
Volume (vph)	0	411	1289	415	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	16	16	16	12	12
Total Lost time (s)		4.0	4.0	4.0		
Lane Util. Factor		1.00	0.97	1.00		
Frpb, ped/bikes		0.96	1.00	1.00		
Flpb, ped/bikes		1.00	1.00	1.00		
Frt		0.86	1.00	0.85		
Flt Protected		1.00	0.95	1.00		
Satd. Flow (prot)		1751	3891	1794		
Flt Permitted		1.00	1.00	1.00		
Satd. Flow (perm)		1751	4096	1794		
Peak-hour factor, PHF	0.92	0.89	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	462	1401	451	0	0
RTOR Reduction (vph)	0	0	238	0	0	0
Lane Group Flow (vph)	0	462	1163	451	0	0
Confl. Peds. (#/hr)		100			100	
Turn Type		Free		Free		
Protected Phases			1 2 4 5			
Permitted Phases		Free	6	Free		
Actuated Green, G (s)		128.0	102.0	128.0		
Effective Green, g (s)		128.0	102.0	128.0		
Actuated g/C Ratio		1.00	0.80	1.00		
Clearance Time (s)						
Lane Grp Cap (vph)		1751	3115	1794		
v/s Ratio Prot			c0.27			
v/s Ratio Perm		c0.26	c0.03	0.25		
v/c Ratio		0.26	0.37	0.25		
Uniform Delay, d1		0.0	3.8	0.0		
Progression Factor		1.00	0.06	1.00		
Incremental Delay, d2		0.4	0.2	0.2		
Delay (s)		0.4	0.4	0.2		
Level of Service		A	A	A		
Approach Delay (s)	0.4		0.4		0.0	
Approach LOS	A		A		A	

Intersection Summary			
HCM Average Control Delay	0.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	56.4%	ICU Level of Service	B
Analysis Period (min)	15		

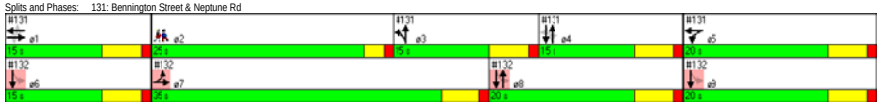
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2	ø6	ø7	ø8	ø9
Lane Configurations																	
Volume (vph)	14	352	98	307	241	60	113	220	3	15	87	116					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900					
Lane Width (ft)	12	12	10	10	12	10	11	11	11	11	11	11					
Right Turn on Red			Yes			Yes			Yes			Yes					
Link Speed (mph)		30			30			30			30						
Link Distance (ft)		669			3390			95			119						
Travel Time (s)		15.2			77.0			2.2			2.7						
Confl. Peds. (#/hr)										23		101					
Confl. Bikes (#/hr)									112								
Peak Hour Factor	0.81	0.81	0.81	0.90	0.90	0.90	0.93	0.93	0.93	0.78	0.78	0.78					
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	3%	3%	3%	8%	8%	8%					
Bus Blockages (#/hr)	0	0	0	0	0	8	0	0	0	0	0	0					
Parking (#/hr)					0	0					10	10					
Shared Lane Traffic (%)																	
Lane Group Flow (vph)	0	573	0	341	335	0	0	362	0	0	280	0					
Turn Type	Perm			D.P+P			D.P+P			Perm							
Protected Phases		1		5	1 5		3	3 4			4		2	6	7	8	9
Permitted Phases	1			1			4			4							
Detector Phase	1	1		5	1 5		3	3 4		4	4						
Switch Phase																	
Minimum Initial (s)	4.0	4.0		4.0			4.0			4.0	4.0		6.0	4.0	4.0	4.0	4.0
Minimum Split (s)	13.0	13.0		13.0			11.0			11.0	11.0		25.0	13.0	19.0	17.0	9.0
Total Split (s)	15.0	15.0	0.0	20.0	35.0	0.0	15.0	30.0	0.0	15.0	15.0	0.0	25.0	15.0	35.0	20.0	20.0
Total Split (%)	16.7%	16.7%	0.0%	22.2%	38.9%	0.0%	16.7%	33.3%	0.0%	16.7%	16.7%	0.0%	28%	17%	39%	22%	22%
Yellow Time (s)	4.0	4.0		4.0			4.0			4.0	4.0		2.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0			1.0			1.0	1.0		1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0					
Lead/Lag							Lag						Lead		Lead	Lag	
Lead-Lag Optimize?							Yes						Yes		Yes	Yes	
Recall Mode	C-Max	C-Max		None			None			None	None		None	None	None	None	None
v/c Ratio		1.26		0.75	0.42			0.43			0.63						
Control Delay		167.4		33.0	19.1			8.5			23.6						
Queue Delay		0.0		0.0	0.0			0.5			0.0						
Total Delay		167.4		33.0	19.1			9.0			23.6						
Queue Length 50th (ft)		~236		122	112			10			33						
Queue Length 95th (ft)		#334		#353	241			131			#72						
Internal Link Dist (ft)		589			3310			15			39						
Turn Bay Length (ft)																	
Base Capacity (vph)		454		457	798			841			445						
Starvation Cap Reductn		0		0	0			170			0						
Spillback Cap Reductn		0		0	0			0			0						
Storage Cap Reductn		0		0	0			0			0						
Reduced v/c Ratio		1.26		0.75	0.42			0.54			0.63						

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 131: Bennington Street & Neptune Rd



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	352	98	307	241	60	113	220	3	15	87	116
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	10	10	12	10	11	11	11	11	11	11
Total Lost time (s)		5.0		5.0	5.0			5.0			5.0	
Lane Util. Factor		0.95		1.00	1.00			0.95			0.95	
Frpb, ped/bikes		1.00		1.00	1.00			1.00			0.84	
Flpb, ped/bikes		1.00		1.00	1.00			1.00			1.00	
Frt		0.97		1.00	0.97			1.00			0.92	
Flt Protected		1.00		0.95	1.00			0.98			1.00	
Satd. Flow (prot)		3422		1668	1642			3325			2289	
Flt Permitted		0.61		0.25	1.00			0.72			0.91	
Satd. Flow (perm)		2090		436	1642			2435			2085	
Peak-hour factor, PHF	0.81	0.81	0.81	0.90	0.90	0.90	0.93	0.93	0.93	0.78	0.78	0.78
Adj. Flow (vph)	17	435	121	341	268	67	122	237	3	19	112	149
RTOR Reduction (vph)	0	25	0	0	8	0	0	1	0	0	123	0
Lane Group Flow (vph)	0	548	0	341	327	0	0	361	0	0	157	0
Confl. Peds. (#/hr)										23		101
Confl. Bikes (#/hr)									112			
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	3%	3%	3%	8%	8%	8%
Bus Blockages (#/hr)	0	0	0	0	0	8	0	0	0	0	0	0
Parking (#/hr)					0	0					10	10
Turn Type	Perm			D.P+P			D.P+P			Perm		
Protected Phases		1		5	1 5		3	3 4			4	
Permitted Phases	1			1			4			4		
Actuated Green, G (s)		16.1		35.9	40.9			26.9			15.5	
Effective Green, g (s)		16.1		35.9	40.9			26.9			15.5	
Actuated g/C Ratio		0.18		0.40	0.45			0.30			0.17	
Clearance Time (s)		5.0		5.0							5.0	
Vehicle Extension (s)		3.0		3.0							3.0	
Lane Grp Cap (vph)		374		445	746			841			359	
v/s Ratio Prot				c0.17	0.20			c0.05				
v/s Ratio Perm		c0.26		0.14				0.07			c0.08	
v/c Ratio		1.47		0.77	0.44			0.43			0.44	
Uniform Delay, d1		37.0		21.2	16.7			25.4			33.3	
Progression Factor		1.00		1.00	1.00			0.33			1.00	
Incremental Delay, d2		224.0		7.7	0.4			0.3			0.9	
Delay (s)		260.9		28.9	17.1			8.7			34.2	
Level of Service		F		C	B			A			C	
Approach Delay (s)		260.9			23.1			8.7			34.2	
Approach LOS		F			C			A			C	

Intersection Summary

HCM Average Control Delay		94.1	HCM Level of Service		F
HCM Volume to Capacity ratio		0.80			
Actuated Cycle Length (s)		90.0	Sum of lost time (s)		27.2
Intersection Capacity Utilization		69.6%	ICU Level of Service		C
Analysis Period (min)		15			

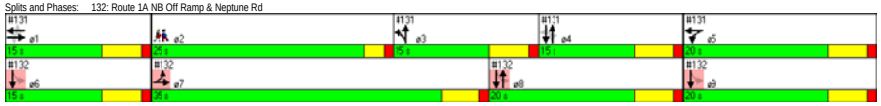
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø2	ø3	ø4	ø5	ø6	ø9
Lane Configurations																			
Volume (vph)	278	175	7	0	0	0	0	88	165	6	54	0							
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900							
Lane Width (ft)	10	11	12	12	12	12	11	11	11	11	11	11							
Right Turn on Red			Yes			Yes			Yes			Yes							
Link Speed (mph)		30			30			30			30								
Link Distance (ft)		106			312			647			107								
Travel Time (s)		2.4			7.1			14.7			2.4								
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.89	0.89	0.89	0.82	0.82	0.82							
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	7%	7%	7%	10%	10%	10%							
Shared Lane Traffic (%)																			
Lane Group Flow (vph)	302	198	0	0	0	0	0	284	0	0	73	0							
Turn Type	Split									Perm									
Protected Phases	7	7						8			6 8 9		1	2	3	4	5	6	9
Permitted Phases										6 8 9									
Detector Phase	7	7						8		6 8 9	6 8 9								
Switch Phase																			
Minimum Initial (s)	4.0	4.0						4.0					4.0	6.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	19.0	19.0						17.0					13.0	25.0	11.0	11.0	13.0	13.0	9.0
Total Split (s)	35.0	35.0	0.0	0.0	0.0	0.0	0.0	20.0	0.0	55.0	55.0	0.0	15.0	25.0	15.0	15.0	20.0	15.0	20.0
Total Split (%)	38.9%	38.9%	0.0%	0.0%	0.0%	0.0%	0.0%	22.2%	0.0%	61.1%	61.1%	0.0%	17%	28%	17%	17%	22%	17%	22%
Yellow Time (s)	4.0	4.0						4.0					4.0	2.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0						1.0					1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0							
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	5.0	5.0	4.0							
Lead/Lag	Lead	Lead						Lag						Lead	Lag				
Lead-Lag Optimize?	Yes	Yes						Yes						Yes	Yes				
Recall Mode	None	None						None					C-Max	None	None	None	None	None	None
v/c Ratio	0.75	0.45						0.61			0.04								
Control Delay	42.4	30.2						19.3			5.1								
Queue Delay	0.7	0.0						0.0			0.0								
Total Delay	43.1	30.2						19.3			5.1								
Queue Length 50th (ft)	157	93						28			3								
Queue Length 95th (ft)	223	140						61			m6								
Internal Link Dist (ft)		26			232			567			27								
Turn Bay Length (ft)																			
Base Capacity (vph)	540	587						645			1850								
Starvation Cap Reductn	0	0						0			0								
Spillback Cap Reductn	63	0						7			0								
Storage Cap Reductn	0	0						0			0								
Reduced v/c Ratio	0.63	0.34						0.45			0.04								

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 132: Route 1A NB Off Ramp & Neptune Rd



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	278	175	7	0	0	0	0	88	165	6	54	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)	5.0	5.0						5.0			5.0	
Lane Util. Factor	1.00	1.00						0.95			0.95	
Frt	1.00	0.99						0.90			1.00	
Flt Protected	0.95	1.00						1.00			1.00	
Satd. Flow (prot)	1620	1755						2943			3157	
Flt Permitted	0.95	1.00						1.00			0.93	
Satd. Flow (perm)	1620	1755						2943			2956	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.89	0.89	0.89	0.82	0.82	0.82
Adj. Flow (vph)	302	190	8	0	0	0	0	99	185	7	66	0
RTOR Reduction (vph)	0	2	0	0	0	0	0	161	0	0	0	0
Lane Group Flow (vph)	302	196	0	0	0	0	0	123	0	0	73	0
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	7%	7%	7%	10%	10%	10%
Turn Type	Split									Perm		
Protected Phases	7	7						8			6 8 9	
Permitted Phases										6 8 9		
Actuated Green, G (s)	22.4	22.4						11.7			57.6	
Effective Green, g (s)	22.4	22.4						11.7			57.6	
Actuated g/C Ratio	0.25	0.25						0.13			0.64	
Clearance Time (s)	5.0	5.0						5.0				
Vehicle Extension (s)	3.0	3.0						3.0				
Lane Grp Cap (vph)	403	437						383			1892	
v/s Ratio Prot	c0.19	0.11						c0.04				
v/s Ratio Perm											c0.02	
v/c Ratio	0.75	0.45						0.32			0.04	
Uniform Delay, d1	31.2	28.6						35.5			6.0	
Progression Factor	1.00	1.00						1.00			0.68	
Incremental Delay, d2	7.5	0.7						0.5			0.0	
Delay (s)	38.7	29.3						36.0			4.1	
Level of Service	D	C						D			A	
Approach Delay (s)		35.0			0.0			36.0			4.1	
Approach LOS		C			A			D			A	

Intersection Summary					
HCM Average Control Delay	32.7	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.27				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	31.5%	ICU Level of Service		A	
Analysis Period (min)	15				

c Critical Lane Group



Movement	WBL	WBR	NBU	NBT	NBR	SBU	SBL	SBT
Lane Configurations								
Volume (veh/h)	41	59	17	1691	165	4	22	1567
Sign Control	Stop			Free				Free
Grade	0%			0%				0%
Peak Hour Factor	0.80	0.80	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	51	74	0	1799	176	0	23	1667
Pedestrians								
Lane Width (ft)								
Walking Speed (ft/s)								
Percent Blockage								
Right turn flare (veh)								
Median type				None				None
Median storage veh)								
Upstream signal (ft)								405
pX, platoon unblocked	0.70		0.00			0.00		
vC, conflicting volume	2767	987	0			0	1974	
vC1, stage 1 conf vol								
vC2, stage 2 conf vol								
vCu, unblocked vol	2665	987	0			0	1974	
tC, single (s)	6.8	6.9	0.0			0.0	4.2	
tC, 2 stage (s)								
tF (s)	3.5	3.3	0.0			0.0	2.2	
p0 queue free %	0	70	0			0	92	
cM capacity (veh/h)	12	248	0			0	286	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	51	74	1199	775	23	834	834
Volume Left	51	0	0	0	23	0	0
Volume Right	0	74	0	176	0	0	0
cSH	12	248	1700	1700	286	1700	1700
Volume to Capacity	4.34	0.30	0.71	0.46	0.08	0.49	0.49
Queue Length 95th (ft)	Err	30	0	0	7	0	0
Control Delay (s)	Err	25.5	0.0	0.0	18.7	0.0	0.0
Lane LOS	F	D			C		
Approach Delay (s)	4114.7		0.0		0.3		
Approach LOS	F						

Intersection Summary				
Average Delay	135.8			
Intersection Capacity Utilization	74.4%	ICU Level of Service		D
Analysis Period (min)	15			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	127	1663	138	0	1651
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.91	0.91	0.89	0.89	0.94	0.94
Hourly flow rate (vph)	0	140	1869	155	0	1756
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2824	1012			2024	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2824	1012			2024	
tC, single (s)	6.9	7.0			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	40			100	
cM capacity (veh/h)	14	234			273	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	140	1246	778	878	878
Volume Left	0	0	0	0	0
Volume Right	140	0	155	0	0
cSH	234	1700	1700	1700	1700
Volume to Capacity	0.60	0.73	0.46	0.52	0.52
Queue Length 95th (ft)	86	0	0	0	0
Control Delay (s)	40.9	0.0	0.0	0.0	0.0
Lane LOS	E				
Approach Delay (s)	40.9	0.0		0.0	
Approach LOS	E				

Intersection Summary				
Average Delay	1.5			
Intersection Capacity Utilization	64.9%	ICU Level of Service		C
Analysis Period (min)	15			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	111	1762	119	0	1626
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.79	0.79	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	0	141	1874	127	0	1730
Pedestrians	1					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			976			829
pX, platoon unblocked	0.75	0.59			0.59	
vC, conflicting volume	2804	1002			2002	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	814	0			1303	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	78			100	
cM capacity (veh/h)	236	637			310	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	141	1250	751	865	865
Volume Left	0	0	0	0	0
Volume Right	141	0	127	0	0
cSH	637	1700	1700	1700	1700
Volume to Capacity	0.22	0.74	0.44	0.51	0.51
Queue Length 95th (ft)	21	0	0	0	0
Control Delay (s)	12.2	0.0	0.0	0.0	0.0
Lane LOS	B				
Approach Delay (s)	12.2	0.0		0.0	
Approach LOS	B				

Intersection Summary				
Average Delay		0.4		
Intersection Capacity Utilization		66.0%	ICU Level of Service	C
Analysis Period (min)		15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	58	167	388	0	0	371
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.84	0.84	0.82	0.82	0.86	0.86
Hourly flow rate (vph)	69	199	473	0	0	431
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						233
pX, platoon unblocked						
vC, conflicting volume	689	237			473	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	689	237			473	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	82	74			100	
cM capacity (veh/h)	384	771			1092	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	69	199	237	237	216	216
Volume Left	69	0	0	0	0	0
Volume Right	0	199	0	0	0	0
cSH	384	771	1700	1700	1700	1700
Volume to Capacity	0.18	0.26	0.14	0.14	0.13	0.13
Queue Length 95th (ft)	16	26	0	0	0	0
Control Delay (s)	16.4	11.3	0.0	0.0	0.0	0.0
Lane LOS	C	B				
Approach Delay (s)	12.6		0.0		0.0	
Approach LOS	B					

Intersection Summary				
Average Delay		2.9		
Intersection Capacity Utilization		27.7%	ICU Level of Service	A
Analysis Period (min)		15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	231	0	0	2115	116
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.89	0.89	0.92	0.92	0.91	0.91
Hourly flow rate (vph)	0	260	0	0	2324	127
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2388	838	2452			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2388	838	2452			
tC, single (s)	6.9	7.0	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.2			
p0 queue free %	100	14	100			
cM capacity (veh/h)	27	301	188			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3
Volume Total	260	930	930	592
Volume Left	0	0	0	0
Volume Right	260	0	0	127
cSH	301	1700	1700	1700
Volume to Capacity	0.86	0.55	0.55	0.35
Queue Length 95th (ft)	190	0	0	0
Control Delay (s)	60.7	0.0	0.0	0.0
Lane LOS	F			
Approach Delay (s)	60.7	0.0		
Approach LOS	F			

Intersection Summary			
Average Delay	5.8		
Intersection Capacity Utilization	64.4%	ICU Level of Service	C
Analysis Period (min)	15		

Intersection Sign configuration not allowed in HCM analysis.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	32	72	12	4	275	12	6	184	31
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.91	0.91	0.91	0.74	0.74	0.74	0.81	0.81	0.81
Hourly flow rate (vph)	0	0	0	35	79	13	5	372	16	7	227	38
Pedestrians		10			20			4			13	
Lane Width (ft)		0.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			2			0			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								119				
pX, platoon unblocked	0.95	0.95		0.95	0.95	0.95				0.95		
vC, conflicting volume	533	690	147	543	701	227	275			408		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	405	569	147	414	581	82	275			272		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	93	80	99	100			99		
cM capacity (veh/h)	408	398	871	481	396	895	1285			1204		

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	127	191	202	121	152
Volume Left	35	5	0	7	0
Volume Right	13	0	16	0	38
cSH	443	1285	1700	1204	1700
Volume to Capacity	0.29	0.00	0.12	0.01	0.09
Queue Length 95th (ft)	29	0	0	0	0
Control Delay (s)	16.4	0.3	0.0	0.5	0.0
Lane LOS	C	A		A	
Approach Delay (s)	16.4	0.1		0.2	
Approach LOS	C				

Intersection Summary				
Average Delay	2.8			
Intersection Capacity Utilization	27.6%	ICU Level of Service		A
Analysis Period (min)	15			

Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

Synchro 7 Capacity Analysis
2022 No-Build Condition
Friday Evening Peak Hour

Signalized and Unsignalized Synchro Analysis

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1486	239	319	1481	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	9	11	12	12
Storage Length (ft)		0	130		0	0
Storage Lanes		0	1		0	0
Taper Length (ft)		25	25		25	25
Right Turn on Red		Yes				Yes
Link Speed (mph)	30			30	30	
Link Distance (ft)	572			1857	345	
Travel Time (s)	13.0			42.2	7.8	
Peak Hour Factor	0.93	0.93	0.92	0.92	0.95	0.95
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Bus Blockages (#/hr)	0	0	0	2	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1855	0	347	1610	0	0
Turn Type			Prot			
Protected Phases	2		1	1 2		
Permitted Phases						
Detector Phase	2		1	1 2		
Switch Phase						
Minimum Initial (s)	4.0		4.0			
Minimum Split (s)	20.0		20.0			
Total Split (s)	75.0	0.0	30.0	105.0	0.0	0.0
Total Split (%)	71.4%	0.0%	28.6%	100.0%	0.0%	0.0%
Yellow Time (s)	3.5		3.5			
All-Red Time (s)	0.5		0.5			
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	Max		None			
v/c Ratio	0.56		0.87	0.33		
Control Delay	9.3		61.3	0.2		
Queue Delay	0.4		0.0	0.0		
Total Delay	9.7		61.3	0.2		
Queue Length 50th (ft)	204		225	0		
Queue Length 95th (ft)	241		#384	0		
Internal Link Dist (ft)	492			1777	265	
Turn Bay Length (ft)			130			
Base Capacity (vph)	3307		398	4951		
Starvation Cap Reductn	794		0	0		
Spillback Cap Reductn	0		0	0		
Storage Cap Reductn	0		0	0		
Reduced v/c Ratio	0.74		0.87	0.33		

Intersection Summary	
Area Type:	Other
Cycle Length: 105	
Actuated Cycle Length: 105	
Natural Cycle: 45	
Control Type: Semi Act-Uncoord	

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Route 145 & Route 1A on-ramp



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1486	239	319	1481	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	11	11	9	11	12	12
Total Lost time (s)	4.0		4.0	4.0		
Lane Util. Factor	0.91		1.00	0.91		
Frt	0.98		1.00	1.00		
Flt Protected	1.00		0.95	1.00		
Satd. Flow (prot)	4861		1608	4951		
Flt Permitted	1.00		0.95	1.00		
Satd. Flow (perm)	4861		1608	4951		
Peak-hour factor, PHF	0.93	0.93	0.92	0.92	0.95	0.95
Adj. Flow (vph)	1598	257	347	1610	0	0
RTOR Reduction (vph)	21	0	0	0	0	0
Lane Group Flow (vph)	1834	0	347	1610	0	0
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Bus Blockages (#/hr)	0	0	0	2	0	0
Turn Type			Prot			
Protected Phases	2		1	1 2		
Permitted Phases						
Actuated Green, G (s)	71.0		26.0	105.0		
Effective Green, g (s)	71.0		26.0	105.0		
Actuated g/C Ratio	0.68		0.25	1.00		
Clearance Time (s)	4.0		4.0			
Vehicle Extension (s)	3.0		3.0			
Lane Grp Cap (vph)	3287		398	4951		
v/s Ratio Prot	c0.38		c0.22	0.33		
v/s Ratio Perm						
v/c Ratio	0.56		0.87	0.33		
Uniform Delay, d1	8.8		37.9	0.0		
Progression Factor	1.00		1.00	1.00		
Incremental Delay, d2	0.7		18.5	0.0		
Delay (s)	9.5		56.4	0.0		
Level of Service	A		E	A		
Approach Delay (s)	9.5			10.0	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM Average Control Delay	9.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations													
Volume (vph)	99	278	218	0	0	0	410	460	91	68	248	110	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	10	12	12	12	10	11	12	12	12	12	
Storage Length (ft)	0		50	0		0	0		0	0		0	
Storage Lanes	0		1	0		0	1		0	0		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		988			531			233			338		
Travel Time (s)		22.5			12.1			5.3			7.7		
Peak Hour Factor	0.98	0.98	0.98	0.92	0.92	0.92	0.96	0.96	0.96	0.97	0.97	0.97	
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%	
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	2	
Parking (#/hr)									0				
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	385	222	0	0	0	427	574	0	0	439	0	
Turn Type	Split		Prot				D.P+P			Perm			
Protected Phases	4	4	4				2	2 6			6		9
Permitted Phases							6			6			
Detector Phase	4	4	4				2	2 6		6	6		
Switch Phase													
Minimum Initial (s)	1.0	1.0	1.0				1.0			1.0	1.0		1.0
Minimum Split (s)	7.0	7.0	7.0				6.0			7.0	7.0		5.0
Total Split (s)	29.0	29.0	29.0	0.0	0.0	0.0	13.0	31.0	0.0	18.0	18.0	0.0	22.0
Total Split (%)	35.4%	35.4%	35.4%	0.0%	0.0%	0.0%	15.9%	37.8%	0.0%	22.0%	22.0%	0.0%	27%
Yellow Time (s)	4.0	4.0	4.0				4.0			5.0	5.0		3.5
All-Red Time (s)	2.0	2.0	2.0				1.0			1.0	1.0		0.5
Lost Time Adjust (s)	-2.0	-2.0	-2.0	0.0	0.0	0.0	-1.0	-1.0	0.0	-2.0	-2.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lag	Lag	Lag				Lead			Lag	Lag		Lead
Lead-Lag Optimize?	Yes	Yes	Yes				Yes			Yes	Yes		Yes
Recall Mode	None	None	None				None			Max	Max		None
v/c Ratio		0.69	0.43				1.14	0.77			0.71		
Control Delay		26.7	12.3				110.9	26.3			29.7		
Queue Delay		0.0	0.0				0.0	0.0			0.0		
Total Delay		26.7	12.3				110.9	26.3			29.7		
Queue Length 50th (ft)		101	25				~110	141			61		
Queue Length 95th (ft)		#336	115				#457	#561			#215		
Internal Link Dist (ft)		908			451			153			258		
Turn Bay Length (ft)			50										
Base Capacity (vph)		710	628				376	746			619		
Starvation Cap Reductn		0	0				0	0			0		
Spillback Cap Reductn		0	0				0	0			0		
Storage Cap Reductn		0	0				0	0			0		
Reduced v/c Ratio		0.54	0.35				1.14	0.77			0.71		

Intersection Summary

Area Type: CBD
Cycle Length: 82
Actuated Cycle Length: 60.6
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Winthrop Avenue & State Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	99	278	218	0	0	0	410	460	91	68	248	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	10	12	12	12	10	11	12	12	12	12
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	
Lane Util. Factor		1.00	1.00				1.00	1.00			0.95	
Frt		1.00	0.85				1.00	0.98			0.96	
Flt Protected		0.99	1.00				0.95	1.00			0.99	
Satd. Flow (prot)		1655	1319				1501	1596			3068	
Flt Permitted		0.99	1.00				0.38	1.00			0.78	
Satd. Flow (perm)		1655	1319				599	1596			2415	
Peak-hour factor, PHF	0.98	0.98	0.98	0.92	0.92	0.92	0.96	0.96	0.96	0.97	0.97	0.97
Adj. Flow (vph)	101	284	222	0	0	0	427	479	95	70	256	113
RTOR Reduction (vph)	0	0	74	0	0	0	0	8	0	0	39	0
Lane Group Flow (vph)	0	385	148	0	0	0	427	566	0	0	400	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	2
Parking (#/hr)									0			
Turn Type	Split		Prot				D.P+P			Perm		
Protected Phases	4	4	4				2	2 6			6	
Permitted Phases							6			6		
Actuated Green, G (s)		18.5	18.5				20.8	25.8			12.5	
Effective Green, g (s)		20.5	20.5				22.8	26.8			14.5	
Actuated g/C Ratio		0.32	0.32				0.36	0.42			0.23	
Clearance Time (s)		6.0	6.0				5.0				6.0	
Vehicle Extension (s)		3.0	3.0				3.0				3.0	
Lane Grp Cap (vph)		535	426				348	675			552	
v/s Ratio Prot		c0.23	0.11				c0.18	0.35				
v/s Ratio Perm							c0.26				0.17	
v/c Ratio		0.72	0.35				1.23	0.84			0.72	
Uniform Delay, d1		18.9	16.4				18.3	16.4			22.6	
Progression Factor		1.00	1.00				1.00	1.00			1.00	
Incremental Delay, d2		4.6	0.5				125.0	9.0			8.0	
Delay (s)		23.5	16.8				143.3	25.4			30.6	
Level of Service		C	B				F	C			C	
Approach Delay (s)		21.1			0.0			75.7			30.6	
Approach LOS		C			A			E			C	

Intersection Summary

HCM Average Control Delay	49.8	HCM Level of Service		D	
HCM Volume to Capacity ratio	0.96				
Actuated Cycle Length (s)	63.4	Sum of lost time (s)		19.1	
Intersection Capacity Utilization	79.1%	ICU Level of Service		D	
Analysis Period (min)	15				

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø3
Lane Configurations													
Volume (vph)	34	379	492	147	259	73	304	262	113	101	303	17	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	10	12	12	10	12	12	10	16	12	12	12	
Storage Length (ft)	0		0	0		0	250		305	0		150	
Storage Lanes	0		1	1		0	1		1	0		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			No			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		3390			1736			677			1166		
Travel Time (s)		77.0			39.5			15.4			26.5		
Peak Hour Factor	0.92	0.92	0.92	0.79	0.79	0.79	0.84	0.84	0.84	0.91	0.91	0.91	
Heavy Vehicles (%)	2%	2%	2%	6%	6%	6%	4%	4%	4%	2%	2%	2%	
Parking (#/hr)			1			1				1			
Shared Lane Traffic (%)							10%						
Lane Group Flow (vph)	0	449	535	186	420	0	326	348	135	0	463	0	
Turn Type	Perm		pm+ov	D.P+P			Split		pt+ov	Split			
Protected Phases		1	2	7	1 7		2	2	2 7	4	4		3
Permitted Phases	1		1	1									
Detector Phase	1	1	2	7	1 7		2	2	2 7	4	4		
Switch Phase													
Minimum Initial (s)	4.0	4.0	4.0	4.0			4.0	4.0		4.0	4.0		4.0
Minimum Split (s)	13.0	13.0	20.0	8.0			20.0	20.0		20.0	20.0		30.0
Total Split (s)	37.0	37.0	34.0	13.0	50.0	0.0	34.0	34.0	47.0	45.0	45.0	0.0	30.0
Total Split (%)	23.3%	23.3%	21.4%	8.2%	31.4%	0.0%	21.4%	21.4%	29.6%	28.3%	28.3%	0.0%	19%
Yellow Time (s)	3.0	3.0	3.0	3.0			3.0	3.0		3.0	3.0		3.0
All-Red Time (s)	1.0	1.0	1.0	1.0			1.0	1.0		1.0	1.0		1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lead	Lag				Lag	Lag		Lag	Lag		Lead
Lead-Lag Optimize?	Yes	Yes	Yes				Yes	Yes		Yes	Yes		Yes
Recall Mode	None	None	None	None			None	None		None	None		None
v/c Ratio		5.61	0.87	1.28	0.86		1.02	1.12	0.25		0.96		
Control Delay		2125.9	51.4	203.1	63.2		109.9	135.5	5.0		80.4		
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0		
Total Delay		2125.9	51.4	203.1	63.2		109.9	135.5	5.0		80.4		
Queue Length 50th (ft)		~648	359	~142	309		284	~327	0		366		
Queue Length 95th (ft)		#1064	#808	#319	#520		#571	#630	29		#768		
Internal Link Dist (ft)		3310			1656			597			1086		
Turn Bay Length (ft)							250		305				
Base Capacity (vph)		80	612	145	486		319	312	540		484		
Starvation Cap Reductn		0	0	0	0		0	0	0		0		
Spillback Cap Reductn		0	0	0	0		0	0	0		0		
Storage Cap Reductn		0	0	0	0		0	0	0		0		
Reduced v/c Ratio		5.61	0.87	1.28	0.86		1.02	1.12	0.25		0.96		

Intersection Summary

Area Type: CBD
Cycle Length: 159
Actuated Cycle Length: 141
Natural Cycle: 145
Control Type: Actuated-Uncoordinated
Description: WB defacto left recoded

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Bennington Street & Saratoga Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	379	492	147	259	73	304	262	113	101	303	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	10	12	12	10	16	12	12	12
Total Lost time (s)		4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		0.95	0.95	1.00		1.00	
Frt		1.00	0.85	1.00	0.97		1.00	1.00	0.85		0.99	
Flt Protected		1.00	1.00	0.95	1.00		0.95	0.99	1.00		0.99	
Satd. Flow (prot)		1558	1275	1533	1456		1484	1450	1584		1647	
Flt Permitted		0.21	1.00	0.12	1.00		0.95	0.99	1.00		0.99	
Satd. Flow (perm)		334	1275	194	1456		1484	1450	1584		1647	
Peak-hour factor, PHF	0.92	0.92	0.92	0.79	0.79	0.79	0.84	0.84	0.84	0.91	0.91	0.91
Adj. Flow (vph)	37	412	535	186	328	92	362	312	135	111	333	19
RTOR Reduction (vph)	0	0	0	0	6	0	0	0	98	0	1	0
Lane Group Flow (vph)	0	449	535	186	414	0	326	348	37	0	462	0
Heavy Vehicles (%)	2%	2%	2%	6%	6%	6%	4%	4%	4%	2%	2%	2%
Parking (#/hr)			1			1			1			
Turn Type	Perm		pm+ov	D.P+P			Split		pt+ov	Split		
Protected Phases		1	2	7	1 7		2	2	2 7	4	4	
Permitted Phases	1		1	1								
Actuated Green, G (s)		33.3	63.6	42.4	46.4		30.3	30.3	39.4		41.4	
Effective Green, g (s)		33.3	63.6	42.4	46.4		30.3	30.3	39.4		41.4	
Actuated g/C Ratio		0.23	0.44	0.30	0.32		0.21	0.21	0.27		0.29	
Clearance Time (s)		4.0	4.0	4.0			4.0	4.0			4.0	
Vehicle Extension (s)		3.0	3.0	3.0			3.0	3.0			3.0	
Lane Grp Cap (vph)		78	601	142	471		314	307	436		476	
v/s Ratio Prot			0.19	c0.08	0.28		0.22	c0.24	0.02		c0.28	
v/s Ratio Perm		c1.34	0.23	0.30								
v/c Ratio		5.76	0.89	1.31	0.88		1.04	1.13	0.09		0.97	
Uniform Delay, d1		55.0	36.6	45.1	45.8		56.5	56.5	38.6		50.4	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2		2168.0	15.3	180.8	16.8		61.1	92.4	0.1		33.7	
Delay (s)		2223.0	51.9	225.8	62.6		117.6	148.9	38.7		84.1	
Level of Service		F	D	F	E		F	F	D		F	
Approach Delay (s)		1042.6			112.7			117.9			84.1	
Approach LOS		F			F			F			F	

Intersection Summary

HCM Average Control Delay	429.2	HCM Level of Service	F
HCM Volume to Capacity ratio	2.45		
Actuated Cycle Length (s)	143.3	Sum of lost time (s)	29.2
Intersection Capacity Utilization	99.7%	ICU Level of Service	F
Analysis Period (min)	15		

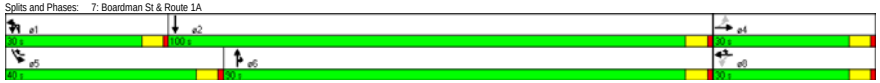
Description: WB defacto left recoded
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	36	3	51	240	16	243	28	42	2193	79	189	1867	12
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Width (ft)	10	11	12	12	10	10	12	11	11	11	11	11	12
Storage Length (ft)	130		0	0		250		400		500	380		0
Storage Lanes	1		0	0		1		1		1	1		0
Taper Length (ft)	25		25	25		25		25		25	25		25
Right Turn on Red			Yes			No				Yes			Yes
Link Speed (mph)		30			30				30			30	
Link Distance (ft)		537			1355				733			925	
Travel Time (s)		12.2			30.8				16.7			21.0	
Confl. Peds. (#/hr)										8			1
Peak Hour Factor	0.82	0.82	0.82	0.76	0.76	0.76	0.99	0.99	0.99	0.99	0.98	0.98	0.98
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	6%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	8	0
Shared Lane Traffic (%)													
Lane Group Flow (vph)	44	66	0	0	337	320	0	70	2215	80	193	1917	0
Turn Type	Perm			Perm		pt+ov	Prot	Prot		Prot	Prot		
Protected Phases		4			8	8 5	1	1	6	6	5	2	
Permitted Phases	4			8									
Detector Phase	4	4		8	8	8 5	1	1	6	6	5	2	
Switch Phase													
Minimum Initial (s)	10.0	10.0		10.0	10.0		8.0	8.0	20.0	20.0	8.0	20.0	
Minimum Split (s)	29.0	29.0		32.0	32.0		13.0	13.0	31.0	31.0	13.0	29.0	
Total Split (s)	30.0	30.0	0.0	30.0	30.0	70.0	30.0	30.0	90.0	90.0	40.0	100.0	0.0
Total Split (%)	18.8%	18.8%	0.0%	18.8%	18.8%	43.8%	18.8%	18.8%	56.3%	56.3%	25.0%	62.5%	0.0%
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag							Lead	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None		None	None		None	None	Min	Min	None	Min	
v/c Ratio	1.19	0.26			2.08	0.73		0.57	1.39	0.11	0.80	1.06	
Control Delay	261.6	17.0			536.1	52.2		84.5	207.3	4.9	83.8	64.2	
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	261.6	17.0			536.1	52.2		84.5	207.3	4.9	83.8	64.2	
Queue Length 50th (ft)	~52	3			~518	270		67	~1514	4	184	~1076	
Queue Length 95th (ft)	#134	41			#626	306		125	#1801	32	275	#1315	
Internal Link Dist (ft)		457			1275				653			845	
Turn Bay Length (ft)	130					250		400		500	380		
Base Capacity (vph)	37	256			162	517		240	1595	743	335	1813	
Starvation Cap Reductn	0	0			0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0			0	0		0	0	0	0	0	
Storage Cap Reductn	0	0			0	0		0	0	0	0	0	
Reduced v/c Ratio	1.19	0.26			2.08	0.62		0.29	1.39	0.11	0.58	1.06	

Intersection Summary

Area Type: Other
Cycle Length: 160
Actuated Cycle Length: 150.6
Natural Cycle: 150
Control Type: Semi Act-Uncoord
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman St & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	36	3	51	240	16	243	28	42	2193	79	189	1867	12
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Width	10	11	12	12	10	10	12	11	11	11	11	11	12
Total Lost time (s)	5.0	5.0			5.0	5.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.86			1.00	0.85		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00			0.96	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1314	1230			1346	1197		1386	2772	1240	1399	2751	
Flt Permitted	0.16	1.00			0.69	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	221	1230			974	1197		1386	2772	1240	1399	2751	
Peak-hour factor, PHF	0.82	0.82	0.82	0.76	0.76	0.76	0.99	0.99	0.99	0.99	0.98	0.98	0.98
Adj. Flow (vph)	44	4	62	316	21	320	28	42	2215	80	193	1905	12
RTOR Reduction (vph)	0	52	0	0	0	0	0	0	0	30	0	0	0
Lane Group Flow (vph)	44	14	0	0	337	320	0	70	2215	50	193	1917	0
Confl. Peds. (#/hr)										8			1
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	6%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	8	0
Turn Type	Perm			Perm		pt+ov	Prot	Prot		Prot	Prot		
Protected Phases		4			8	8 5	1	1	6	6	5	2	
Permitted Phases	4			8									
Actuated Green, G (s)	25.0	25.0			25.0	54.9		12.3	85.7	85.7	24.9	98.3	
Effective Green, g (s)	25.0	25.0			25.0	54.9		13.3	86.7	86.7	25.9	99.3	
Actuated g/C Ratio	0.17	0.17			0.17	0.36		0.09	0.58	0.58	0.17	0.66	
Clearance Time (s)	5.0	5.0			5.0			5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	2.5	2.5			2.5			2.0	5.0	5.0	2.0	5.0	
Lane Grp Cap (vph)	37	204			162	436		122	1596	714	241	1814	
v/s Ratio Prot		0.01				c0.27		0.05	c0.80	0.04	0.14	c0.70	
v/s Ratio Perm	0.20				c0.35								
v/c Ratio	1.19	0.07			2.08	0.73		0.57	1.39	0.07	0.80	1.06	
Uniform Delay, d1	62.8	53.0			62.8	41.5		65.9	31.9	14.1	59.9	25.6	
Progression Factor	1.00	1.00			1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	209.4	0.1			506.6	5.9		4.0	178.5	0.1	16.3	37.9	
Delay (s)	272.2	53.1			569.4	47.5		69.9	210.4	14.2	76.1	63.6	
Level of Service	F	D			F	D		E	F	B	E	E	
Approach Delay (s)		140.8			315.2				199.6			64.7	
Approach LOS		F			F				F			E	

Intersection Summary

HCM Average Control Delay	158.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.42		
Actuated Cycle Length (s)	150.6	Sum of lost time (s)	13.0
Intersection Capacity Utilization	118.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBT	NBR	SBT	SBR	SEL2	SEL	SER	SER2
Lane Configurations															
Volume (vph)	10	252	13	899	421	97	65	655	1344	580	18	1	128	16	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	10	16	12	12	12	12	12	14	16	12	12	12	12	12
Storage Length (ft)	50		0	0		0			0		0		0	0	
Storage Lanes	1		1	2		0			1		0		1	0	
Taper Length (ft)	25		25	25		25			25		25		25	25	
Right Turn on Red			Yes				No		Yes						Yes
Link Speed (mph)		30			30			30		30			30		
Link Distance (ft)		485			572			480		673			302		
Travel Time (s)		11.0			13.0			10.9		15.3			6.9		
Peak Hour Factor	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.97	0.97	0.94	0.94	0.76	0.76	0.76	0.76
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	2%	3%	3%	3%	3%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	291	14	977	634	0	0	675	1386	636	0	0	191	0	0
Turn Type	Split		Prot	Split					custom			Split			
Protected Phases	4	4	4	8	8			2	2	6		12	12		
Permitted Phases									4 8 12						
Detector Phase	4	4	4	8	8			2	2	6		12	12		
Switch Phase															
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0	4.0		4.0	4.0		
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0			21.0	21.0	21.0		21.0	21.0		
Total Split (s)	35.0	35.0	35.0	80.0	80.0	0.0	0.0	70.0	70.0	70.0	0.0	30.0	30.0	0.0	0.0
Total Split (%)	16.3%	16.3%	16.3%	37.2%	37.2%	0.0%	0.0%	32.6%	32.6%	32.6%	0.0%	14.0%	14.0%	0.0%	0.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0	4.0		4.0	4.0		
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0			1.0	1.0	1.0		1.0	1.0		
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	0.0	0.0	-1.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag															
Lead-Lag Optimize?															
Recall Mode	None	None	None	None	None			Max	Max	Max		None	None		
v/c Ratio		0.76	0.06	0.78	0.97			0.61	0.83	0.51			0.90		
Control Delay		101.8	30.0	64.5	92.9			63.5	4.9	60.1			128.6		
Queue Delay		0.0	0.0	75.6	168.7			0.0	0.0	0.0			0.0		
Total Delay		101.8	30.0	140.1	261.6			63.5	4.9	60.1			128.6		
Queue Length 50th (ft)		208	0	621	868			419	0	380			264		
Queue Length 95th (ft)		267	26	738	#1195			511	0	464			#322		
Internal Link Dist (ft)		405			492			400		593			222		
Turn Bay Length (ft)															
Base Capacity (vph)		477	269	1253	652			1111	1672	1254			219		
Starvation Cap Reductn		0	0	412	198			0	0	0			0		
Spillback Cap Reductn		0	0	0	0			0	0	0			0		
Storage Cap Reductn		0	0	0	0			0	0	0			0		
Reduced v/c Ratio		0.61	0.05	1.16	1.40			0.61	0.83	0.51			0.87		

Intersection Summary

Area Type: Other
Cycle Length: 215
Actuated Cycle Length: 208.3
Natural Cycle: 105
Control Type: Semi Act-Uncoord
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Winthrop Avenue & Route 16



Movement	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBT	NBR	SBT	SBR	SEL2	SEL	SER	SER2
Lane Configurations															
Volume (vph)	10	252	13	899	421	97	65	655	1344	580	18	1	128	16	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	16	12	12	12	12	12	14	16	12	12	12	12	12
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0	4.0	4.0			4.0		
Lane Util. Factor		0.95	1.00	0.97	1.00			0.95	1.00	0.95			1.00		
Frt		1.00	0.85	1.00	0.96			1.00	0.85	1.00			0.98		
Flt Protected		1.00	1.00	0.95	1.00			1.00	1.00	1.00			0.96		
Satd. Flow (prot)		3203	1729	3433	1785			3505	1672	3954			1756		
Flt Permitted		1.00	1.00	0.95	1.00			1.00	1.00	1.00			0.96		
Satd. Flow (perm)		3203	1729	3433	1785			3505	1672	3954			1756		
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.97	0.97	0.94	0.94	0.76	0.76	0.76	0.76
Adj. Flow (vph)	11	280	14	977	458	105	71	675	1386	617	19	1	168	21	1
RTOR Reduction (vph)	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	291	2	977	634	0	0	675	1386	636	0	0	191	0	0
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	2%	3%	3%	3%	3%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Turn Type	Split		Prot	Split					custom			Split			
Protected Phases	4	4	4	8	8			2	2	6		12	12		
Permitted Phases									4 8 12						
Actuated Green, G (s)		24.0	24.0	75.1	75.1			65.0	198.3	65.0			24.2		
Effective Green, g (s)		25.0	25.0	76.1	76.1			66.0	200.3	66.0			25.2		
Actuated g/C Ratio		0.12	0.12	0.37	0.37			0.32	0.96	0.32			0.12		
Clearance Time (s)		5.0	5.0	5.0	5.0			5.0	5.0	5.0			5.0		
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0	3.0	3.0			3.0		
Lane Grp Cap (vph)		384	208	1254	652			1111	1672	1253			212		
v/s Ratio Prot		0.09	0.00	0.28	c0.36			0.19	c0.26	0.16			0.11		
v/s Ratio Perm									0.57						
v/c Ratio		0.76	0.01	0.78	0.97			0.61	0.83	0.51			0.90		
Uniform Delay, d1		88.7	80.7	58.6	65.1			60.2	0.8	57.9			90.3		
Progression Factor		1.00	1.00	1.00	1.00			1.00	1.00	1.00			1.00		
Incremental Delay, d2		8.3	0.0	3.1	28.3			2.5	3.6	1.5			35.9		
Delay (s)		97.0	80.7	61.8	93.3			62.7	4.3	59.4			126.2		
Level of Service		F	F	E	F			E	A	E			F		
Approach Delay (s)		96.3			74.2			23.4		59.4			126.2		
Approach LOS		F			E			C		E			F		

Intersection Summary

HCM Average Control Delay	53.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	208.3	Sum of lost time (s)	4.0
Intersection Capacity Utilization	97.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations											
Volume (vph)	233	27	56	0	237	1135	357	288	297	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	16	12	12	12	12	12	12	12	12
Storage Length (ft)		0	0	0		0	115		200	0	0
Storage Lanes		1	1	0		2	1		1	0	0
Taper Length (ft)		25	25	25		25	25		25	25	25
Right Turn on Red			Yes			Yes			Yes		
Link Speed (mph)		30			30			30		30	
Link Distance (ft)		335			262			919		278	
Travel Time (s)		7.6			6.0			20.9		6.3	
Confl. Peds. (#/hr)	1					2	2				
Peak Hour Factor	0.87	0.87	0.87	0.91	0.91	0.91	0.88	0.88	0.88	0.92	0.92
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%
Shared Lane Traffic (%)	50%										
Lane Group Flow (vph)	134	165	64	0	260	1247	406	327	338	0	0
Turn Type	Split		Prot			Free	Prot		Prot		
Protected Phases	8	8	8		6		1	16	16		
Permitted Phases						Free					
Detector Phase	8	8	8		6		1	16	16		
Switch Phase											
Minimum Initial (s)	4.0	4.0	4.0		4.0		4.0				
Minimum Split (s)	20.0	20.0	20.0		20.0		8.0				
Total Split (s)	20.0	20.0	20.0	0.0	20.0	0.0	30.0	50.0	50.0	0.0	0.0
Total Split (%)	28.6%	28.6%	28.6%	0.0%	28.6%	0.0%	42.9%	71.4%	71.4%	0.0%	0.0%
Yellow Time (s)	3.0	3.0	3.0		3.0		3.0				
All-Red Time (s)	1.0	1.0	1.0		1.0		1.0				
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lag	Lag		Lead						
Lead-Lag Optimize?	Yes	Yes	Yes		Yes						
Recall Mode	None	None	None		Max		None				
v/c Ratio	0.46	0.29	0.17		0.26	0.79	0.69	0.13	0.28		
Control Delay	28.5	23.2	8.0		19.6	4.1	23.8	3.7	1.2		
Queue Delay	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		
Total Delay	28.5	23.2	8.0		19.6	4.1	23.8	3.7	1.2		
Queue Length 50th (ft)	47	28	0		37	0	118	16	0		
Queue Length 95th (ft)	101	55	25		80	0	219	35	21		
Internal Link Dist (ft)		255			182			839		198	
Turn Bay Length (ft)							115		200		
Base Capacity (vph)	457	914	555		1004	1579	816	2403	1186		
Starvation Cap Reductn	0	0	0		0	0	0	0	0		
Spillback Cap Reductn	0	0	0		0	0	0	0	0		
Storage Cap Reductn	0	0	0		0	0	0	0	0		
Reduced v/c Ratio	0.29	0.18	0.12		0.26	0.79	0.50	0.14	0.28		

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 58.4
Natural Cycle: 60
Control Type: Actuated-Uncoordinated

Splits and Phases: 10: State Road & Ocean Avenue



Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations											
Volume (vph)	233	27	56	0	237	1135	357	288	297	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	16	12	12	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0		
Lane Util. Factor	0.91	0.91	1.00		0.95	1.00	1.00	0.95	1.00		
Frpb, ped/bikes	1.00	1.00	1.00		1.00	0.99	1.00	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00		
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85		
Flt Protected	0.95	0.95	1.00		1.00	1.00	0.95	1.00	1.00		
Satd. Flow (prot)	1626	3253	1812		3574	1579	1787	3574	1599		
Flt Permitted	0.95	0.95	1.00		1.00	1.00	0.95	1.00	1.00		
Satd. Flow (perm)	1626	3253	1812		3574	1579	1787	3574	1599		
Peak-hour factor, PHF	0.87	0.87	0.87	0.91	0.91	0.91	0.88	0.88	0.88	0.92	0.92
Adj. Flow (vph)	268	31	64	0	260	1247	406	327	338	0	0
RTOR Reduction (vph)	0	0	53	0	0	0	0	0	107	0	0
Lane Group Flow (vph)	134	165	11	0	260	1247	406	327	231	0	0
Confl. Peds. (#/hr)	1					2	2				
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%
Turn Type	Split		Prot			Free	Prot		Prot		
Protected Phases	8	8	8		6		1	16	16		
Permitted Phases						Free					
Actuated Green, G (s)	10.4	10.4	10.4		16.4	58.1	19.3	39.7	39.7		
Effective Green, g (s)	10.4	10.4	10.4		16.4	58.1	19.3	39.7	39.7		
Actuated g/C Ratio	0.18	0.18	0.18		0.28	1.00	0.33	0.68	0.68		
Clearance Time (s)	4.0	4.0	4.0		4.0		4.0				
Vehicle Extension (s)	3.0	3.0	3.0		3.0		3.0				
Lane Grp Cap (vph)	291	582	324		1009	1579	594	2442	1093		
v/s Ratio Prot	0.08	0.05	0.01		0.07		0.23	0.09	0.14		
v/s Ratio Perm						c0.79					
v/c Ratio	0.46	0.28	0.04		0.26	0.79	0.68	0.13	0.21		
Uniform Delay, d1	21.3	20.6	19.7		16.1	0.0	16.8	3.2	3.4		
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00		
Incremental Delay, d2	1.2	0.3	0.0		0.6	4.1	3.3	0.0	0.1		
Delay (s)	22.5	20.9	19.8		16.8	4.1	20.0	3.2	3.5		
Level of Service	C	C	B		B	A	C	A	A		
Approach Delay (s)		21.3			6.3			9.7		0.0	
Approach LOS		C			A			A		A	

Intersection Summary

HCM Average Control Delay	9.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	58.1	Sum of lost time (s)	0.0
Intersection Capacity Utilization	49.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	105	7	8	0	0	0	0	2299	0	0	2052	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	16	12	12	12	11	11	11	11	11	11
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		122			363			405			225	
Travel Time (s)		2.8			8.3			9.2			5.1	
Peak Hour Factor	0.84	0.84	0.84	0.92	0.92	0.92	0.98	0.98	0.98	0.97	0.97	0.97
Heavy Vehicles (%)	24%	24%	24%	2%	2%	2%	6%	6%	6%	6%	6%	6%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	143	0	0	0	0	0	2346	0	0	2115	0
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Detector Phase	4	4						2			6	
Switch Phase												
Minimum Initial (s)	4.0	4.0						4.0			4.0	
Minimum Split (s)	14.0	14.0						27.0			27.0	
Total Split (s)	36.0	36.0	0.0	0.0	0.0	0.0	0.0	55.0	0.0	0.0	55.0	0.0
Total Split (%)	39.6%	39.6%	0.0%	0.0%	0.0%	0.0%	0.0%	60.4%	0.0%	0.0%	60.4%	0.0%
Yellow Time (s)	4.0	4.0						5.0			5.0	
All-Red Time (s)	2.0	2.0						2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	4.0	4.0	4.0	4.0	4.0	7.0	4.0	4.0	7.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None						Max			Max	
v/c Ratio		0.55						1.07			0.97	
Control Delay		35.3						58.3			27.0	
Queue Delay		0.0						0.0			0.0	
Total Delay		35.3						58.3			27.0	
Queue Length 50th (ft)		58						~626			396	
Queue Length 95th (ft)		102						#841			#717	
Internal Link Dist (ft)		42			283			325			145	
Turn Bay Length (ft)												
Base Capacity (vph)		686						2185			2185	
Starvation Cap Reductn		0						0			0	
Spillback Cap Reductn		0						0			0	
Storage Cap Reductn		0						0			0	
Reduced v/c Ratio		0.21						1.07			0.97	

Intersection Summary

Area Type: Other
Cycle Length: 91
Actuated Cycle Length: 72.5
Natural Cycle: 90
Control Type: Semi Act-Uncoord
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 12: Jughandle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	105	7	8	0	0	0	0	2299	0	0	2052	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	16	16	16	12	12	12	11	11	11	11	11	11
Total Lost time (s)		6.0						7.0			7.0	
Lane Util. Factor		1.00						0.95			0.95	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1648						3292			3292	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1648						3292			3292	
Peak-hour factor, PHF	0.84	0.84	0.84	0.92	0.92	0.92	0.98	0.98	0.98	0.97	0.97	0.97
Adj. Flow (vph)	125	8	10	0	0	0	0	2346	0	0	2115	0
RTOR Reduction (vph)	0	3	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	140	0	0	0	0	0	2346	0	0	2115	0
Heavy Vehicles (%)	24%	24%	24%	2%	2%	2%	6%	6%	6%	6%	6%	6%
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Actuated Green, G (s)		11.4						48.1			48.1	
Effective Green, g (s)		11.4						48.1			48.1	
Actuated g/C Ratio		0.16						0.66			0.66	
Clearance Time (s)		6.0						7.0			7.0	
Vehicle Extension (s)		3.0						3.0			3.0	
Lane Grp Cap (vph)		259						2184			2184	
v/s Ratio Prot								c0.71			0.64	
v/s Ratio Perm		0.08										
v/c Ratio		0.54						1.07			0.97	
Uniform Delay, d1		28.1						12.2			11.5	
Progression Factor		1.00						1.00			1.00	
Incremental Delay, d2		2.2						42.7			13.1	
Delay (s)		30.3						54.9			24.6	
Level of Service		C						D			C	
Approach Delay (s)		30.3			0.0			54.9			24.6	
Approach LOS		C			A			D			C	

Intersection Summary			
HCM Average Control Delay	40.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	72.5	Sum of lost time (s)	13.0
Intersection Capacity Utilization	81.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Volume (vph)	35	262	69	69	234	71	14	141	1275	75	30	412	1199	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	50		0		150		0		800		0
Storage Lanes	1		0	1		0		1		0		1		0
Taper Length (ft)	25		25	25		25		25		25		25		25
Right Turn on Red			Yes			Yes				Yes				Yes
Link Speed (mph)		30			30				30				30	
Link Distance (ft)		1202			2003				910				1421	
Travel Time (s)		27.3			45.5				20.7				32.3	
Confl. Peds. (#/hr)	17		14	14		17				2				8
Confl. Bikes (#/hr)			1			1								
Peak Hour Factor	0.88	0.88	0.88	0.94	0.94	0.94	0.92	0.92	0.92	0.92	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)														
Lane Group Flow (vph)	40	376	0	73	325	0	0	168	1468	0	0	466	1284	0
Turn Type	Perm			Perm				Prot				Prot		
Protected Phases		4			8			1	6			5	2	
Permitted Phases	4			8										
Detector Phase	4	4		8	8			1	6			5	2	
Switch Phase														
Minimum Initial (s)	4.0	4.0		4.0	4.0			4.0	4.0			4.0	4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0			31.0	11.0			11.0	11.0	
Total Split (s)	36.0	36.0	0.0	36.0	36.0	0.0	0.0	36.0	56.0	0.0	0.0	36.0	56.0	0.0
Total Split (%)	28.1%	28.1%	0.0%	28.1%	28.1%	0.0%	0.0%	28.1%	43.8%	0.0%	0.0%	28.1%	43.8%	0.0%
Yellow Time (s)	4.0	4.0		4.0	4.0			4.0	4.0			4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0			2.0	2.0			2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	4.0	6.0	6.0	4.0	4.0	6.0	6.0	4.0	4.0	6.0	6.0	4.0
Lead/Lag								Lead	Lag			Lead	Lag	
Lead-Lag Optimize?								Yes	Yes			Yes	Yes	
Recall Mode	None	None		None	None			None	Max			None	Max	
v/c Ratio	0.38	0.92		1.06	0.78			no cap	1.07			no cap	0.93	
Control Delay	53.3	75.1		171.3	58.6				82.0				49.6	
Queue Delay	0.0	0.0		0.0	0.0				0.0				0.0	
Total Delay	53.3	75.1		171.3	58.6			Error	82.0			Error	49.6	
Queue Length 50th (ft)	28	296		~63	244			~290	~715			~803	533	
Queue Length 95th (ft)	65	#457		#167	#360			#436	#856			#1015	#684	
Internal Link Dist (ft)		1122			1923				830				1341	
Turn Bay Length (ft)	50			50				150				800		
Base Capacity (vph)	110	429		73	436			1	1374			1	1381	
Starvation Cap Reductn	0	0		0	0			0	0			0	0	
Spillback Cap Reductn	0	0		0	0			0	0			0	0	
Storage Cap Reductn	0	0		0	0			0	0			0	0	
Reduced v/c Ratio	0.36	0.88		1.00	0.75			168.00	1.07			466.00	0.93	

Intersection Summary

Area Type: Other
Cycle Length: 128
Actuated Cycle Length: 126.7
Natural Cycle: 90
Control Type: Semi Act-Uncoord
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 15: Revere St & Route 60



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Volume (vph)	35	262	69	69	234	71	14	141	1275	75	30	412	1199	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	0.95			1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00	1.00			1.00	1.00	
Flpb, ped/bikes	0.99	1.00		0.99	1.00			1.00	1.00			1.00	1.00	
Frt	1.00	0.97		1.00	0.96			1.00	0.99			1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00			0.95	1.00	
Satd. Flow (prot)	1734	1776		1774	1800			1752	3471			1752	3494	
Flt Permitted	0.26	1.00		0.16	1.00			0.13	1.00			0.13	1.00	
Satd. Flow (perm)	468	1776		307	1800			246	3471			246	3494	
Peak-hour factor, PHF	0.88	0.88	0.88	0.94	0.94	0.94	0.92	0.92	0.92	0.92	0.95	0.95	0.95	0.95
Adj. Flow (vph)	40	298	78	73	249	76	15	153	1386	82	32	434	1262	22
RTOR Reduction (vph)	0	8	0	0	9	0	0	0	3	0	0	0	1	0
Lane Group Flow (vph)	40	368	0	73	316	0	0	168	1465	0	0	466	1283	0
Confl. Peds. (#/hr)	17		14	14		17				2				8
Confl. Bikes (#/hr)			1			1								
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Perm			Perm				Prot				Prot		
Protected Phases		4			8			1	6			5	2	
Permitted Phases	4			8										
Actuated Green, G (s)	28.6	28.6		28.6	28.6			30.0	50.0			30.0	50.0	
Effective Green, g (s)	28.6	28.6		28.6	28.6			30.0	50.0			30.0	50.0	
Actuated g/C Ratio	0.23	0.23		0.23	0.23			0.24	0.39			0.24	0.39	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			3.0	3.0	
Lane Grp Cap (vph)	106	401		69	407			58	1371			58	1380	
v/s Ratio Prot		0.21			0.18				c0.42				0.37	
v/s Ratio Perm	0.09			c0.24				0.68				c1.89		
v/c Ratio	0.38	0.92		1.06	0.78			2.90	1.07			8.03	0.93	
Uniform Delay, d1	41.5	47.9		49.0	46.0			48.3	38.3			48.3	36.6	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00			1.00	1.00	
Incremental Delay, d2	2.2	25.5		125.2	9.0			898.5	44.9			3200.6	12.4	
Delay (s)	43.7	73.4		174.2	55.1			946.8	83.2			3248.9	49.0	
Level of Service	D	E		F	E			F	F			F	D	
Approach Delay (s)		70.5			76.9				171.9				901.1	
Approach LOS		E			E				F				F	

Intersection Summary			
HCM Average Control Delay	456.7	HCM Level of Service	F
HCM Volume to Capacity ratio	2.98		
Actuated Cycle Length (s)	126.6	Sum of lost time (s)	18.0
Intersection Capacity Utilization	104.2%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

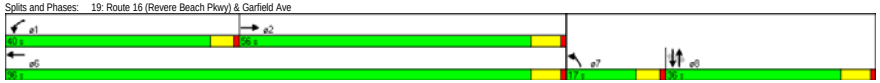
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1405	163	374	1585	6	280	289	148	178	189	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	10	10	10	11	11	12	12	12	12
Storage Length (ft)	0		0	200		0	300		50	0		80
Storage Lanes	0		0	1		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			No			No
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2232			2756			1675			1148	
Travel Time (s)		50.7			62.6			38.1			26.1	
Confl. Peds. (#/hr)	6					6	5		30	30		5
Peak Hour Factor	0.98	0.98	0.98	0.93	0.93	0.93	0.86	0.86	0.86	0.96	0.96	0.96
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	2%	2%	2%	1%	1%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1600	0	402	1710	0	326	336	172	185	197	157
Turn Type				Prot			pm+pt		Perm	Perm		Perm
Protected Phases		2		1	6		7	8			8	
Permitted Phases							8		8	8		8
Detector Phase		2		1	6		7	8	8	8	8	8
Switch Phase												
Minimum Initial (s)		15.0		8.0	15.0		8.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)		55.0		13.0	21.0		13.0	16.0	16.0	16.0	16.0	16.0
Total Split (s)	0.0	56.0	0.0	40.0	96.0	0.0	17.0	36.0	36.0	36.0	36.0	36.0
Total Split (%)	0.0%	37.6%	0.0%	26.8%	64.4%	0.0%	11.4%	24.2%	24.2%	24.2%	24.2%	24.2%
Yellow Time (s)		5.0		4.0	5.0		4.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)		1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	5.0	6.0	4.0	5.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag		Lag		Lead			Lead	Lag	Lag	Lag	Lag	Lag
Lead-Lag Optimize?								Yes	Yes	Yes	Yes	Yes
Recall Mode		Max		None	None		None	None	None	None	None	None
v/c Ratio		0.99		1.05	0.60		1.06	0.93	0.57	3.08	0.52	0.50
Control Delay		68.5		112.6	19.5		113.4	89.8	62.2	999.4	58.7	59.1
Queue Delay		0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		68.5		112.6	19.5		113.4	89.8	62.2	999.4	58.7	59.1
Queue Length 50th (ft)		563		~423	362		~289	324	152	~312	173	137
Queue Length 95th (ft)		#678		#636	408		#478	#473	223	#475	257	214
Internal Link Dist (ft)		2152			2676			1595			1068	
Turn Bay Length (ft)				200			300		50			80
Base Capacity (vph)		1617		384	2836		307	363	301	60	379	316
Starvation Cap Reductn		0		0	0		0	0	0	0	0	0
Spillback Cap Reductn		0		0	0		0	0	0	0	0	0
Storage Cap Reductn		0		0	0		0	0	0	0	0	0
Reduced v/c Ratio		0.99		1.05	0.60		1.06	0.93	0.57	3.08	0.52	0.50

Intersection Summary

Area Type: Other
Cycle Length: 149
Actuated Cycle Length: 149
Natural Cycle: 150
Control Type: Semi Act-Uncoord
Description: HAS EXCL PED PHASE

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 19: Route 16 (Revere Beach Pkwy) & Garfield Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1405	163	374	1585	6	280	289	148	178	189	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	10	10	10	11	11	12	12	12	12
Total Lost time (s)		6.0		5.0	6.0		5.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor		0.91		1.00	0.91		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes		1.00		1.00	1.00		1.00	1.00	0.94	1.00	1.00	0.98
Flpb, ped/bikes		1.00		1.00	1.00		1.00	1.00	1.00	0.98	1.00	1.00
Frt		0.98		1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		4792		1636	4697		1708	1801	1495	1755	1881	1568
Flt Permitted		1.00		0.95	1.00		0.45	1.00	1.00	0.16	1.00	1.00
Satd. Flow (perm)		4792		1636	4697		812	1801	1495	299	1881	1568
Peak-hour factor, PHF	0.98	0.98	0.98	0.93	0.93	0.93	0.86	0.86	0.86	0.96	0.96	0.96
Adj. Flow (vph)	0	1434	166	402	1704	6	326	336	172	185	197	157
RTOR Reduction (vph)	0	9	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1591	0	402	1710	0	326	336	172	185	197	157
Confl. Peds. (#/hr)	6					6	5		30	30		5
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	2%	2%	2%	1%	1%	1%
Turn Type				Prot			pm+pt		Perm	Perm		Perm
Protected Phases		2		1	6		7	8			8	
Permitted Phases							8		8	8		8
Actuated Green, G (s)		50.0		35.0	90.0		42.0	30.0	30.0	30.0	30.0	30.0
Effective Green, g (s)		50.0		35.0	90.0		42.0	30.0	30.0	30.0	30.0	30.0
Actuated g/C Ratio		0.34		0.23	0.60		0.28	0.20	0.20	0.20	0.20	0.20
Clearance Time (s)		6.0		5.0	6.0		5.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)		4.0		1.0	4.0		1.0	8.0	8.0	8.0	8.0	8.0
Lane Grp Cap (vph)		1608		384	2837		301	363	301	60	379	316
v/s Ratio Prot		c0.33		c0.25	0.36		c0.09	0.19			0.10	
v/s Ratio Perm							0.22		0.12	c0.62		0.10
v/c Ratio		0.99		1.05	0.60		1.08	0.93	0.57	3.08	0.52	0.50
Uniform Delay, d1		49.2		57.0	18.4		52.2	58.4	53.7	59.5	53.1	52.8
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		20.0		58.7	0.4		75.8	31.7	7.1	980.0	4.7	5.2
Delay (s)		69.3		115.7	18.8		128.1	90.1	60.8	1039.5	57.8	58.0
Level of Service		E		F	B		F	F	E	F	E	E
Approach Delay (s)		69.3			37.2			98.9			394.8	
Approach LOS		E			D			F			F	

Intersection Summary

HCM Average Control Delay	95.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.51		
Actuated Cycle Length (s)	149.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	95.8%	ICU Level of Service	F
Analysis Period (min)	15		

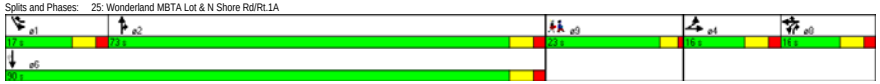
Description: HAS EXCL PED PHASE
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations													
Volume (vph)	0	0	0	70	0	374	0	1618	50	77	1194	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		0	0		0	0		175	370		50	
Storage Lanes	1		0	1		1	0		1	1		1	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		452			461			392			1885		
Travel Time (s)		10.3			10.5			8.9			42.8		
Peak Hour Factor	0.92	0.92	0.92	0.73	0.73	0.73	0.96	0.96	0.96	0.92	0.92	0.92	
Heavy Vehicles (%)	2%	2%	2%	5%	5%	5%	1%	1%	1%	2%	2%	2%	
Shared Lane Traffic (%)	0%			10%		49%							
Lane Group Flow (vph)	0	0	0	86	261	261	0	1685	52	84	1298	0	
Turn Type	Split			Split		pt+ov			pt+ov	Prot		Perm	
Protected Phases	4	4		8	8	1 8		2	2 8	1	6		9
Permitted Phases												6	
Detector Phase	4	4		8	8	1 8		2	2 8	1	6	6	
Switch Phase													
Minimum Initial (s)	5.0	5.0		5.0	5.0			10.0		6.0	10.0	10.0	5.0
Minimum Split (s)	11.0	11.0		11.0	11.0			16.0		12.0	16.0	16.0	23.0
Total Split (s)	16.0	16.0	0.0	16.0	16.0	33.0	0.0	73.0	89.0	17.0	90.0	90.0	23.0
Total Split (%)	11.0%	11.0%	0.0%	11.0%	11.0%	22.8%	0.0%	50.3%	61.4%	11.7%	62.1%	62.1%	16%
Yellow Time (s)	4.0	4.0		4.0	4.0			4.0		4.0	4.0	4.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0			2.0		2.0	2.0	2.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0	4.0	6.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	
Lead/Lag								Lag		Lead			
Lead-Lag Optimize?													
Recall Mode	None	None		None	None			C-Min		None	C-Min	C-Min	None
v/c Ratio				0.80	0.80	0.53		0.79	0.05	0.56	0.51		
Control Delay				110.6	26.9	9.3		28.0	3.4	69.5	12.4		
Queue Delay				0.0	0.0	0.0		0.0	0.0	0.0	0.0		
Total Delay				110.6	26.9	9.3		28.0	3.4	69.5	12.4		
Queue Length 50th (ft)				85	9	0		668	4	84	237		
Queue Length 95th (ft)				#127	36	21		836	13	m102	m339		
Internal Link Dist (ft)		372			381			312			1805		
Turn Bay Length (ft)									175	370			
Base Capacity (vph)				113	331	492		2138	1088	160	2564		
Starvation Cap Reductn				0	0	0		0	0	0	0		
Spillback Cap Reductn				0	0	0		0	0	0	0		
Storage Cap Reductn				0	0	0		0	0	0	0		
Reduced v/c Ratio				0.76	0.79	0.53		0.79	0.05	0.53	0.51		

Intersection Summary

Area Type: Other
Cycle Length: 145
Actuated Cycle Length: 145
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 120
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 25: Wonderland MBTA Lot & N Shore Rd/Rt.1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	70	0	374	0	1618	50	77	1194	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0	6.0		6.0	6.0	6.0	6.0	
Lane Util. Factor				0.95	0.91	0.95		0.95	1.00	1.00	0.95	
Frt				1.00	0.86	0.85		1.00	0.85	1.00	1.00	
Flt Protected				0.95	1.00	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)				1633	1406	1461		3574	1599	1770	3539	
Flt Permitted				0.95	1.00	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (perm)				1633	1406	1461		3574	1599	1770	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.73	0.73	0.73	0.96	0.96	0.96	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	96	0	512	0	1685	52	84	1298	0
RTOR Reduction (vph)	0	0	0	0	235	211	0	0	9	0	0	0
Lane Group Flow (vph)	0	0	0	86	26	50	0	1685	43	84	1298	0
Heavy Vehicles (%)	2%	2%	2%	5%	5%	5%	1%	1%	1%	2%	2%	2%
Turn Type	Split			Split		pt+ov			pt+ov	Prot		Perm
Protected Phases	4	4		8	8	1 8		2	2 8	1	6	
Permitted Phases												6
Actuated Green, G (s)				9.5	9.5	27.8		86.0	95.5	12.3	104.3	
Effective Green, g (s)				9.5	9.5	27.8		86.0	95.5	12.3	104.3	
Actuated g/C Ratio				0.07	0.07	0.19		0.59	0.66	0.08	0.72	
Clearance Time (s)				6.0	6.0			6.0		6.0	6.0	
Vehicle Extension (s)				2.0	2.0			3.0		3.0	3.0	
Lane Grp Cap (vph)				107	92	280		2120	1053	150	2546	
v/s Ratio Prot				c0.05	0.02	0.03		c0.47	0.03	0.05	c0.37	
v/s Ratio Perm												
v/c Ratio				0.80	0.29	0.18		0.79	0.04	0.56	0.51	
Uniform Delay, d1				66.8	64.5	49.0		22.7	8.7	63.8	9.0	
Progression Factor				1.00	1.00	1.00		1.00	1.00	0.99	1.23	
Incremental Delay, d2				32.3	0.6	0.3		3.2	0.0	2.4	0.4	
Delay (s)				99.1	65.2	49.4		25.9	8.7	65.3	11.4	
Level of Service				F	E	D		C	A	E	B	
Approach Delay (s)		0.0			63.2			25.4			14.7	
Approach LOS		A			E			C			B	

Intersection Summary

HCM Average Control Delay	27.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	37.2
Intersection Capacity Utilization	70.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

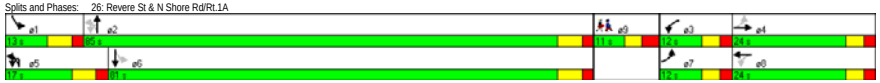
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations														
Volume (vph)	267	173	82	132	286	91	1	315	1610	153	60	972	242	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		0	80		0		200		0	75		0	
Storage Lanes	1		0	1		0		1		0	1		0	
Taper Length (ft)	25		25	25		25		25		25	25		25	
Right Turn on Red			Yes			Yes				Yes			Yes	
Link Speed (mph)		30			30				30			30		
Link Distance (ft)		2000			713				1885			1623		
Travel Time (s)		45.5			16.2				42.8			36.9		
Confl. Bikes (#/hr)			1			3								
Peak Hour Factor	0.79	0.79	0.79	0.80	0.80	0.80	0.90	0.90	0.90	0.90	0.89	0.89	0.89	
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	2%	2%	2%	2%	1%	1%	1%	
Bus Blockages (#/hr)	0	10	0	0	0	0	0	0	0	0	0	0	0	
Shared Lane Traffic (%)														
Lane Group Flow (vph)	338	323	0	165	472	0	0	351	1959	0	67	1364	0	
Turn Type	pm+pt			pm+pt			pm+pt	pm+pt			pm+pt			
Protected Phases	7	4		3	8		5	5	2		1	6		9
Permitted Phases	4			8			2	2			6			
Detector Phase	7	4		3	8		5	5	2		1	6		
Switch Phase														
Minimum Initial (s)	6.0	10.0		6.0	10.0		6.0	6.0	30.0		6.0	30.0		4.0
Minimum Split (s)	11.0	15.0		11.0	15.0		12.0	12.0	36.0		12.0	36.0		27.0
Total Split (s)	12.0	24.0	0.0	12.0	24.0	0.0	17.0	17.0	85.0	0.0	13.0	81.0	0.0	11.0
Total Split (%)	8.3%	16.6%	0.0%	8.3%	16.6%	0.0%	11.7%	11.7%	58.6%	0.0%	9.0%	55.9%	0.0%	8%
Yellow Time (s)	3.0	3.0		3.0	3.0		4.0	4.0	4.0		4.0	4.0		3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0		2.0	2.0		3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lead	Lag		Lead	Lag		
Lead-Lag Optimize?														
Recall Mode	None	None		None	None		None	None	C-Min		None	C-Min		None
v/c Ratio	2.47	1.38		1.18	1.91			1.58	0.99		0.50	0.75		
Control Delay	704.6	238.5		177.0	456.3			306.7	44.2		29.8	30.4		
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0		
Total Delay	704.6	238.5		177.0	456.3			306.7	44.2		29.8	30.4		
Queue Length 50th (ft)	~475	~394		~134	~681			~394	~1011		23	512		
Queue Length 95th (ft)	#568	#489		#234	#777			m#585	#1152		61	593		
Internal Link Dist (ft)		1920			633				1805			1543		
Turn Bay Length (ft)				80				200			75			
Base Capacity (vph)	137	234		140	247			222	1971		138	1808		
Starvation Cap Reductn	0	0		0	0			0	0		0	0		
Spillback Cap Reductn	0	0		0	0			0	0		0	0		
Storage Cap Reductn	0	0		0	0			0	0		0	0		
Reduced v/c Ratio	2.47	1.38		1.18	1.91			1.58	0.99		0.49	0.75		

Intersection Summary

Area Type: Other
Cycle Length: 145
Actuated Cycle Length: 145
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 145
Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 26: Revere St & N Shore Rd/Rt.1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	267	173	82	132	286	91	1	315	1610	153	60	972	242
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.96			1.00	0.99		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1694		1805	1824			1770	3493		1787	3467	
Flt Permitted	0.21	1.00		0.21	1.00			0.09	1.00		0.05	1.00	
Satd. Flow (perm)	392	1694		400	1824			159	3493		100	3467	
Peak-hour factor, PHF	0.79	0.79	0.79	0.80	0.80	0.80	0.90	0.90	0.90	0.90	0.89	0.89	0.89
Adj. Flow (vph)	338	219	104	165	358	114	1	350	1789	170	67	1092	272
RTOR Reduction (vph)	0	12	0	0	8	0	0	0	5	0	0	15	0
Lane Group Flow (vph)	338	311	0	165	464	0	0	351	1954	0	67	1349	0
Confl. Bikes (#/hr)			1			3							
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	2%	2%	2%	2%	1%	1%	1%
Bus Blockages (#/hr)	0	10	0	0	0	0	0	0	0	0	0	0	0
Turn Type	pm+pt			pm+pt			pm+pt	pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	5	2		1	6	
Permitted Phases	4			8			2	2			6		
Actuated Green, G (s)	26.0	19.0		26.0	19.0			91.4	80.4		80.6	75.0	
Effective Green, g (s)	26.0	19.0		26.0	19.0			91.4	80.4		80.6	75.0	
Actuated g/C Ratio	0.18	0.13		0.18	0.13			0.63	0.55		0.56	0.52	
Clearance Time (s)	5.0	5.0		5.0	5.0			6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	137	222		140	239			222	1937		121	1793	
v/s Ratio Prot	c0.12	0.18		0.06	0.25			c0.12	0.56		0.02	0.39	
v/s Ratio Perm	c0.32			0.15				c0.87			0.29		
v/c Ratio	2.47	1.40		1.18	1.94			1.58	1.01		0.55	0.75	
Uniform Delay, d1	57.7	63.0		57.7	63.0			36.6	32.3		32.9	27.7	
Progression Factor	1.00	1.00		1.00	1.00			1.46	0.90		1.00	1.00	
Incremental Delay, d2	681.6	205.0		132.0	439.0			275.7	19.0		5.4	3.0	
Delay (s)	739.3	268.0		189.8	502.0			329.0	48.2		38.3	30.6	
Level of Service	F	F		F	F			F	D		D	C	
Approach Delay (s)		509.0			421.1				90.9			31.0	
Approach LOS		F			F				F			C	

Intersection Summary

HCM Average Control Delay	170.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.82		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	33.0
Intersection Capacity Utilization	108.1%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

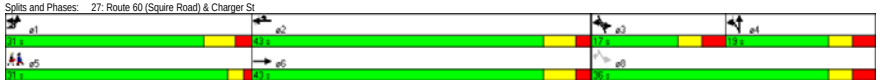
Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø5	ø8
Lane Configurations															
Volume (vph)	5	174	1649	0	0	1389	295	42	82	35	312	0	135		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)		400		0	0		50	0		0	0		125		
Storage Lanes		1		0	0		1	1		0	1		1		
Taper Length (ft)		25		25	25		25	25		25	25		25		
Right Turn on Red				Yes			Yes			Yes			Yes		
Link Speed (mph)			30			30			30			30			
Link Distance (ft)			930			2104			1965			1139			
Travel Time (s)			21.1			47.8			44.7			25.9			
Confl. Peds. (#/hr)													10		
Confl. Bikes (#/hr)										1					
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	0.84	0.84	0.84	0.81	0.81	0.81		
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%		
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	188	1736	0	0	1462	295	50	140	0	385	0	167		
Turn Type	Prot	Prot					Prot	Prot			custom		custom		
Protected Phases		1	6			2	2	3 4	4		3			5	8
Permitted Phases											8		1 2 4 8		
Detector Phase	1	1	6			2	2	3 4	4		3		1 2 4 8		
Switch Phase															
Minimum Initial (s)	6.0	6.0	20.0			20.0	20.0		6.0		6.0			4.0	6.0
Minimum Split (s)	12.0	12.0	26.0			26.0	26.0		12.0		12.0			30.0	20.0
Total Split (s)	31.0	31.0	43.0	0.0	0.0	43.0	43.0	36.0	19.0	0.0	17.0	0.0	129.0	31.0	36.0
Total Split (%)	28.2%	28.2%	39.1%	0.0%	0.0%	39.1%	39.1%	32.7%	17.3%	0.0%	15.5%	0.0%	117.3%	28%	33%
Yellow Time (s)	4.0	4.0	4.0			4.0	4.0		3.0		3.0			2.0	3.0
All-Red Time (s)	2.0	2.0	2.0			2.0	2.0		3.0		3.0			1.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	6.0	6.0	6.0	4.0	4.0	6.0	6.0	6.0	6.0	4.0	6.0	4.0	6.0		
Lead/Lag	Lead	Lead	Lag			Lag	Lag		Lag		Lead			Lead	
Lead-Lag Optimize?															
Recall Mode	None	None	C-Min			C-Min	C-Min		None		None			None	None
v/c Ratio		0.69	0.73			0.68	0.41	0.11	0.69		1.34		0.10		
Control Delay		40.3	37.9			28.7	19.1	31.0	59.6		208.2		0.1		
Queue Delay		0.0	0.0			0.0	0.0	0.0	0.0		0.0		0.0		
Total Delay		40.3	37.9			28.7	19.1	31.0	59.6		208.2		0.1		
Queue Length 50th (ft)		137	352			306	103	26	84		~333		0		
Queue Length 95th (ft)		m152	m#536			400	197	53	139		#463		0		
Internal Link Dist (ft)			850			2024			1885			1059			
Turn Bay Length (ft)		400					50						125		
Base Capacity (vph)		402	2383			2157	718	492	228		287		1548		
Starvation Cap Reductn		0	0			0	0	0	0		0		0		
Spillback Cap Reductn		0	0			0	0	0	0		0		0		
Storage Cap Reductn		0	0			0	0	0	0		0		0		
Reduced v/c Ratio		0.47	0.73			0.68	0.41	0.10	0.61		1.34		0.11		

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 110
Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 27: Route 60 (Squire Road) & Charger St



Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	5	174	1649	0	0	1389	295	42	82	35	312	0	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0			6.0	6.0	6.0	6.0		6.0		6.0
Lane Util. Factor		1.00	0.91			0.91	1.00	1.00	1.00		1.00		1.00
Frpb, ped/bikes		1.00	1.00			1.00	1.00	1.00	1.00		1.00		0.99
Flpb, ped/bikes		1.00	1.00			1.00	1.00	1.00	1.00		1.00		1.00
Frt		1.00	1.00			1.00	0.85	1.00	0.95		1.00		0.85
Flt Protected		0.95	1.00			1.00	1.00	0.95	1.00		0.95		1.00
Satd. Flow (prot)		1770	5085			5085	1583	1805	1807		1805		1591
Flt Permitted		0.95	1.00			1.00	1.00	0.95	1.00		0.35		1.00
Satd. Flow (perm)		1770	5085			5085	1583	1805	1807		666		1591
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	1.00	0.84	0.84	0.84	0.81	0.81	0.81
Adj. Flow (vph)	5	183	1736	0	0	1462	295	50	98	42	385	0	167
RTOR Reduction (vph)	0	0	0	0	0	0	47	0	14	0	0	0	0
Lane Group Flow (vph)	0	188	1736	0	0	1462	248	50	126	0	385	0	167
Confl. Peds. (#/hr)													10
Confl. Bikes (#/hr)										1			
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	Prot					Prot	Prot			custom		custom
Protected Phases	1	1	6			2	2	3 4	4		3		
Permitted Phases											8		1 2 4 8
Actuated Green, G (s)		16.9	50.3			46.6	46.6	28.5	11.5		28.5		110.0
Effective Green, g (s)		16.9	50.3			46.6	46.6	28.5	11.5		28.5		110.0
Actuated g/C Ratio		0.15	0.46			0.42	0.42	0.26	0.10		0.26		1.00
Clearance Time (s)		6.0	6.0			6.0	6.0		6.0		6.0		
Vehicle Extension (s)		3.0	3.0			3.0	3.0		3.0		3.0		
Lane Grp Cap (vph)		272	2325			2154	671	468	189		286		1591
v/s Ratio Prot		c0.11	c0.34			0.29	0.16	0.03	0.07		c0.13		
v/s Ratio Perm											c0.21		0.10
v/c Ratio		0.69	0.75			0.68	0.37	0.11	0.66		1.35		0.10
Uniform Delay, d1		44.1	24.6			25.6	21.7	31.1	47.4		38.8		0.0
Progression Factor		0.81	1.38			1.00	1.00	1.00	1.00		1.00		1.00
Incremental Delay, d2		2.9	0.9			1.7	1.6	0.1	8.5		177.3		0.0
Delay (s)		38.4	34.7			27.4	23.2	31.2	55.9		216.1		0.0
Level of Service		D	C			C	C	C	E		F		A
Approach Delay (s)			35.1			26.7			49.4			150.7	
Approach LOS			D			C			D			F	

Intersection Summary

HCM Average Control Delay	46.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	74.0%	ICU Level of Service	D
Analysis Period (min)	15		

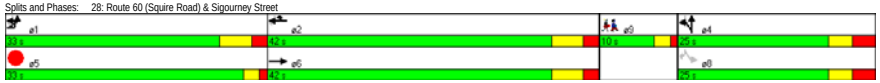
c Critical Lane Group

Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø5	ø9
Lane Configurations															
Volume (vph)	20	277	1573	0	0	1442	129	79	71	18	228	0	181		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)		325		0	0		0	0		0	0		0		
Storage Lanes		1		0	0		1	1		0	1		1		
Taper Length (ft)		25		25	25		25	25		25	25		25		
Right Turn on Red				No			Yes			Yes			Yes		
Link Speed (mph)			30			30			30			30			
Link Distance (ft)			924			930			1560			1008			
Travel Time (s)			21.0			21.1			35.5			22.9			
Confl. Bikes (#/hr)							2						2		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.88	0.88	0.88	0.80	0.80	0.80	0.93	0.93	0.93		
Heavy Vehicles (%)	3%	3%	3%	3%	2%	2%	2%	0%	0%	0%	1%	1%	1%		
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	320	1691	0	0	1639	147	99	111	0	245	0	195		
Turn Type	Prot	Prot					Prot	Split			custom		custom		
Protected Phases	1	1	6			2	2	4	4					5	9
Permitted Phases											8		1 2 4 8		
Detector Phase	1	1	6			2	2	4	4		8		1 2 4 8		
Switch Phase															
Minimum Initial (s)	10.0	10.0	20.0			20.0	20.0	6.0	6.0		12.0			4.0	4.0
Minimum Split (s)	16.0	16.0	26.0			26.0	26.0	12.0	12.0		18.0			33.0	21.0
Total Split (s)	33.0	33.0	42.0	0.0	0.0	42.0	42.0	25.0	25.0	0.0	25.0	0.0	125.0	33.0	10.0
Total Split (%)	30.0%	30.0%	38.2%	0.0%	0.0%	38.2%	38.2%	22.7%	22.7%	0.0%	22.7%	0.0%	113.6%	30%	9%
Yellow Time (s)	4.0	4.0	4.0			4.0	4.0	3.0	3.0		3.0			2.0	2.0
All-Red Time (s)	2.0	2.0	2.0			2.0	2.0	3.0	3.0		3.0			1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	6.0	6.0	6.0	4.0	4.0	6.0	6.0	6.0	6.0	4.0	6.0	4.0	6.0		
Lead/Lag	Lead	Lead	Lag			Lag	Lag							Lead	
Lead-Lag Optimize?															
Recall Mode	None	None	C-Min			C-Min	C-Min	None	None		None			None	None
v/c Ratio		0.84	0.95			1.30	0.24	0.22	0.24		0.77		0.13		
Control Delay		61.1	40.9			161.8	2.3	36.2	33.2		57.5		0.3		
Queue Delay		0.0	0.0			0.0	0.0	0.0	0.0		0.0		0.0		
Total Delay		61.1	40.9			161.8	2.3	36.2	33.2		57.5		0.3		
Queue Length 50th (ft)		214	418			~827	17	55	56		158		0		
Queue Length 95th (ft)		#330	#1005			#960	m4	99	102		#356		7		
Internal Link Dist (ft)			844			850			1480			928			
Turn Bay Length (ft)		325													
Base Capacity (vph)		430	1778			1261	622	443	460		317		1525		
Starvation Cap Reductn		0	0			0	0	0	0		0		0		
Spillback Cap Reductn		0	0			0	0	0	0		0		0		
Storage Cap Reductn		0	0			0	0	0	0		0		0		
Reduced v/c Ratio		0.74	0.95			1.30	0.24	0.22	0.24		0.77		0.13		

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 25 (23%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 28: Route 60 (Squire Road) & Sigourney Street



Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	20	277	1573	0	0	1442	129	79	71	18	228	0	181
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0			6.0	6.0	6.0	6.0		6.0		6.0
Lane Util. Factor		1.00	0.95			0.95	1.00	1.00	1.00		1.00		1.00
Frpb, ped/bikes		1.00	1.00			1.00	1.00	1.00	1.00		1.00		0.99
Flpb, ped/bikes		1.00	1.00			1.00	1.00	1.00	1.00		1.00		1.00
Frt		1.00	1.00			1.00	0.85	1.00	0.97		1.00		0.85
Flt Protected		0.95	1.00			1.00	1.00	0.95	1.00		0.95		1.00
Satd. Flow (prot)		1752	3505			3539	1583	1805	1844		1787		1579
Flt Permitted		0.95	1.00			1.00	1.00	0.95	1.00		0.69		1.00
Satd. Flow (perm)		1752	3505			3539	1583	1805	1844		1289		1579
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.88	0.88	0.88	0.80	0.80	0.80	0.93	0.93	0.93
Adj. Flow (vph)	22	298	1691	0	0	1639	147	99	89	22	245	0	195
RTOR Reduction (vph)	0	0	0	0	0	0	61	0	8	0	0	0	18
Lane Group Flow (vph)	0	320	1691	0	0	1639	86	99	103	0	245	0	177
Confl. Bikes (#/hr)							2						2
Heavy Vehicles (%)	3%	3%	3%	3%	2%	2%	2%	0%	0%	0%	1%	1%	1%
Turn Type	Prot	Prot					Prot	Split			custom		custom
Protected Phases	1	1	6			2	2	4	4				
Permitted Phases											8		1 2 4 8
Actuated Green, G (s)		23.8	51.6			36.8	36.8	27.0	27.0		27.0		99.6
Effective Green, g (s)		23.8	51.6			36.8	36.8	27.0	27.0		27.0		99.6
Actuated g/C Ratio		0.22	0.47			0.33	0.33	0.25	0.25		0.25		0.91
Clearance Time (s)		6.0	6.0			6.0	6.0	6.0	6.0		6.0		
Vehicle Extension (s)		3.0	3.0			3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		379	1644			1184	530	443	453		316		1430
v/s Ratio Prot		c0.18	c0.48			c0.46	0.05	0.05	0.06				
v/s Ratio Perm											c0.19		0.11
v/c Ratio		0.84	1.03			1.38	0.16	0.22	0.23		0.78		0.12
Uniform Delay, d1		41.3	29.2			36.6	25.8	33.1	33.2		38.7		0.6
Progression Factor		1.00	1.00			0.52	0.14	1.00	1.00		1.00		1.00
Incremental Delay, d2		15.7	29.8			177.4	0.5	0.3	0.3		11.3		0.0
Delay (s)		57.0	59.0			196.3	4.1	33.4	33.4		50.0		0.6
Level of Service		E	E			F	A	C	C		D		A
Approach Delay (s)			58.7			180.5			33.4			28.1	
Approach LOS			E			F			C			C	

Intersection Summary

HCM Average Control Delay	103.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	28.4
Intersection Capacity Utilization	92.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	ø2	ø3	ø9
Lane Configurations									
Volume (vph)	478	1310	1068	249	153	355			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	11	11	11	12	15	12			
Storage Length (ft)	120			0	0	150			
Storage Lanes	1			0	1	1			
Taper Length (ft)	25			25	25	25			
Right Turn on Red				Yes		Yes			
Link Speed (mph)		30	30		30				
Link Distance (ft)		1857	236		865				
Travel Time (s)		42.2	5.4		19.7				
Peak Hour Factor	0.91	0.91	0.86	0.86	0.79	0.79			
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%			
Bus Blockages (#/hr)	0	2	0	0	0	0			
Shared Lane Traffic (%)									
Lane Group Flow (vph)	525	1440	1532	0	194	449			
Turn Type	Prot					custom			
Protected Phases	5	2 3 5	2 3		7	7	2	3	9
Permitted Phases						2 3 5			
Detector Phase	5	2 3 5	2 3		7	7			
Switch Phase									
Minimum Initial (s)	3.0				2.0	2.0	3.0	3.0	1.0
Minimum Split (s)	8.0				8.0	8.0	12.0	8.0	7.0
Total Split (s)	30.0	95.0	65.0	0.0	25.0	25.0	30.0	35.0	20.0
Total Split (%)	21.4%	67.9%	46.4%	0.0%	17.9%	17.9%	21%	25%	14%
Yellow Time (s)	4.0				4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0				1.0	1.0	2.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-2.0	-2.0	0.0	-1.0	-1.0			
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lag				Lead	Lead	Lag	Lead	
Lead-Lag Optimize?	Yes				Yes	Yes	Yes	Yes	
Recall Mode	None				C-Max	C-Max	Max	None	None
v/c Ratio	1.64	0.45	0.72		0.34	0.28			
Control Delay	335.3	12.6	40.7		41.0	0.5			
Queue Delay	0.0	0.5	40.1		0.4	0.0			
Total Delay	335.3	13.1	80.7		41.3	0.5			
Queue Length 50th (ft)	~689	222	416		139	0			
Queue Length 95th (ft)	#914	253	441		181	0			
Internal Link Dist (ft)		1777	156		785				
Turn Bay Length (ft)	120					150			
Base Capacity (vph)	321	3218	2130		570	1583			
Starvation Cap Reductn	0	0	712		0	0			
Spillback Cap Reductn	0	1194	0		110	0			
Storage Cap Reductn	0	0	0		0	0			
Reduced v/c Ratio	1.64	0.71	1.08		0.42	0.28			

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 116 (83%), Referenced to phase 7:SBL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 41: Route 145 & N Shore Rd



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	478	1310	1068	249	153	355
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	15	12
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.91	0.91		1.00	1.00
Frt	1.00	1.00	0.97		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1728	4951	4823		1947	1583
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1728	4951	4823		1947	1583
Peak-hour factor, PHF	0.91	0.91	0.86	0.86	0.79	0.79
Adj. Flow (vph)	525	1440	1242	290	194	449
RTOR Reduction (vph)	0	0	27	0	0	42
Lane Group Flow (vph)	525	1440	1505	0	194	407
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Bus Blockages (#/hr)	0	2	0	0	0	0
Turn Type	Prot					custom
Protected Phases	5	2 3 5	2 3		7	7
Permitted Phases						2 3 5
Actuated Green, G (s)	25.0	90.0	60.0		40.0	130.0
Effective Green, g (s)	26.0	89.0	62.0		41.0	127.0
Actuated g/C Ratio	0.19	0.64	0.44		0.29	0.91
Clearance Time (s)	5.0				5.0	5.0
Vehicle Extension (s)	3.0				3.0	3.0
Lane Grp Cap (vph)	321	3147	2136		570	1526
v/s Ratio Prot	c0.30	0.29	c0.31		c0.10	0.08
v/s Ratio Perm						0.18
v/c Ratio	1.64	0.46	0.70		0.34	0.27
Uniform Delay, d1	57.0	13.1	31.6		38.9	0.8
Progression Factor	1.00	1.00	1.22		1.00	1.00
Incremental Delay, d2	299.7	0.1	1.0		1.6	0.1
Delay (s)	356.7	13.2	39.7		40.5	0.9
Level of Service	F	B	D		D	A
Approach Delay (s)		105.0	39.7		12.8	
Approach LOS		F	D		B	

Intersection Summary

HCM Average Control Delay	66.5	HCM Level of Service	E
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2	ø7	ø9
Lane Configurations															
Volume (vph)	0	1245	218	155	1024	0	293	0	434	0	0	0			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	12	11	11	9	11	12	10	12	12	12	12	16			
Storage Length (ft)	0		0	100		0	0		100	0		0			
Storage Lanes	0		0	1		0	1		1	0		1			
Taper Length (ft)	25		25	25		25	25		25	25		25			
Right Turn on Red			No			Yes			No			No			
Link Speed (mph)		30			30			30			30				
Link Distance (ft)		236			635			5227			589				
Travel Time (s)		5.4			14.4			118.8			13.4				
Peak Hour Factor	0.85	0.85	0.85	0.83	0.83	0.83	0.91	0.91	0.91	1.00	1.00	1.00			
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	2%	2%	2%	0%	0%	0%			
Bus Blockages (#/hr)	0	0	0	0	2	0	0	0	0	0	0	0			
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	1721	0	187	1234	0	322	0	477	0	0	0			
Turn Type				Prot			Prot		custom			custom			
Protected Phases		2 7		5	2 5 7		3		3				2	7	9
Permitted Phases									2 5 7			3			
Detector Phase		2 7		5	2 5 7		3		3			3			
Switch Phase															
Minimum Initial (s)				3.0			3.0		3.0			3.0	3.0	2.0	1.0
Minimum Split (s)				8.0			8.0		8.0			8.0	12.0	8.0	7.0
Total Split (s)	0.0	55.0	0.0	30.0	85.0	0.0	35.0	0.0	35.0	0.0	0.0	35.0	30.0	25.0	20.0
Total Split (%)	0.0%	39.3%	0.0%	21.4%	60.7%	0.0%	25.0%	0.0%	25.0%	0.0%	0.0%	25.0%	21%	18%	14%
Yellow Time (s)				4.0			4.0		4.0			4.0	4.0	4.0	2.0
All-Red Time (s)				1.0			1.0		1.0			1.0	2.0	1.0	1.0
Lost Time Adjust (s)	0.0	-2.0	0.0	-1.0	-2.0	0.0	-1.0	0.0	-1.0	0.0	0.0	-1.0			
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			
Lead/Lag				Lag			Lead		Lead			Lead	Lag	Lead	
Lead-Lag Optimize?				Yes			Yes		Yes			Yes	Yes	Yes	
Recall Mode				None			None		None			None	Max	C-Max	None
v/c Ratio		0.70		0.62	0.34		0.45		0.30						
Control Delay		25.5		62.5	7.5		49.6		0.5						
Queue Delay		89.9		0.0	19.4		0.0		0.0						
Total Delay		115.4		62.5	26.9		49.6		0.5						
Queue Length 50th (ft)		339		159	137		131		0						
Queue Length 95th (ft)		378		222	142		180		0						
Internal Link Dist (ft)		156			555			5147			509				
Turn Bay Length (ft)				100					100						
Base Capacity (vph)		2462		302	3608		709		1583						
Starvation Cap Reductn		1023		0	0		0		0						
Spillback Cap Reductn		0		0	2398		0		0						
Storage Cap Reductn		0		0	0		0		0						
Reduced v/c Ratio		1.20		0.62	1.02		0.45		0.30						

Intersection Summary	
Area Type:	Other
Cycle Length: 140	
Actuated Cycle Length: 140	
Offset: 116 (83%), Referenced to phase 7:SBL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	

Splits and Phases: 42: Winthrop Ave & Suffolk Downs



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1245	218	155	1024	0	293	0	434	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	9	11	12	10	12	12	12	12	16
Total Lost time (s)		4.0		4.0	4.0		4.0		4.0			
Lane Util. Factor		0.91		1.00	0.91		0.97		1.00			
Frt		0.98		1.00	1.00		1.00		0.85			
Flt Protected		1.00		0.95	1.00		0.95		1.00			
Satd. Flow (prot)		4854		1624	5001		3204		1583			
Flt Permitted		1.00		0.95	1.00		0.95		1.00			
Satd. Flow (perm)		4854		1624	5001		3204		1583			
Peak-hour factor, PHF	0.85	0.85	0.85	0.83	0.83	0.83	0.91	0.91	0.91	1.00	1.00	1.00
Adj. Flow (vph)	0	1465	256	187	1234	0	322	0	477	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1721	0	187	1234	0	322	0	477	0	0	0
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	2	0	0	0	0	0	0	0
Turn Type				Prot			Prot		custom			custom
Protected Phases		2 7		5	2 5 7		3		3			
Permitted Phases									2 5 7			3
Actuated Green, G (s)		69.0		25.0	99.0		30.0		129.0			
Effective Green, g (s)		68.0		26.0	95.0		31.0		131.0			
Actuated g/C Ratio		0.49		0.19	0.68		0.22		0.94			
Clearance Time (s)				5.0			5.0		5.0			
Vehicle Extension (s)				3.0			3.0		3.0			
Lane Grp Cap (vph)		2358		302	3394		709		1526			
v/s Ratio Prot		c0.35		c0.12	0.25		c0.10		0.07			
v/s Ratio Perm									0.23			
v/c Ratio		0.73		0.62	0.36		0.45		0.31			
Uniform Delay, d1		28.7		52.4	9.6		47.2		0.4			
Progression Factor		0.90		1.00	1.00		1.00		1.00			
Incremental Delay, d2		1.9		3.8	0.1		0.5		0.1			
Delay (s)		27.7		56.2	9.7		47.6		0.5			
Level of Service		C		E	A		D		A			
Approach Delay (s)		27.7			15.8			19.5			0.0	
Approach LOS		C			B			B			A	

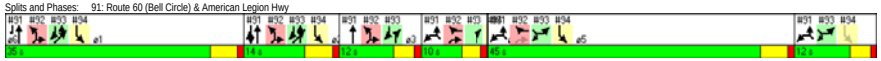
Intersection Summary			
HCM Average Control Delay	21.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	62.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NWL	NWR	NEL	NER	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations																
Volume (vph)	0	1176	0	0	817	345	1239	387	0	0						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900						
Lane Width (ft)	12	13	12	12	13	16	16	16	12	12						
Storage Length (ft)	0		0	0		130	0	0	0	0						
Storage Lanes	0		0	0		1	2	1	0	0						
Taper Length (ft)	25		25	25		25	25	25	25	25						
Right Turn on Red			No			Yes		Yes								
Link Speed (mph)		30			30		30		30							
Link Distance (ft)		324			508		202		225							
Travel Time (s)		7.4			11.5		4.6		5.1							
Peak Hour Factor	0.92	0.94	0.92	0.92	0.78	0.77	0.91	0.91	0.92	0.92						
Heavy Vehicles (%)	2%	4%	2%	2%	7%	3%	5%	5%	2%	2%						
Shared Lane Traffic (%)																
Lane Group Flow (vph)	0	1251	0	0	1047	448	1362	425	0	0						
Turn Type						Prot		Prot								
Protected Phases		1 2 3			1 2	1 2	4 5 6	4 5 6			1	2	3	4	5	6
Permitted Phases																
Minimum Split (s)											35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	0.0	61.0	0.0	0.0	49.0	49.0	67.0	67.0	0.0	0.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	0.0%	47.7%	0.0%	0.0%	38.3%	38.3%	52.3%	52.3%	0.0%	0.0%	27%	11%	9%	8%	35%	9%
Yellow Time (s)											4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)											1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	-1.0	0.0	0.0	-1.0	-1.0	-1.0	-1.0	0.0	0.0						
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	4.0	4.0						
Lead/Lag											Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?											Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio		0.78			0.85	0.61	0.72	0.41								
Control Delay		2.8			46.6	25.2	21.9	14.1								
Queue Delay		10.5			0.0	0.0	9.3	4.9								
Total Delay		13.3			46.6	25.2	31.2	19.0								
Queue Length 50th (ft)		0			421	194	480	134								
Queue Length 95th (ft)		m0			415	229	581	193								
Internal Link Dist (ft)		244			428		122		145							
Turn Bay Length (ft)						130										
Base Capacity (vph)		1597			1226	731	1890	1038								
Starvation Cap Reductn		333			0	0	506	532								
Spillback Cap Reductn		0			0	0	0	0								
Storage Cap Reductn		0			0	0	0	0								
Reduced v/c Ratio		0.99			0.85	0.61	0.98	0.84								

Intersection Summary	
Area Type:	Other
Cycle Length: 128	
Actuated Cycle Length: 128	
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green	
Natural Cycle: 150	
Control Type: Pretimed	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 91: Route 60 (Bell Circle) & American Legion Hwy



Movement	NBL	NBT	NBR	SBL	SBT	SBR	NWL	NWR	NEL	NER
Lane Configurations										
Volume (vph)	0	1176	0	0	817	345	1239	387	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	13	12	12	13	16	16	16	12	12
Total Lost time (s)		4.0			4.0	4.0	3.0	3.0		
Lane Util. Factor		0.95			0.95	1.00	0.97	1.00		
Frt		1.00			1.00	0.85	1.00	1.00		
Flt Protected		1.00			1.00	1.00	0.95	1.00		
Satd. Flow (prot)		3587			3486	1777	3780	2051		
Flt Permitted		1.00			1.00	1.00	1.00	1.00		
Satd. Flow (perm)		3587			3486	1777	3979	2051		
Peak-hour factor, PHF	0.92	0.94	0.92	0.92	0.78	0.77	0.91	0.91	0.92	0.92
Adj. Flow (vph)	0	1251	0	0	1047	448	1362	425	0	0
RTOR Reduction (vph)	0	0	0	0	0	106	0	13	0	0
Lane Group Flow (vph)	0	1251	0	0	1047	342	1362	412	0	0
Heavy Vehicles (%)	2%	4%	2%	2%	7%	3%	5%	5%	2%	2%
Turn Type						Prot		Prot		
Protected Phases		1 2 3			1 2	1 2	4 5 6	4 5 6		
Permitted Phases										
Actuated Green, G (s)		57.0			44.0	44.0	63.0	63.0		
Effective Green, g (s)		58.0			45.0	45.0	60.0	60.0		
Actuated g/C Ratio		0.45			0.35	0.35	0.47	0.47		
Clearance Time (s)										
Lane Grp Cap (vph)		1625			1226	625	1772	961		
v/s Ratio Prot		c0.35			c0.30	0.19	c0.36	0.20		
v/s Ratio Perm										
v/c Ratio		0.77			0.85	0.55	0.77	0.43		
Uniform Delay, d1		29.4			38.5	33.3	28.2	22.6		
Progression Factor		0.08			1.00	1.00	0.79	0.69		
Incremental Delay, d2		0.3			7.7	3.4	2.7	1.2		
Delay (s)		2.7			46.1	36.7	24.9	16.7		
Level of Service		A			D	D	C	B		
Approach Delay (s)		2.7			43.3		23.0		0.0	
Approach LOS		A			D		C		A	

Intersection Summary			
HCM Average Control Delay	24.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	74.5%	ICU Level of Service	D
Analysis Period (min)	15		

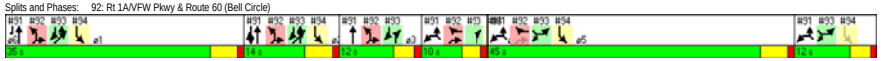
c Critical Lane Group

Lane Group	WBL	WBR	SEL	SER	NEL	NER	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations												
Volume (vph)	0	1197	0	0	347	1601						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900						
Lane Width (ft)	16	16	12	12	16	14						
Right Turn on Red		Yes		Yes	Yes	Yes						
Link Speed (mph)	30		30		30							
Link Distance (ft)	646		202		216							
Travel Time (s)	14.7		4.6		4.9							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.73	0.85						
Heavy Vehicles (%)	2%	3%	2%	2%	5%	5%						
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1301	0	0	475	1884						
Turn Type		custom				custom						
Protected Phases		4 5			1 2 3	1 2 3 4	1	2	3	4	5	6
Permitted Phases						5						
Minimum Split (s)							35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	0.0	55.0	0.0	0.0	61.0	71.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	0.0%	43.0%	0.0%	0.0%	47.7%	55.5%	27%	11%	9%	8%	35%	9%
Yellow Time (s)							4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)							1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	-1.0	0.0	0.0	-1.0	0.0						
Total Lost Time (s)	4.0	3.0	4.0	4.0	4.0	5.0						
Lead/Lag							Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio		0.68			0.24	0.59						
Control Delay		15.7			6.5	0.1						
Queue Delay		0.4			2.6	1.5						
Total Delay		16.1			9.1	1.5						
Queue Length 50th (ft)		236			21	0						
Queue Length 95th (ft)		322			m10	m0						
Internal Link Dist (ft)	566		122		136							
Turn Bay Length (ft)												
Base Capacity (vph)		1904			1958	3196						
Starvation Cap Reductn		0			1333	1044						
Spillback Cap Reductn		208			798	0						
Storage Cap Reductn		0			0	0						
Reduced v/c Ratio		0.77			0.76	0.88						

Intersection Summary	
Area Type:	Other
Cycle Length: 128	
Actuated Cycle Length: 128	
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green	
Natural Cycle: 150	
Control Type: Pretimed	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 92: Rt 1A/VFW Pkwy & Route 60 (Bell Circle)



Movement	WBL	WBR	SEL	SER	NEL	NER
Lane Configurations						
Volume (vph)	0	1197	0	0	347	1601
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	16	16	12	12	16	14
Total Lost time (s)		3.0			4.0	5.0
Lane Util. Factor		0.88			0.97	0.88
Frt		1.00			1.00	1.00
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		3679			3979	3397
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		3679			3979	3397
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.73	0.85
Adj. Flow (vph)	0	1301	0	0	475	1884
RTOR Reduction (vph)	0	414	0	0	184	368
Lane Group Flow (vph)	0	887	0	0	291	1516
Heavy Vehicles (%)	2%	3%	2%	2%	5%	5%
Turn Type		custom				custom
Protected Phases		4 5			1 2 3	1 2 3 4
Permitted Phases						5
Actuated Green, G (s)		50.0			57.0	107.0
Effective Green, g (s)		51.0			58.0	103.0
Actuated g/C Ratio		0.40			0.45	0.80
Clearance Time (s)						
Lane Grp Cap (vph)		1466			1803	2734
v/s Ratio Prot		c0.24			0.07	c0.27
v/s Ratio Perm						0.17
v/c Ratio		0.60			0.16	0.55
Uniform Delay, d1		30.5			20.7	4.4
Progression Factor		1.00			1.05	0.00
Incremental Delay, d2		1.9			0.0	0.1
Delay (s)		32.4			21.7	0.1
Level of Service		C			C	A
Approach Delay (s)	32.4		0.0		4.4	
Approach LOS	C		A		A	

Intersection Summary			
HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	60.2%	ICU Level of Service	B
Analysis Period (min)	15		

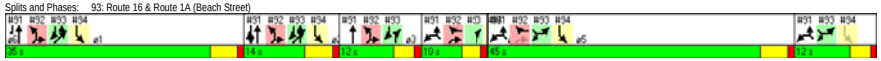
c Critical Lane Group

Lane Group	NBR	SBR	SEL	SER2	NEL	NET	ø2	ø3	ø4	ø5	ø6
Lane Configurations											
Volume (vph)	753	817	634	903	1176	657					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900					
Lane Width (ft)	12	13	12	14	12	16					
Storage Length (ft)	0	0	100		0						
Storage Lanes	2	2	0		2						
Taper Length (ft)	25	25	25		25						
Right Turn on Red	No			Yes							
Link Speed (mph)			30			30					
Link Distance (ft)			186			610					
Travel Time (s)			4.2			13.9					
Peak Hour Factor	0.86	0.78	0.85	0.93	0.73	0.73					
Heavy Vehicles (%)	2%	7%	3%	5%	2%	2%					
Shared Lane Traffic (%)											
Lane Group Flow (vph)	876	1047	746	971	1611	900					
Turn Type	custom	custom		Prot	Prot						
Protected Phases	2 3 4	1 2 3	5 6	5 6	1 2	1	2	3	4	5	6
Permitted Phases											
Minimum Split (s)						35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	36.0	61.0	57.0	57.0	49.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	28.1%	47.7%	44.5%	44.5%	38.3%	27.3%	11%	9%	8%	35%	9%
Yellow Time (s)						4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)						1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0					
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0					
Lead/Lag						Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio	1.07	0.86	0.50	0.62	1.27	1.76					
Control Delay	96.9	12.6	18.5	11.1	162.6	380.9					
Queue Delay	0.0	3.0	9.1	2.7	0.0	0.0					
Total Delay	96.9	15.6	27.6	13.7	162.6	380.9					
Queue Length 50th (ft)	~456	128	144	87	~866	~1110					
Queue Length 95th (ft)	#553	34	167	143	#707	#1021					
Internal Link Dist (ft)			106			530					
Turn Bay Length (ft)			100	100							
Base Capacity (vph)	820	1222	1482	1576	1271	511					
Starvation Cap Reductn	0	98	698	466	0	0					
Spillback Cap Reductn	0	0	0	0	0	0					
Storage Cap Reductn	0	0	0	0	0	0					
Reduced v/c Ratio	1.07	0.93	0.95	0.87	1.27	1.76					

Intersection Summary

Area Type: Other
Cycle Length: 128
Actuated Cycle Length: 128
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green
Natural Cycle: 150
Control Type: Pretimed
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 93: Route 16 & Route 1A (Beach Street)



Movement	NBR	SBR	SEL	SER2	NEL	NET
Lane Configurations						
Volume (vph)	753	817	634	903	1176	657
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	13	12	14	12	16
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.88	0.88	0.97	0.88	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	1.00
Flt Protected	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	3278	2745	3579	3397	3614	2111
Flt Permitted	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	3278	2745	3579	3397	3614	2111
Peak-hour factor, PHF	0.86	0.78	0.85	0.93	0.73	0.73
Adj. Flow (vph)	876	1047	746	971	1611	900
RTOR Reduction (vph)	0	0	0	168	0	0
Lane Group Flow (vph)	876	1047	746	803	1611	900
Heavy Vehicles (%)	2%	7%	3%	5%	2%	2%
Turn Type	custom	custom		Prot	Prot	
Protected Phases	2 3 4	1 2 3	5 6	5 6	1 2	1
Permitted Phases						
Actuated Green, G (s)	32.0	57.0	53.0	53.0	44.0	30.0
Effective Green, g (s)	30.0	58.0	54.0	54.0	45.0	31.0
Actuated g/C Ratio	0.23	0.45	0.42	0.42	0.35	0.24
Clearance Time (s)						5.0
Lane Grp Cap (vph)	768	1244	1510	1433	1271	511
v/s Ratio Prot	c0.27	0.38	0.21	c0.24	c0.45	c0.43
v/s Ratio Perm						
v/c Ratio	1.14	0.84	0.49	0.56	1.27	1.76
Uniform Delay, d1	49.0	30.9	27.0	28.0	41.5	48.5
Progression Factor	1.00	0.25	0.62	0.47	1.00	1.00
Incremental Delay, d2	78.6	3.6	1.1	1.5	126.8	350.5
Delay (s)	127.6	11.4	17.8	14.6	168.3	399.0
Level of Service	F	B	B	B	F	F
Approach Delay (s)			16.0			251.0
Approach LOS			B			F

Intersection Summary

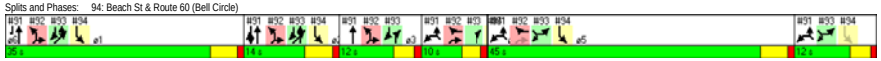
HCM Average Control Delay	127.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	Err%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	SBL	SBR	NWL	NWR	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations												
Volume (vph)	0	376	1135	440	0	0						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900						
Lane Width (ft)	12	16	16	16	12	12						
Right Turn on Red		Yes	Yes	Yes		Yes						
Link Speed (mph)	30		30		30							
Link Distance (ft)	999		225		186							
Travel Time (s)	22.7		5.1		4.2							
Confl. Peds. (#/hr)		100			100							
Peak Hour Factor	0.92	0.84	0.87	0.95	0.92	0.92						
Heavy Vehicles (%)	2%	3%	3%	4%	2%	2%						
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	448	1305	463	0	0						
Turn Type		Free		Free								
Protected Phases			1 2 4 5				1	2	3	4	5	6
Permitted Phases		Free	6	Free								
Minimum Split (s)							35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	0.0	0.0	104.0	0.0	0.0	0.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	0.0%	0.0%	81.3%	0.0%	0.0%	0.0%	27%	11%	9%	8%	35%	9%
Yellow Time (s)							4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)							1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	-1.0	0.0	0.0	0.0						
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0						
Lead/Lag							Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio		0.26	0.39	0.26								
Control Delay		0.4	0.3	0.3								
Queue Delay		0.1	0.2	0.0								
Total Delay		0.4	0.5	0.3								
Queue Length 50th (ft)		0	0	0								
Queue Length 95th (ft)		0	0	0								
Internal Link Dist (ft)	919		145		106							
Turn Bay Length (ft)												
Base Capacity (vph)		1734	3367	1760								
Starvation Cap Reductn		0	1151	0								
Spillback Cap Reductn		380	624	0								
Storage Cap Reductn		0	0	0								
Reduced v/c Ratio		0.33	0.59	0.26								

Intersection Summary	
Area Type:	Other
Cycle Length: 128	
Actuated Cycle Length: 128	
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green	
Natural Cycle: 150	
Control Type: Pretimed	

Splits and Phases: 94: Beach St & Route 60 (Bell Circle)



Movement	EBL	EBR	SBL	SBR	NWL	NWR
Lane Configurations						
Volume (vph)	0	376	1135	440	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	16	16	16	12	12
Total Lost time (s)		4.0	4.0	4.0		
Lane Util. Factor		1.00	0.97	1.00		
Frpb, ped/bikes		0.96	1.00	1.00		
Flpb, ped/bikes		1.00	1.00	1.00		
Frt		0.86	1.00	0.85		
Flt Protected		1.00	0.95	1.00		
Satd. Flow (prot)		1734	3853	1760		
Flt Permitted		1.00	1.00	1.00		
Satd. Flow (perm)		1734	4056	1760		
Peak-hour factor, PHF	0.92	0.84	0.87	0.95	0.92	0.92
Adj. Flow (vph)	0	448	1305	463	0	0
RTOR Reduction (vph)	0	0	242	0	0	0
Lane Group Flow (vph)	0	448	1063	463	0	0
Confl. Peds. (#/hr)		100			100	
Heavy Vehicles (%)	2%	3%	3%	4%	2%	2%
Turn Type		Free		Free		
Protected Phases			1 2 4 5			
Permitted Phases		Free	6	Free		
Actuated Green, G (s)		128.0	102.0	128.0		
Effective Green, g (s)		128.0	102.0	128.0		
Actuated g/C Ratio		1.00	0.80	1.00		
Clearance Time (s)						
Lane Grp Cap (vph)		1734	3085	1760		
v/s Ratio Prot			c0.25			
v/s Ratio Perm		0.26	0.02	c0.26		
v/c Ratio		0.26	0.34	0.26		
Uniform Delay, d1		0.0	3.6	0.0		
Progression Factor		1.00	0.22	1.00		
Incremental Delay, d2		0.4	0.2	0.3		
Delay (s)		0.4	1.0	0.3		
Level of Service		A	A	A		
Approach Delay (s)	0.4		0.8		0.0	
Approach LOS	A		A		A	

Intersection Summary			
HCM Average Control Delay	0.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	52.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

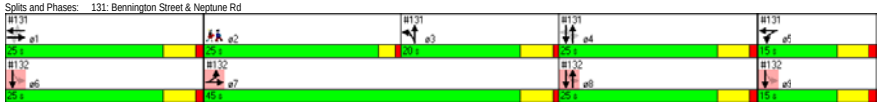
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2	ø6	ø7	ø8	ø9
Lane Configurations																	
Volume (vph)	23	575	161	354	414	64	259	351	8	24	107	67					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900					
Lane Width (ft)	12	12	10	12	12	12	11	11	11	11	11	11					
Right Turn on Red			Yes			Yes			Yes			Yes					
Link Speed (mph)		30			30			30			30						
Link Distance (ft)		669			3390			98			119						
Travel Time (s)		15.2			77.0			2.2			2.7						
Confl. Peds. (#/hr)										23		101					
Peak Hour Factor	0.89	0.89	0.89	0.95	0.95	0.95	0.93	0.93	0.93	0.86	0.86	0.86					
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	8%	8%	8%	4%	4%	4%					
Bus Blockages (#/hr)	0	0	0	0	0	8	0	0	0	0	0	0					
Parking (#/hr)					0	0					10	10					
Shared Lane Traffic (%)																	
Lane Group Flow (vph)	0	853	0	373	503	0	0	664	0	0	230	0					
Turn Type	Perm			D.P+P			D.P+P			Perm							
Protected Phases		1		5	1 5		3	3 4			4		2	6	7	8	9
Permitted Phases	1			1			4			4							
Detector Phase	1	1		5	1 5		3	3 4		4	4						
Switch Phase																	
Minimum Initial (s)	8.0	8.0		8.0			6.0			6.0	6.0		6.0	8.0	6.0	8.0	6.0
Minimum Split (s)	13.0	13.0		13.0			13.0			11.0	11.0		25.0	13.0	19.0	17.0	11.0
Total Split (s)	25.0	25.0	0.0	15.0	40.0	0.0	20.0	45.0	0.0	25.0	25.0	0.0	25.0	25.0	45.0	25.0	15.0
Total Split (%)	22.7%	22.7%	0.0%	13.6%	36.4%	0.0%	18.2%	40.9%	0.0%	22.7%	22.7%	0.0%	23%	23%	41%	23%	14%
Yellow Time (s)	4.0	4.0		4.0			4.0			4.0	4.0		2.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0			1.0			1.0	1.0		1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0					
Lead/Lag							Lag						Lead		Lead	Lag	
Lead-Lag Optimize?							Yes						Yes		Yes	Yes	
Recall Mode	C-Min	C-Min		None			None			None	None		None	None	None	None	None
v/c Ratio		2.34		0.99	0.78			0.60			0.37						
Control Delay		632.5		78.3	40.3			9.5			24.5						
Queue Delay		0.0		0.0	0.0			2.6			0.0						
Total Delay		632.5		78.3	40.3			12.1			24.5						
Queue Length 50th (ft)		~517		~239	311			25			42						
Queue Length 95th (ft)		#637		#514	#566			m244			87						
Internal Link Dist (ft)		589			3310			18			39						
Turn Bay Length (ft)																	
Base Capacity (vph)		365		376	649			1108			623						
Starvation Cap Reductn		0		0	0			315			0						
Spillback Cap Reductn		0		0	0			0			0						
Storage Cap Reductn		0		0	0			0			0						
Reduced v/c Ratio		2.34		0.99	0.78			0.84			0.37						

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
Description: Bennington WB defacto left recoded

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 131: Bennington Street & Neptune Rd



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	575	161	354	414	64	259	351	8	24	107	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	10	12	12	12	11	11	11	11	11	11
Total Lost time (s)		5.0		5.0	5.0			5.0			5.0	
Lane Util. Factor		0.95		1.00	1.00			0.95			0.95	
Frpb, ped/bikes		1.00		1.00	1.00			1.00			0.93	
Flpb, ped/bikes		1.00		1.00	1.00			1.00			1.00	
Frt		0.97		1.00	0.98			1.00			0.95	
Flt Protected		1.00		0.95	1.00			0.98			0.99	
Satd. Flow (prot)		3421		1736	1611			3158			2715	
Flt Permitted		0.55		0.23	1.00			0.73			0.83	
Satd. Flow (perm)		1883		415	1611			2340			2265	
Peak-hour factor, PHF	0.89	0.89	0.89	0.95	0.95	0.95	0.93	0.93	0.93	0.86	0.86	0.86
Adj. Flow (vph)	26	646	181	373	436	67	278	377	9	28	124	78
RTOR Reduction (vph)	0	23	0	0	4	0	0	1	0	0	54	0
Lane Group Flow (vph)	0	830	0	373	499	0	0	663	0	0	176	0
Confl. Peds. (#/hr)										23		101
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	8%	8%	8%	4%	4%	4%
Bus Blockages (#/hr)	0	0	0	0	0	8	0	0	0	0	0	0
Parking (#/hr)					0	0					10	10
Turn Type	Perm			D.P+P			D.P+P			Perm		
Protected Phases		1		5	1 5		3	3 4			4	
Permitted Phases	1			1			4			4		
Actuated Green, G (s)		17.6		36.6	41.6			46.0			28.5	
Effective Green, g (s)		17.6		36.6	41.6			46.0			28.5	
Actuated g/C Ratio		0.16		0.33	0.38			0.42			0.26	
Clearance Time (s)		5.0		5.0							5.0	
Vehicle Extension (s)		2.5		2.5							2.5	
Lane Grp Cap (vph)		301		366	609			1109			587	
v/s Ratio Prot				c0.18	0.31			c0.10				
v/s Ratio Perm		c0.44		0.16				c0.16			0.08	
v/c Ratio		2.76		1.02	0.82			0.60			0.30	
Uniform Delay, d1		46.2		32.4	30.8			24.8			32.7	
Progression Factor		1.00		1.00	1.00			0.37			1.00	
Incremental Delay, d2		800.6		52.0	8.2			0.5			0.2	
Delay (s)		846.8		84.4	39.0			9.6			32.9	
Level of Service		F		F	D			A			C	
Approach Delay (s)		846.8			58.4			9.6			32.9	
Approach LOS		F			E			A			C	

Intersection Summary

HCM Average Control Delay	300.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	27.4
Intersection Capacity Utilization	94.7%	ICU Level of Service	F
Analysis Period (min)	15		

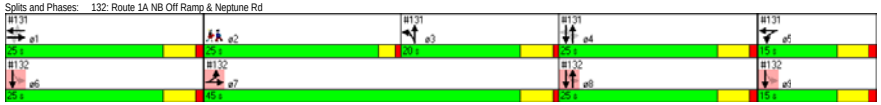
Description: Bennington WB defacto left recoded
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø2	ø3	ø4	ø5	ø6	ø9
Lane Configurations																			
Volume (vph)	497	446	14	0	0	0	0	168	325	0	67	0							
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900							
Lane Width (ft)	11	11	12	12	12	12	11	11	11	11	11	11							
Right Turn on Red			Yes			Yes			Yes			Yes							
Link Speed (mph)		30			30			30			30								
Link Distance (ft)		80			312			647			104								
Travel Time (s)		1.8			7.1			14.7			2.4								
Peak Hour Factor	0.97	0.97	0.97	0.92	0.92	0.92	0.90	0.90	0.90	0.75	0.75	0.75							
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	6%	6%	6%	8%	8%	8%							
Shared Lane Traffic (%)																			
Lane Group Flow (vph)	512	474	0	0	0	0	0	548	0	0	89	0							
Turn Type	Split									Perm									
Protected Phases	7	7						8			6 8 9		1	2	3	4	5	6	9
Permitted Phases										6 8 9									
Detector Phase	7	7						8		6 8 9	6 8 9								
Switch Phase																			
Minimum Initial (s)	6.0	6.0						8.0					8.0	6.0	6.0	6.0	8.0	8.0	6.0
Minimum Split (s)	19.0	19.0						17.0					13.0	25.0	13.0	11.0	13.0	13.0	11.0
Total Split (s)	45.0	45.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	65.0	65.0	0.0	25.0	25.0	20.0	25.0	15.0	25.0	15.0
Total Split (%)	40.9%	40.9%	0.0%	0.0%	0.0%	0.0%	0.0%	22.7%	0.0%	59.1%	59.1%	0.0%	23%	23%	18%	23%	14%	23%	14%
Yellow Time (s)	4.0	4.0						4.0					4.0	2.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0						1.0					1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0							
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	5.0	5.0	4.0							
Lead/Lag	Lead	Lead						Lag						Lead	Lag				
Lead-Lag Optimize?	Yes	Yes						Yes						Yes	Yes				
Recall Mode	None	None						None					C-Min	None	None	None	None	None	None
v/c Ratio	0.90	0.79						0.80			0.05								
Control Delay	54.7	43.2						24.6			7.2								
Queue Delay	13.9	0.0						0.1			0.0								
Total Delay	68.6	43.2						24.7			7.2								
Queue Length 50th (ft)	328	287						66			8								
Queue Length 95th (ft)	#512	415						121			m6								
Internal Link Dist (ft)		1			232			567			24								
Turn Bay Length (ft)																			
Base Capacity (vph)	610	641						835			1671								
Starvation Cap Reductn	0	0						0			0								
Spillback Cap Reductn	90	0						19			0								
Storage Cap Reductn	0	0						0			0								
Reduced v/c Ratio	0.98	0.74						0.67			0.05								

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 132: Route 1A NB Off Ramp & Neptune Rd



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	497	446	14	0	0	0	0	168	325	0	67	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)	5.0	5.0						5.0			5.0	
Lane Util. Factor	1.00	1.00						0.95			0.95	
Frt	1.00	1.00						0.90			1.00	
Flt Protected	0.95	1.00						1.00			1.00	
Satd. Flow (prot)	1678	1758						2967			3231	
Flt Permitted	0.95	1.00						1.00			1.00	
Satd. Flow (perm)	1678	1758						2967			3231	
Peak-hour factor, PHF	0.97	0.97	0.97	0.92	0.92	0.92	0.90	0.90	0.90	0.75	0.75	0.75
Adj. Flow (vph)	512	460	14	0	0	0	0	187	361	0	89	0
RTOR Reduction (vph)	0	1	0	0	0	0	0	308	0	0	0	0
Lane Group Flow (vph)	512	473	0	0	0	0	0	240	0	0	89	0
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	6%	6%	6%	8%	8%	8%
Turn Type	Split									Perm		
Protected Phases	7	7						8			6 8 9	
Permitted Phases										6 8 9		
Actuated Green, G (s)	37.3	37.3						16.1			62.7	
Effective Green, g (s)	37.3	37.3						16.1			62.7	
Actuated g/C Ratio	0.34	0.34						0.15			0.57	
Clearance Time (s)	5.0	5.0						5.0				
Vehicle Extension (s)	2.5	2.5						2.5				
Lane Grp Cap (vph)	569	596						434			1842	
v/s Ratio Prot	c0.31	0.27						c0.08			c0.03	
v/s Ratio Perm												
v/c Ratio	0.90	0.79						0.55			0.05	
Uniform Delay, d1	34.6	32.9						43.6			10.5	
Progression Factor	1.00	1.00						1.00			0.62	
Incremental Delay, d2	17.0	6.9						1.2			0.0	
Delay (s)	51.5	39.8						44.8			6.5	
Level of Service	D	D						D			A	
Approach Delay (s)		45.9			0.0			44.8			6.5	
Approach LOS		D			A			D			A	

Intersection Summary

HCM Average Control Delay	43.4	HCM Level of Service		D	
HCM Volume to Capacity ratio	0.45				
Actuated Cycle Length (s)	110.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	51.0%	ICU Level of Service		A	
Analysis Period (min)	15				

c Critical Lane Group



Movement	WBL	WBR	NBU	NBT	NBR	SBU	SBL	SBT
Lane Configurations								
Volume (veh/h)	20	14	20	2273	210	12	20	2028
Sign Control	Stop			Free				Free
Grade	0%			0%				0%
Peak Hour Factor	0.89	0.89	0.98	0.98	0.98	0.97	0.97	0.97
Hourly flow rate (vph)	22	16	0	2319	214	0	21	2091
Pedestrians								
Lane Width (ft)								
Walking Speed (ft/s)								
Percent Blockage								
Right turn flare (veh)								
Median type				None				None
Median storage veh)								
Upstream signal (ft)								405
pX, platoon unblocked	0.37		0.00			0.00		
vC, conflicting volume	3513	1267	0			0	2534	
vC1, stage 1 conf vol								
vC2, stage 2 conf vol								
vCu, unblocked vol	4372	1267	0			0	2534	
tC, single (s)	7.0	7.1	0.0			0.0	4.2	
tC, 2 stage (s)								
tF (s)	3.6	3.4	0.0			0.0	2.2	
p0 queue free %	0	90	0			0	88	
cM capacity (veh/h)	0	151	0			0	166	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	22	16	1546	987	21	1045	1045
Volume Left	22	0	0	0	21	0	0
Volume Right	0	16	0	214	0	0	0
cSH	0	151	1700	1700	166	1700	1700
Volume to Capacity	74.41	0.10	0.91	0.58	0.12	0.61	0.61
Queue Length 95th (ft)	Err	9	0	0	10	0	0
Control Delay (s)	Err	31.7	0.0	0.0	29.8	0.0	0.0
Lane LOS	F	D			D		
Approach Delay (s)	5894.8		0.0		0.3		
Approach LOS	F						

Intersection Summary				
Average Delay	48.2			
Intersection Capacity Utilization	93.7%	ICU Level of Service		F
Analysis Period (min)	15			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	114	2299	105	0	2172
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.79	0.79	0.94	0.94	0.96	0.96
Hourly flow rate (vph)	0	144	2446	112	0	2262
Pedestrians	3					
Lane Width (ft)	16.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	3636	1282			2560	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3636	1282			2560	
tC, single (s)	6.9	7.0			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.3	
p0 queue free %	100	6			100	
cM capacity (veh/h)	4	153			159	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	144	1630	927	1131	1131
Volume Left	0	0	0	0	0
Volume Right	144	0	112	0	0
cSH	153	1700	1700	1700	1700
Volume to Capacity	0.94	0.96	0.55	0.67	0.67
Queue Length 95th (ft)	171	0	0	0	0
Control Delay (s)	116.4	0.0	0.0	0.0	0.0
Lane LOS	F				
Approach Delay (s)	116.4	0.0		0.0	
Approach LOS	F				

Intersection Summary				
Average Delay	3.4			
Intersection Capacity Utilization	80.6%	ICU Level of Service		D
Analysis Period (min)	15			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	157	2347	125	0	2068
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.89	0.89	0.94	0.94	0.95	0.95
Hourly flow rate (vph)	0	176	2497	133	0	2177
Pedestrians	3					
Lane Width (ft)	16.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			925			880
pX, platoon unblocked	0.67	0.47			0.47	
vC, conflicting volume	3655	1318			2633	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	410	0			2221	
tC, single (s)	6.9	7.0			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	65			100	
cM capacity (veh/h)	372	505			106	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	176	1665	965	1088	1088
Volume Left	0	0	0	0	0
Volume Right	176	0	133	0	0
cSH	505	1700	1700	1700	1700
Volume to Capacity	0.35	0.98	0.57	0.64	0.64
Queue Length 95th (ft)	39	0	0	0	0
Control Delay (s)	15.9	0.0	0.0	0.0	0.0
Lane LOS	C				
Approach Delay (s)	15.9	0.0		0.0	
Approach LOS	C				

Intersection Summary				
Average Delay		0.6		
Intersection Capacity Utilization		85.3%	ICU Level of Service	E
Analysis Period (min)		15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	66	168	794	0	0	466
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.83	0.83	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	80	202	882	0	0	518
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						233
pX, platoon unblocked						
vC, conflicting volume	1141	441			882	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1141	441			882	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	59	64			100	
cM capacity (veh/h)	196	567			775	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	80	202	441	441	259	259
Volume Left	80	0	0	0	0	0
Volume Right	0	202	0	0	0	0
cSH	196	567	1700	1700	1700	1700
Volume to Capacity	0.41	0.36	0.26	0.26	0.15	0.15
Queue Length 95th (ft)	46	40	0	0	0	0
Control Delay (s)	35.4	14.8	0.0	0.0	0.0	0.0
Lane LOS	E	B				
Approach Delay (s)	20.7		0.0		0.0	
Approach LOS	C					

Intersection Summary				
Average Delay		3.5		
Intersection Capacity Utilization		39.0%	ICU Level of Service	A
Analysis Period (min)		15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	431	0	0	2034	136
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.97	0.97
Hourly flow rate (vph)	0	468	0	0	2097	140
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2167	769	2237			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2167	769	2237			
tC, single (s)	7.0	7.1	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.2			
p0 queue free %	100	0	100			
cM capacity (veh/h)	36	325	228			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3
Volume Total	468	839	839	560
Volume Left	0	0	0	0
Volume Right	468	0	0	140
cSH	325	1700	1700	1700
Volume to Capacity	1.44	0.49	0.49	0.33
Queue Length 95th (ft)	625	0	0	0
Control Delay (s)	246.4	0.0	0.0	0.0
Lane LOS	F			
Approach Delay (s)	246.4	0.0		
Approach LOS	F			

Intersection Summary			
Average Delay	42.7		
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		

Intersection Sign configuration not allowed in HCM analysis.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	19	84	6	8	408	22	5	180	52
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.84	0.84	0.84	0.88	0.88	0.88	0.78	0.78	0.78
Hourly flow rate (vph)	0	0	0	23	100	7	9	464	25	6	231	67
Pedestrians		3			28			3			24	
Lane Width (ft)		0.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			2			0			2	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								119				
pX, platoon unblocked												
vC, conflicting volume	611	815	155	654	836	296	300			517		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	611	815	155	654	836	296	300			517		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	93	66	99	99			99		
cM capacity (veh/h)	263	299	861	337	294	676	1265			1007		

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	130	241	257	122	182
Volume Left	23	9	0	6	0
Volume Right	7	0	25	0	67
cSH	311	1265	1700	1007	1700
Volume to Capacity	0.42	0.01	0.15	0.01	0.11
Queue Length 95th (ft)	49	1	0	0	0
Control Delay (s)	24.6	0.4	0.0	0.5	0.0
Lane LOS	C	A		A	
Approach Delay (s)	24.6	0.2		0.2	
Approach LOS	C				

Intersection Summary				
Average Delay	3.6			
Intersection Capacity Utilization	34.5%	ICU Level of Service		A
Analysis Period (min)	15			

Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

Synchro 7 Capacity Analysis
2022 No-Build Condition
Saturday Afternoon Peak Hour

Signalized and Unsignalized Synchro Analysis

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1094	122	228	1107	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	9	11	12	12
Storage Length (ft)		0	130		0	0
Storage Lanes		0	1		0	0
Taper Length (ft)		25	25		25	25
Right Turn on Red		Yes				Yes
Link Speed (mph)	30			30	30	
Link Distance (ft)	572			1857	345	
Travel Time (s)	13.0			42.2	7.8	
Peak Hour Factor	0.95	0.95	0.91	0.91	0.95	0.95
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Bus Blockages (#/hr)	0	0	0	2	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1280	0	251	1216	0	0
Turn Type			Prot			
Protected Phases	2		1	1 2		
Permitted Phases						
Detector Phase	2		1	1 2		
Switch Phase						
Minimum Initial (s)	4.0		4.0			
Minimum Split (s)	20.0		20.0			
Total Split (s)	75.0	0.0	30.0	105.0	0.0	0.0
Total Split (%)	71.4%	0.0%	28.6%	100.0%	0.0%	0.0%
Yellow Time (s)	3.5		3.5			
All-Red Time (s)	0.5		0.5			
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	Max		None			
v/c Ratio	0.38		0.67	0.25		
Control Delay	7.2		45.3	0.1		
Queue Delay	0.0		0.0	0.0		
Total Delay	7.2		45.3	0.1		
Queue Length 50th (ft)	118		151	0		
Queue Length 95th (ft)	143		239	0		
Internal Link Dist (ft)	492			1777	265	
Turn Bay Length (ft)			130			
Base Capacity (vph)	3376		405	4951		
Starvation Cap Reductn	0		0	0		
Spillback Cap Reductn	0		0	0		
Storage Cap Reductn	0		0	0		
Reduced v/c Ratio	0.38		0.62	0.25		

Intersection Summary	
Area Type:	Other
Cycle Length: 105	
Actuated Cycle Length: 103.3	
Natural Cycle: 40	
Control Type: Semi Act-Uncoord	

Splits and Phases: 3: Route 145 & Route 1A on-ramp



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1094	122	228	1107	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	11	11	9	11	12	12
Total Lost time (s)	4.0		4.0	4.0		
Lane Util. Factor	0.91		1.00	0.91		
Frt	0.98		1.00	1.00		
Flt Protected	1.00		0.95	1.00		
Satd. Flow (prot)	4890		1608	4951		
Flt Permitted	1.00		0.95	1.00		
Satd. Flow (perm)	4890		1608	4951		
Peak-hour factor, PHF	0.95	0.95	0.91	0.91	0.95	0.95
Adj. Flow (vph)	1152	128	251	1216	0	0
RTOR Reduction (vph)	12	0	0	0	0	0
Lane Group Flow (vph)	1268	0	251	1216	0	0
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Bus Blockages (#/hr)	0	0	0	2	0	0
Turn Type			Prot			
Protected Phases	2		1	1 2		
Permitted Phases						
Actuated Green, G (s)	71.1		24.3	103.4		
Effective Green, g (s)	71.1		24.3	103.4		
Actuated g/C Ratio	0.69		0.24	1.00		
Clearance Time (s)	4.0		4.0			
Vehicle Extension (s)	3.0		3.0			
Lane Grp Cap (vph)	3362		378	4951		
v/s Ratio Prot	c0.26		c0.16	0.25		
v/s Ratio Perm						
v/c Ratio	0.38		0.66	0.25		
Uniform Delay, d1	6.8		35.8	0.0		
Progression Factor	1.00		1.00	1.00		
Incremental Delay, d2	0.3		4.4	0.0		
Delay (s)	7.1		40.2	0.0		
Level of Service	A		D	A		
Approach Delay (s)	7.1			6.9	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM Average Control Delay	7.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	103.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	43.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations													
Volume (vph)	87	292	255	0	0	0	330	182	85	56	153	134	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	10	12	12	12	10	11	12	12	12	12	
Storage Length (ft)	0		50	0		0	0		0	0		0	
Storage Lanes	0		1	0		0	1		0	0		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		988			531			233			338		
Travel Time (s)		22.5			12.1			5.3			7.7		
Peak Hour Factor	0.93	0.93	0.93	0.92	0.92	0.92	0.96	0.96	0.96	0.94	0.94	0.94	
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	1%	1%	1%	
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	2	
Parking (#/hr)									0				
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	408	274	0	0	0	344	279	0	0	366	0	
Turn Type	Split		Prot				D.P+P			Perm			
Protected Phases	4	4	4				2	2 6			6		9
Permitted Phases							6			6			
Detector Phase	4	4	4				2	2 6		6	6		
Switch Phase													
Minimum Initial (s)	1.0	1.0	1.0				1.0			1.0	1.0		1.0
Minimum Split (s)	7.0	7.0	7.0				6.0			7.0	7.0		5.0
Total Split (s)	29.0	29.0	29.0	0.0	0.0	0.0	13.0	31.0	0.0	18.0	18.0	0.0	22.0
Total Split (%)	35.4%	35.4%	35.4%	0.0%	0.0%	0.0%	15.9%	37.8%	0.0%	22.0%	22.0%	0.0%	27%
Yellow Time (s)	4.0	4.0	4.0				4.0			5.0	5.0		3.5
All-Red Time (s)	2.0	2.0	2.0				1.0			1.0	1.0		0.5
Lost Time Adjust (s)	-2.0	-2.0	-2.0	0.0	0.0	0.0	-1.0	-1.0	0.0	-2.0	-2.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lag	Lag	Lag				Lead			Lag	Lag		Lead
Lead-Lag Optimize?	Yes	Yes	Yes				Yes			Yes	Yes		Yes
Recall Mode	None	None	None				None			Max	Max		None
v/c Ratio		0.70	0.50				0.86	0.38			0.51		
Control Delay		27.1	13.4				42.0	15.0			17.3		
Queue Delay		0.0	0.0				0.0	0.0			0.0		
Total Delay		27.1	13.4				42.0	15.0			17.3		
Queue Length 50th (ft)		109	33				75	50			33		
Queue Length 95th (ft)		#362	145				#328	188			107		
Internal Link Dist (ft)		908			451			153			258		
Turn Bay Length (ft)			50										
Base Capacity (vph)		707	636				399	728			716		
Starvation Cap Reductn		0	0				0	0			0		
Spillback Cap Reductn		0	0				0	0			0		
Storage Cap Reductn		0	0				0	0			0		
Reduced v/c Ratio		0.58	0.43				0.86	0.38			0.51		

Intersection Summary

Area Type: CBD
Cycle Length: 82
Actuated Cycle Length: 61.3
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Winthrop Avenue & State Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	87	292	255	0	0	0	330	182	85	56	153	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	10	12	12	12	10	11	12	12	12	12
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	
Lane Util. Factor		1.00	1.00				1.00	1.00			0.95	
Frt		1.00	0.85				1.00	0.95			0.94	
Flt Protected		0.99	1.00				0.95	1.00			0.99	
Satd. Flow (prot)		1674	1332				1501	1558			3004	
Flt Permitted		0.99	1.00				0.46	1.00			0.85	
Satd. Flow (perm)		1674	1332				720	1558			2567	
Peak-hour factor, PHF	0.93	0.93	0.93	0.92	0.92	0.92	0.96	0.96	0.96	0.94	0.94	0.94
Adj. Flow (vph)	94	314	274	0	0	0	344	190	89	60	163	143
RTOR Reduction (vph)	0	0	85	0	0	0	0	18	0	0	111	0
Lane Group Flow (vph)	0	408	189	0	0	0	344	261	0	0	255	0
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	2
Parking (#/hr)									0			
Turn Type	Split		Prot				D.P+P			Perm		
Protected Phases	4	4	4				2	2 6			6	
Permitted Phases							6			6		
Actuated Green, G (s)		19.3	19.3				20.7	25.7			12.4	
Effective Green, g (s)		21.3	21.3				22.7	26.7			14.4	
Actuated g/C Ratio		0.33	0.33				0.35	0.42			0.22	
Clearance Time (s)		6.0	6.0				5.0				6.0	
Vehicle Extension (s)		3.0	3.0				3.0				3.0	
Lane Grp Cap (vph)		556	443				368	649			577	
v/s Ratio Prot		c0.24	0.14				c0.14	0.17				
v/s Ratio Perm							c0.20				0.10	
v/c Ratio		0.73	0.43				0.93	0.40			0.44	
Uniform Delay, d1		18.9	16.7				18.2	13.1			21.4	
Progression Factor		1.00	1.00				1.00	1.00			1.00	
Incremental Delay, d2		5.0	0.7				30.5	0.4			2.4	
Delay (s)		23.9	17.3				48.7	13.5			23.8	
Level of Service		C	B				D	B			C	
Approach Delay (s)		21.2			0.0			33.0			23.8	
Approach LOS		C			A			C			C	

Intersection Summary

HCM Average Control Delay	26.2	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.82				
Actuated Cycle Length (s)	64.1	Sum of lost time (s)		19.1	
Intersection Capacity Utilization	64.0%	ICU Level of Service		C	
Analysis Period (min)	15				

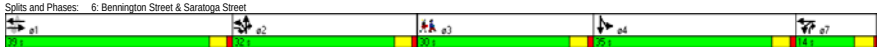
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø3
Lane Configurations													
Volume (vph)	316	291	165	39	323	3	136	263	75	37	195	364	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	10	12	12	10	12	12	10	16	12	12	12	
Storage Length (ft)	0		0	0		0	250		305	0		150	
Storage Lanes	0		1	0		0	1		1	0		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			No			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		3390			1736			677			1166		
Travel Time (s)		77.0			39.5			15.4			26.5		
Peak Hour Factor	0.95	0.95	0.95	0.86	0.86	0.86	0.93	0.93	0.93	0.90	0.90	0.90	
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	2%	2%	2%	1%	1%	1%	
Parking (#/hr)			1			1				1			
Shared Lane Traffic (%)							10%						
Lane Group Flow (vph)	0	639	174	0	424	0	131	298	81	0	662	0	
Turn Type	Perm		pm+ov	D.P+P			Split		pt+ov	Split			
Protected Phases		1	2	7	1 7		2	2	2 7	4	4		3
Permitted Phases	1		1	1									
Detector Phase	1	1	2	7	1 7		2	2	2 7	4	4		
Switch Phase													
Minimum Initial (s)	4.0	4.0	4.0	4.0			4.0	4.0		4.0	4.0		4.0
Minimum Split (s)	13.0	13.0	20.0	8.0			20.0	20.0		20.0	20.0		30.0
Total Split (s)	39.0	39.0	32.0	14.0	53.0	0.0	32.0	32.0	46.0	35.0	35.0	0.0	30.0
Total Split (%)	26.0%	26.0%	21.3%	9.3%	35.3%	0.0%	21.3%	21.3%	30.7%	23.3%	23.3%	0.0%	20%
Yellow Time (s)	3.0	3.0	3.0	3.5			3.0	3.0		3.0	3.0		3.0
All-Red Time (s)	1.0	1.0	1.0	0.5			1.0	1.0		1.0	1.0		1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lead	Lag				Lag	Lag		Lag	Lag		Lead
Lead-Lag Optimize?	Yes	Yes	Yes				Yes	Yes		Yes	Yes		Yes
Recall Mode	None	None	None	None			None	None		Max	Max		None
v/c Ratio		3.18	0.26		0.61		0.40	0.94	0.15		1.64		
Control Delay		1012.6	22.2		38.6		52.1	88.2	5.2		328.6		
Queue Delay		0.0	0.0		0.0		0.0	0.0	0.0		0.0		
Total Delay		1012.6	22.2		38.6		52.1	88.2	5.2		328.6		
Queue Length 50th (ft)		~854	66		117		90	234	0		~693		
Queue Length 95th (ft)		#1217	167		212		196	#544	26		#1196		
Internal Link Dist (ft)		3310			1656			597			1086		
Turn Bay Length (ft)							250		305				
Base Capacity (vph)		201	668		694		325	318	528		404		
Starvation Cap Reductn		0	0		0		0	0	0		0		
Spillback Cap Reductn		0	0		0		0	0	0		0		
Storage Cap Reductn		0	0		0		0	0	0		0		
Reduced v/c Ratio		3.18	0.26		0.61		0.40	0.94	0.15		1.64		

Intersection Summary	
Area Type:	CBD
Cycle Length: 150	
Actuated Cycle Length: 132	
Natural Cycle: 145	
Control Type: Actuated-Uncoordinated	

– Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Bennington Street & Saratoga Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	316	291	165	39	323	3	136	263	75	37	195	364
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	10	12	12	10	16	12	12	12
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00		0.95		0.95	0.95	1.00		1.00	
Frt		1.00	0.85		1.00		1.00	1.00	0.85		0.92	
Flt Protected		0.97	1.00		0.99		0.95	1.00	1.00		1.00	
Satd. Flow (prot)		1555	1301		2983		1513	1483	1615		1549	
Flt Permitted		0.47	1.00		0.58		0.95	1.00	1.00		1.00	
Satd. Flow (perm)		749	1301		1731		1513	1483	1615		1549	
Peak-hour factor, PHF	0.95	0.95	0.95	0.86	0.86	0.86	0.93	0.93	0.93	0.90	0.90	0.90
Adj. Flow (vph)	333	306	174	45	376	3	146	283	81	41	217	404
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	58	0	36	0
Lane Group Flow (vph)	0	639	174	0	424	0	131	298	23	0	626	0
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	2%	2%	2%	1%	1%	1%
Parking (#/hr)						1			1			
Turn Type	Perm		pm+ov	D.P+P			Split		pt+ov	Split		
Protected Phases		1	2	7	1 7		2	2	2 7	4	4	
Permitted Phases	1		1	1								
Actuated Green, G (s)		35.4	63.7		45.5		28.3	28.3	38.4		31.4	
Effective Green, g (s)		35.4	63.7		45.5		28.3	28.3	38.4		31.4	
Actuated g/C Ratio		0.26	0.47		0.34		0.21	0.21	0.29		0.23	
Clearance Time (s)		4.0	4.0				4.0	4.0			4.0	
Vehicle Extension (s)		3.0	3.0				3.0	3.0			3.0	
Lane Grp Cap (vph)		197	655		680		319	312	461		362	
v/s Ratio Prot			0.06		c0.05		0.09	c0.20	0.01		c0.40	
v/s Ratio Perm		c0.85	0.08		0.16							
v/c Ratio		3.24	0.27		0.62		0.41	0.96	0.05		1.73	
Uniform Delay, d1		49.5	21.3		37.3		45.8	52.4	34.8		51.5	
Progression Factor		1.00	1.00		1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2		1022.7	0.2		1.8		0.9	38.7	0.0		339.5	
Delay (s)		1072.2	21.5		39.1		46.7	91.1	34.8		391.0	
Level of Service		F	C		D		D	F	C		F	
Approach Delay (s)		847.3			39.1			70.8			391.0	
Approach LOS		F			D			E			F	

Intersection Summary			
HCM Average Control Delay	415.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.92		
Actuated Cycle Length (s)	134.4	Sum of lost time (s)	29.2
Intersection Capacity Utilization	114.9%	ICU Level of Service	H
Analysis Period (min)	15		

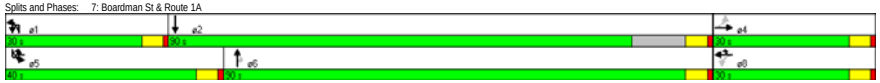
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Volume (vph)	36	10	35	242	12	308	19	12	1751	323	38	130	1716	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	12	12	10	10	12	11	11	11	12	11	11	12
Storage Length (ft)	130		0	0		250		400		500		380		0
Storage Lanes	1		0	0		1		1		1		1		0
Taper Length (ft)	25		25	25		25		25		25		25		25
Right Turn on Red			Yes			No				Yes				Yes
Link Speed (mph)		30			30				30				30	
Link Distance (ft)		537			1355				733				976	
Travel Time (s)		12.2			30.8				16.7				22.2	
Confl. Peds. (#/hr)														2
Peak Hour Factor	0.66	0.66	0.66	0.81	0.81	0.81	0.92	0.91	0.91	0.91	0.92	0.91	0.91	0.91
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	2%	1%	1%	1%	3%	3%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	8	0
Shared Lane Traffic (%)														
Lane Group Flow (vph)	55	68	0	0	314	380	0	34	1924	355	0	184	1916	0
Turn Type	Perm			Perm		pt+ov	Prot	Prot		Perm	Prot	Prot		
Protected Phases		4			8	8 5!	1	1	6		5!	5	2	
Permitted Phases	4			8						6				
Detector Phase	4	4		8	8	8 5	1	1	6	6	5	5	2	
Switch Phase														
Minimum Initial (s)	10.0	10.0		10.0	10.0		8.0	8.0	20.0	20.0	8.0	8.0	20.0	
Minimum Split (s)	29.0	29.0		32.0	32.0		13.0	13.0	31.0	31.0	13.0	13.0	29.0	
Total Split (s)	30.0	30.0	0.0	30.0	30.0	70.0	30.0	30.0	90.0	90.0	40.0	40.0	90.0	0.0
Total Split (%)	18.8%	18.8%	0.0%	18.8%	18.8%	43.8%	18.8%	18.8%	56.3%	56.3%	25.0%	25.0%	56.3%	0.0%
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	-1.0	-1.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	5.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0
Lead/Lag							Lead	Lead	Lag	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None		None	None		None	None	None	None	None	None	None	
v/c Ratio	1.17	0.22			1.53	0.74		0.30	0.94	0.34		0.73	0.83	
Control Delay	240.6	20.9			301.6	51.3		73.9	38.8	2.4		76.2	21.3	
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0	0.0		0.0	0.0	
Total Delay	240.6	20.9			301.6	51.3		73.9	38.8	2.4		76.2	21.3	
Queue Length 50th (ft)	~62	12			~414	316		31	841	0		169	677	
Queue Length 95th (ft)	#113	31			#579	378		73	#1222	48		254	836	
Internal Link Dist (ft)		457			1275				653				896	
Turn Bay Length (ft)	130					250		400		500		380		
Base Capacity (vph)	47	309			205	660		307	2041	1058		419	2307	
Starvation Cap Reductn	0	0			0	0		0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0		0	0	0		0	0	
Storage Cap Reductn	0	0			0	0		0	0	0		0	0	
Reduced v/c Ratio	1.17	0.22			1.53	0.58		0.11	0.94	0.34		0.44	0.83	

Intersection Summary

Area Type: Other
Cycle Length: 160
Actuated Cycle Length: 145.9
Natural Cycle: 120
Control Type: Semi Act-Uncoord
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
! Phase conflict between lane groups.

Splits and Phases: 7: Boardman St & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Volume (vph)	36	10	35	242	12	308	19	12	1751	323	38	130	1716	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	12	12	10	10	12	11	11	11	12	11	11	12
Total Lost time (s)	5.0	5.0			5.0	5.0		4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00	1.00		1.00	0.95	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.88			1.00	0.85		1.00	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00			0.95	1.00		0.95	1.00	1.00		0.95	1.00	
Satd. Flow (prot)	1604	1545			1660	1478		1717	3455	1546		1694	3325	
Flt Permitted	0.16	1.00			0.69	1.00		0.95	1.00	1.00		0.95	1.00	
Satd. Flow (perm)	270	1545			1194	1478		1717	3455	1546		1694	3325	
Peak-hour factor, PHF	0.66	0.66	0.66	0.81	0.81	0.81	0.92	0.91	0.91	0.91	0.92	0.91	0.91	0.91
Adj. Flow (vph)	55	15	53	299	15	380	21	13	1924	355	41	143	1886	30
RTOR Reduction (vph)	0	44	0	0	0	0	0	0	0	144	0	0	1	0
Lane Group Flow (vph)	55	24	0	0	314	380	0	34	1924	211	0	184	1915	0
Confl. Peds. (#/hr)														2
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	2%	1%	1%	1%	3%	3%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	8	0
Turn Type	Perm			Perm		pt+ov	Prot	Prot		Perm	Prot	Prot		
Protected Phases		4			8	8 5!	1	1	6		5!	5	2	
Permitted Phases	4			8						6				
Actuated Green, G (s)	25.0	25.0			25.0	50.6		6.9	86.2	86.2		20.6	99.9	
Effective Green, g (s)	25.0	25.0			25.0	50.6		7.9	87.2	87.2		21.6	100.9	
Actuated g/C Ratio	0.17	0.17			0.17	0.34		0.05	0.59	0.59		0.15	0.69	
Clearance Time (s)	5.0	5.0			5.0			5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	2.5	2.5			2.5			2.0	5.0	5.0		2.0	5.0	
Lane Grp Cap (vph)	46	263			203	509		92	2052	918		249	2285	
v/s Ratio Prot		0.02				c0.26		0.02	c0.56			0.11	c0.58	
v/s Ratio Perm	0.20				c0.26					0.14				
v/c Ratio	1.20	0.09			1.55	0.75		0.37	0.94	0.23		0.74	0.84	
Uniform Delay, d1	60.9	51.3			60.9	42.4		67.0	27.3	14.0		59.9	16.9	
Progression Factor	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	195.7	0.1			269.0	5.6		0.9	9.2	0.3		9.5	3.2	
Delay (s)	256.6	51.4			329.9	48.0		68.0	36.5	14.3		69.4	20.1	
Level of Service	F	D			F	D		E	D	B		E	C	
Approach Delay (s)		143.2			175.6				33.6				24.4	
Approach LOS		F			F				C				C	

Intersection Summary

HCM Average Control Delay	51.3	HCM Level of Service	D
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	146.8	Sum of lost time (s)	13.0
Intersection Capacity Utilization	100.1%	ICU Level of Service	G
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBT	NBR	SBT	SBR	SEL2	SEL	SER	SER2
Lane Configurations															
Volume (vph)	7	200	8	720	279	33	75	611	927	487	33	20	89	7	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	10	16	12	12	12	12	12	14	16	12	12	12	12	12
Storage Length (ft)	50		0	0		0			0		0		0	0	
Storage Lanes	1		1	2		0			1		0		1	0	
Taper Length (ft)	25		25	25		25			25		25		25	25	
Right Turn on Red			Yes				No		Yes						Yes
Link Speed (mph)		30			30			30		30			30		
Link Distance (ft)		485			572			480		673			302		
Travel Time (s)		11.0			13.0			10.9		15.3			6.9		
Peak Hour Factor	0.75	0.75	0.75	0.92	0.92	0.92	0.92	0.97	0.97	0.81	0.81	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	0%	1%	1%	1%	1%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	276	11	783	421	0	0	630	956	642	0	0	142	0	0
Turn Type	Split		Prot	Split					custom			Split			
Protected Phases	4	4	4	8	8			2	2	6		12	12		
Permitted Phases									4 8 12						
Detector Phase	4	4	4	8	8			2	2	6		12	12		
Switch Phase															
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0	4.0		4.0	4.0		
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0			21.0	21.0	21.0		21.0	21.0		
Total Split (s)	35.0	35.0	35.0	80.0	80.0	0.0	0.0	70.0	70.0	70.0	0.0	30.0	30.0	0.0	0.0
Total Split (%)	16.3%	16.3%	16.3%	37.2%	37.2%	0.0%	0.0%	32.6%	32.6%	32.6%	0.0%	14.0%	14.0%	0.0%	0.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0	4.0		4.0	4.0		
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0			1.0	1.0	1.0		1.0	1.0		
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	0.0	0.0	-1.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag															
Lead-Lag Optimize?															
Recall Mode	None	None	None	None	None			Max	Max	Max		None	None		
v/c Ratio		0.68	0.05	0.78	0.80			0.46	0.56	0.42			0.70		
Control Delay		84.4	32.1	62.8	70.3			44.7	1.3	43.4			94.7		
Queue Delay		0.0	0.0	0.3	0.6			0.0	0.0	0.0			0.0		
Total Delay		84.4	32.1	63.1	70.9			44.7	1.3	43.4			94.7		
Queue Length 50th (ft)		161	0	423	447			283	0	283			157		
Queue Length 95th (ft)		202	18	548	637			446	0	390			262		
Internal Link Dist (ft)		405			492			400		593			222		
Turn Bay Length (ft)															
Base Capacity (vph)		601	333	1549	805			1373	1706	1540			272		
Starvation Cap Reductn		0	0	243	135			0	0	0			0		
Spillback Cap Reductn		0	0	0	0			0	0	0			0		
Storage Cap Reductn		0	0	0	0			0	0	0			0		
Reduced v/c Ratio		0.46	0.03	0.60	0.63			0.46	0.56	0.42			0.52		

Intersection Summary

Area Type: Other
Cycle Length: 215
Actuated Cycle Length: 174.5
Natural Cycle: 85
Control Type: Semi Act-Uncoord

Splits and Phases: 8: Winthrop Avenue & Route 16



Movement	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBT	NBR	SBT	SBR	SEL2	SEL	SER	SER2
Lane Configurations															
Volume (vph)	7	200	8	720	279	33	75	611	927	487	33	20	89	7	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	16	12	12	12	12	12	14	16	12	12	12	12	12
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0	4.0	4.0			4.0		
Lane Util. Factor		0.95	1.00	0.97	1.00			0.95	1.00	0.95			1.00		
Frt		1.00	0.85	1.00	0.96			1.00	0.85	0.99			0.98		
Flt Protected		1.00	1.00	0.95	1.00			1.00	1.00	1.00			0.96		
Satd. Flow (prot)		3331	1798	3502	1820			3574	1706	4012			1792		
Flt Permitted		1.00	1.00	0.95	1.00			1.00	1.00	1.00			0.96		
Satd. Flow (perm)		3331	1798	3502	1820			3574	1706	4012			1792		
Peak-hour factor, PHF	0.75	0.75	0.75	0.92	0.92	0.92	0.92	0.97	0.97	0.81	0.81	0.86	0.86	0.86	0.86
Adj. Flow (vph)	9	267	11	783	303	36	82	630	956	601	41	23	103	8	8
RTOR Reduction (vph)	0	0	10	0	0	0	0	0	0	0	0	0	1	0	0
Lane Group Flow (vph)	0	276	1	783	421	0	0	630	956	642	0	0	141	0	0
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	0%	1%	1%	1%	1%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Turn Type	Split		Prot	Split					custom			Split			
Protected Phases	4	4	4	8	8			2	2	6		12	12		
Permitted Phases									4 8 12						
Actuated Green, G (s)		20.2	20.2	49.2	49.2			66.0	164.2	66.0			18.8		
Effective Green, g (s)		21.2	21.2	50.2	50.2			67.0	166.2	67.0			19.8		
Actuated g/C Ratio		0.12	0.12	0.29	0.29			0.38	0.95	0.38			0.11		
Clearance Time (s)		5.0	5.0	5.0	5.0			5.0	5.0	5.0			5.0		
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0	3.0	3.0			3.0		
Lane Grp Cap (vph)		405	219	1009	524			1375	1706	1543			204		
v/s Ratio Prot		c0.08	0.00	0.22	c0.23			0.18	c0.22	0.16			c0.08		
v/s Ratio Perm									0.34						
v/c Ratio		0.68	0.01	0.78	0.80			0.46	0.56	0.42			0.69		
Uniform Delay, d1		73.3	67.2	56.8	57.4			40.0	0.4	39.3			74.3		
Progression Factor		1.00	1.00	1.00	1.00			1.00	1.00	1.00			1.00		
Incremental Delay, d2		4.7	0.0	3.8	8.7			1.1	0.4	0.8			9.7		
Delay (s)		77.9	67.3	60.6	66.1			41.1	0.8	40.1			84.0		
Level of Service		E	E	E	E			D	A	D			F		
Approach Delay (s)		77.5			62.6			16.8		40.1			84.0		
Approach LOS		E			E			B		D			F		

Intersection Summary

HCM Average Control Delay	41.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	174.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	69.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations											
Volume (vph)	204	32	67	0	159	696	282	172	217	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	16	12	12	12	12	12	12	12	12
Storage Length (ft)		0	0	0		0	115		200	0	0
Storage Lanes		1	1	0		2	1		1	0	0
Taper Length (ft)		25	25	25		25	25		25	25	25
Right Turn on Red			Yes			Yes			Yes		
Link Speed (mph)		30			30			30		30	
Link Distance (ft)		335			262			919		278	
Travel Time (s)		7.6			6.0			20.9		6.3	
Peak Hour Factor	0.97	0.97	0.97	0.96	0.96	0.96	0.90	0.90	0.90	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	0%	0%
Shared Lane Traffic (%)	50%										
Lane Group Flow (vph)	105	138	69	0	166	725	313	191	241	0	0
Turn Type	Split		Prot			Free	Prot		Prot		
Protected Phases	8	8	8		6		1	1 6	1 6		
Permitted Phases						Free					
Detector Phase	8	8	8		6		1	1 6	1 6		
Switch Phase											
Minimum Initial (s)	4.0	4.0	4.0		4.0		4.0				
Minimum Split (s)	20.0	20.0	20.0		20.0		8.0				
Total Split (s)	20.0	20.0	20.0	0.0	45.0	0.0	20.0	65.0	65.0	0.0	0.0
Total Split (%)	23.5%	23.5%	23.5%	0.0%	52.9%	0.0%	23.5%	76.5%	76.5%	0.0%	0.0%
Yellow Time (s)	3.0	3.0	3.0		3.0		3.0				
All-Red Time (s)	1.0	1.0	1.0		1.0		1.0				
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lag	Lag		Lead						
Lead-Lag Optimize?	Yes	Yes	Yes		Yes						
Recall Mode	None	None	None		Max		None				
v/c Ratio	0.49	0.32	0.23		0.09	0.45	0.87	0.07	0.19		
Control Delay	39.9	33.0	10.3		10.5	0.9	58.0	2.6	0.8		
Queue Delay	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		
Total Delay	39.9	33.0	10.3		10.5	0.9	58.0	2.6	0.8		
Queue Length 50th (ft)	53	34	0		20	0	151	8	0		
Queue Length 95th (ft)	105	62	34		40	0	#314	20	16		
Internal Link Dist (ft)		255			182			839		198	
Turn Bay Length (ft)							115		200		
Base Capacity (vph)	332	664	425		1869	1615	361	2715	1273		
Starvation Cap Reductn	0	0	0		0	0	0	0	0		
Spillback Cap Reductn	0	0	0		0	0	0	0	0		
Storage Cap Reductn	0	0	0		0	0	0	0	0		
Reduced v/c Ratio	0.32	0.21	0.16		0.09	0.45	0.87	0.07	0.19		

Intersection Summary

Area Type: Other
Cycle Length: 85
Actuated Cycle Length: 79.3
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 10: State Road & Ocean Avenue



Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations											
Volume (vph)	204	32	67	0	159	696	282	172	217	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	16	12	12	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0		
Lane Util. Factor	0.91	0.91	1.00		0.95	1.00	1.00	0.95	1.00		
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85		
Flt Protected	0.95	0.95	1.00		1.00	1.00	0.95	1.00	1.00		
Satd. Flow (prot)	1643	3285	1830		3610	1615	1787	3574	1599		
Flt Permitted	0.95	0.95	1.00		1.00	1.00	0.95	1.00	1.00		
Satd. Flow (perm)	1643	3285	1830		3610	1615	1787	3574	1599		
Peak-hour factor, PHF	0.97	0.97	0.97	0.96	0.96	0.96	0.90	0.90	0.90	0.92	0.92
Adj. Flow (vph)	210	33	69	0	166	725	313	191	241	0	0
RTOR Reduction (vph)	0	0	60	0	0	0	0	0	56	0	0
Lane Group Flow (vph)	105	138	9	0	166	725	313	191	185	0	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	0%	0%
Turn Type	Split		Prot			Free	Prot		Prot		
Protected Phases	8	8	8		6		1	1 6	1 6		
Permitted Phases						Free					
Actuated Green, G (s)	10.3	10.3	10.3		41.1	79.3	15.9	61.0	61.0		
Effective Green, g (s)	10.3	10.3	10.3		41.1	79.3	15.9	61.0	61.0		
Actuated g/C Ratio	0.13	0.13	0.13		0.52	1.00	0.20	0.77	0.77		
Clearance Time (s)	4.0	4.0	4.0		4.0		4.0				
Vehicle Extension (s)	3.0	3.0	3.0		3.0		3.0				
Lane Grp Cap (vph)	213	427	238		1871	1615	358	2749	1230		
v/s Ratio Prot	0.06	0.04	0.00		0.05		c0.18	0.05	0.12		
v/s Ratio Perm						c0.45					
v/c Ratio	0.49	0.32	0.04		0.09	0.45	0.87	0.07	0.15		
Uniform Delay, d1	32.1	31.3	30.2		9.6	0.0	30.7	2.2	2.4		
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00		
Incremental Delay, d2	1.8	0.4	0.1		0.1	0.9	20.4	0.0	0.1		
Delay (s)	33.9	31.8	30.2		9.7	0.9	51.1	2.2	2.4		
Level of Service	C	C	C		A	A	D	A	A		
Approach Delay (s)		32.1			2.6			22.8		0.0	
Approach LOS		C			A			C		A	

Intersection Summary

HCM Average Control Delay	15.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	79.3	Sum of lost time (s)	4.0
Intersection Capacity Utilization	35.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	52	8	7	0	0	0	0	1998	2	0	1870	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	16	12	12	12	11	11	11	11	11	11
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		149			363			405			217	
Travel Time (s)		3.4			8.3			9.2			4.9	
Peak Hour Factor	0.84	0.84	0.84	0.92	0.92	0.92	0.96	0.96	0.96	0.95	0.95	0.95
Heavy Vehicles (%)	14%	14%	14%	0%	0%	0%	2%	2%	2%	3%	3%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	80	0	0	0	0	0	2083	0	0	1968	0
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Detector Phase	4	4						2			6	
Switch Phase												
Minimum Initial (s)	4.0	4.0						4.0			4.0	
Minimum Split (s)	14.0	14.0						27.0			27.0	
Total Split (s)	36.0	36.0	0.0	0.0	0.0	0.0	0.0	55.0	0.0	0.0	55.0	0.0
Total Split (%)	39.6%	39.6%	0.0%	0.0%	0.0%	0.0%	0.0%	60.4%	0.0%	0.0%	60.4%	0.0%
Yellow Time (s)	4.0	4.0						5.0			5.0	
All-Red Time (s)	2.0	2.0						2.0			2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	4.0	4.0	4.0	4.0	4.0	7.0	4.0	4.0	7.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None						Max			Max	
v/c Ratio		0.37						0.81			0.78	
Control Delay		31.2						12.0			10.6	
Queue Delay		0.0						0.0			0.0	
Total Delay		31.2						12.0			10.6	
Queue Length 50th (ft)		30						297			260	
Queue Length 95th (ft)		62						#604			436	
Internal Link Dist (ft)		69			283			325			137	
Turn Bay Length (ft)												
Base Capacity (vph)		773						2563			2538	
Starvation Cap Reductn		0						0			0	
Spillback Cap Reductn		0						0			0	
Storage Cap Reductn		0						0			0	
Reduced v/c Ratio		0.10						0.81			0.78	

Intersection Summary	
Area Type:	Other
Cycle Length: 91	
Actuated Cycle Length: 70	
Natural Cycle: 60	
Control Type: Semi Act-Uncoord	

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 12: Jughandle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	52	8	7	0	0	0	0	1998	2	0	1870	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	16	16	16	12	12	12	11	11	11	11	11	11
Total Lost time (s)		6.0						7.0			7.0	
Lane Util. Factor		1.00						0.95			0.95	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1794						3421			3388	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1794						3421			3388	
Peak-hour factor, PHF	0.84	0.84	0.84	0.92	0.92	0.92	0.96	0.96	0.96	0.95	0.95	0.95
Adj. Flow (vph)	62	10	8	0	0	0	0	2081	2	0	1968	0
RTOR Reduction (vph)	0	5	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	75	0	0	0	0	0	2083	0	0	1968	0
Heavy Vehicles (%)	14%	14%	14%	0%	0%	0%	2%	2%	2%	3%	3%	3%
Turn Type	Perm											
Protected Phases		4						2			6	
Permitted Phases	4											
Actuated Green, G (s)		7.1						51.0			51.0	
Effective Green, g (s)		7.1						51.0			51.0	
Actuated g/C Ratio		0.10						0.72			0.72	
Clearance Time (s)		6.0						7.0			7.0	
Vehicle Extension (s)		3.0						3.0			3.0	
Lane Grp Cap (vph)		179						2454			2430	
v/s Ratio Prot								c0.61			0.58	
v/s Ratio Perm		0.04										
v/c Ratio		0.42						0.85			0.81	
Uniform Delay, d1		30.1						7.3			6.8	
Progression Factor		1.00						1.00			1.00	
Incremental Delay, d2		1.6						3.9			3.0	
Delay (s)		31.6						11.2			9.8	
Level of Service		C						B			A	
Approach Delay (s)		31.6			0.0			11.2			9.8	
Approach LOS		C			A			B			A	

Intersection Summary					
HCM Average Control Delay	10.9	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.80				
Actuated Cycle Length (s)	71.1	Sum of lost time (s)		13.0	
Intersection Capacity Utilization	69.9%	ICU Level of Service		C	
Analysis Period (min)	15				
c Critical Lane Group					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Volume (vph)	40	268	74	89	177	70	15	119	1081	87	28	424	1190	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	50		0		150		0		800		0
Storage Lanes	1		0	1		0		1		0		1		0
Taper Length (ft)	25		25	25		25		25		25		25		25
Right Turn on Red			Yes			Yes				Yes				Yes
Link Speed (mph)		30			30				30				30	
Link Distance (ft)		1202			2003				910				1421	
Travel Time (s)		27.3			45.5				20.7				32.3	
Confl. Peds. (#/hr)	8		18	18		8				1				4
Confl. Bikes (#/hr)														1
Peak Hour Factor	0.91	0.91	0.91	0.85	0.85	0.85	0.95	0.95	0.95	0.95	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	3%	3%	3%	3%	2%	2%	2%	2%
Shared Lane Traffic (%)														
Lane Group Flow (vph)	44	376	0	105	290	0	0	141	1230	0	0	481	1301	0
Turn Type	Perm			Perm				Prot				Prot		
Protected Phases		4			8			1	6			5	2	
Permitted Phases	4			8										
Detector Phase	4	4		8	8			1	6			5	2	
Switch Phase														
Minimum Initial (s)	4.0	4.0		4.0	4.0			4.0	4.0			4.0	4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0			31.0	11.0			11.0	11.0	
Total Split (s)	36.0	36.0	0.0	36.0	36.0	0.0	0.0	36.0	56.0	0.0	0.0	36.0	56.0	0.0
Total Split (%)	28.1%	28.1%	0.0%	28.1%	28.1%	0.0%	0.0%	28.1%	43.8%	0.0%	0.0%	28.1%	43.8%	0.0%
Yellow Time (s)	4.0	4.0		4.0	4.0			4.0	4.0			4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0			2.0	2.0			2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	4.0	6.0	6.0	4.0	4.0	6.0	6.0	4.0	4.0	6.0	6.0	4.0
Lead/Lag								Lead	Lag			Lead	Lag	
Lead-Lag Optimize?								Yes	Yes			Yes	Yes	
Recall Mode	None	None		None	None			None	Max			None	Max	
v/c Ratio	0.30	0.88		1.35	0.69			no cap	0.91			no cap	0.94	
Control Delay	47.3	68.6		258.3	52.0				47.3				52.1	
Queue Delay	0.0	0.0		0.0	0.0				0.0				0.0	
Total Delay	47.3	68.6		258.3	52.0			Error	47.3			Error	52.1	
Queue Length 50th (ft)	30	295		~114	211			~243	498			~829	541	
Queue Length 95th (ft)	69	#473		#217	291			#381	#636			#1042	#694	
Internal Link Dist (ft)		1122			1923				830				1341	
Turn Bay Length (ft)	50			50				150				800		
Base Capacity (vph)	145	427		78	422			1	1357			1	1377	
Starvation Cap Reductn	0	0		0	0			0	0			0	0	
Spillback Cap Reductn	0	0		0	0			0	0			0	0	
Storage Cap Reductn	0	0		0	0			0	0			0	0	
Reduced v/c Ratio	0.30	0.88		1.35	0.69			141.00	0.91			481.00	0.94	

Intersection Summary

Area Type: Other
Cycle Length: 128
Actuated Cycle Length: 128
Natural Cycle: 110
Control Type: Semi Act-Uncoord
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 15: Revere St & Route 60



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Volume (vph)	40	268	74	89	177	70	15	119	1081	87	28	424	1190	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	0.95			1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00	1.00			1.00	1.00	
Flpb, ped/bikes	0.99	1.00		0.99	1.00			1.00	1.00			1.00	1.00	
Frt	1.00	0.97		1.00	0.96			1.00	0.99			1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00			0.95	1.00	
Satd. Flow (prot)	1760	1789		1736	1755			1752	3460			1770	3522	
Flt Permitted	0.33	1.00		0.18	1.00			0.13	1.00			0.13	1.00	
Satd. Flow (perm)	618	1789		332	1755			246	3460			248	3522	
Peak-hour factor, PHF	0.91	0.91	0.91	0.85	0.85	0.85	0.95	0.95	0.95	0.95	0.94	0.94	0.94	0.94
Adj. Flow (vph)	44	295	81	105	208	82	16	125	1138	92	30	451	1266	35
RTOR Reduction (vph)	0	8	0	0	11	0	0	0	5	0	0	0	1	0
Lane Group Flow (vph)	44	368	0	105	279	0	0	141	1225	0	0	481	1300	0
Confl. Peds. (#/hr)	8		18	18		8				1				4
Confl. Bikes (#/hr)														1
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	3%	3%	3%	3%	2%	2%	2%	2%
Turn Type	Perm			Perm				Prot				Prot		
Protected Phases		4			8			1	6			5	2	
Permitted Phases	4			8										
Actuated Green, G (s)	30.0	30.0		30.0	30.0			30.0	50.0			30.0	50.0	
Effective Green, g (s)	30.0	30.0		30.0	30.0			30.0	50.0			30.0	50.0	
Actuated g/C Ratio	0.23	0.23		0.23	0.23			0.23	0.39			0.23	0.39	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			3.0	3.0	
Lane Grp Cap (vph)	145	419		78	411			58	1352			58	1376	
v/s Ratio Prot		0.21			0.16				0.35				c0.37	
v/s Ratio Perm	0.07			c0.32				0.57				c1.94		
v/c Ratio	0.30	0.88		1.35	0.68			2.43	0.91			8.29	0.94	
Uniform Delay, d1	40.4	47.3		49.0	44.6			49.0	36.8			49.0	37.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00			1.00	1.00	
Incremental Delay, d2	1.2	18.5		219.5	4.4			693.0	10.3			3316.8	14.2	
Delay (s)	41.6	65.7		268.5	49.1			742.0	47.1			3365.8	51.9	
Level of Service	D	E		F	D			F	D			F	D	
Approach Delay (s)		63.2			107.4				118.6				946.4	
Approach LOS		E			F				F				F	

Intersection Summary

HCM Average Control Delay	483.4	HCM Level of Service	F
HCM Volume to Capacity ratio	3.05		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	101.6%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø3
Lane Configurations													
Volume (vph)	0	1143	115	378	1408	6	213	251	142	179	176	110	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	10	10	10	11	11	12	12	12	12	
Storage Length (ft)	0		0	200		0	300		50	0		80	
Storage Lanes	0		0	1		0	1		1	1		1	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			No			No	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		2232			2756			1675			1148		
Travel Time (s)		50.7			62.6			38.1			26.1		
Confl. Peds. (#/hr)	5					5	3		18	18		3	
Peak Hour Factor	0.95	0.95	0.95	0.97	0.97	0.97	0.89	0.89	0.89	0.93	0.93	0.93	
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	1324	0	390	1458	0	239	282	160	192	189	118	
Turn Type				Prot			D.P+P		Perm	Perm		Perm	
Protected Phases		2		1	1 2		4	4 9			9		3
Permitted Phases							9		4 9	9		9	
Detector Phase		2		1	1 2		4	4 9	4 9	9	9	9	
Switch Phase													
Minimum Initial (s)		4.0		4.0			4.0			4.0	4.0	4.0	4.0
Minimum Split (s)		55.0		13.0			13.0			15.0	15.0	15.0	29.0
Total Split (s)	0.0	55.0	0.0	40.0	95.0	0.0	17.0	52.0	52.0	35.0	35.0	35.0	29.0
Total Split (%)	0.0%	31.3%	0.0%	22.7%	54.0%	0.0%	9.7%	29.5%	29.5%	19.9%	19.9%	19.9%	16%
Yellow Time (s)		5.0		4.0			4.0			6.0	6.0	6.0	4.0
All-Red Time (s)		1.0		1.0			1.0			1.0	1.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.0	6.0	4.0	5.0	5.0	4.0	5.0	5.0	5.0	7.0	7.0	7.0	
Lead/Lag		Lag		Lead			Lag						Lead
Lead-Lag Optimize?													
Recall Mode		Max		None			None			None	None	None	None
v/c Ratio		0.82		1.00	0.50		0.78	0.49	0.33	0.95	0.54	0.40	
Control Delay		51.1		101.0	18.0		61.9	45.6	42.1	109.8	61.8	58.7	
Queue Delay		0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		51.1		101.0	18.0		61.9	45.6	42.1	109.8	61.8	58.7	
Queue Length 50th (ft)		421		375	272		181	218	117	183	165	100	
Queue Length 95th (ft)		538		#659	375		#328	338	199	#377	269	179	
Internal Link Dist (ft)		2152			2676			1595			1068		
Turn Bay Length (ft)				200			300		50			80	
Base Capacity (vph)		1614		391	2889		307	573	488	203	353	295	
Starvation Cap Reductn		0		0	0		0	0	0	0	0	0	
Spillback Cap Reductn		0		0	0		0	0	0	0	0	0	
Storage Cap Reductn		0		0	0		0	0	0	0	0	0	
Reduced v/c Ratio		0.82		1.00	0.50		0.78	0.49	0.33	0.95	0.54	0.40	

Intersection Summary

Area Type: Other
Cycle Length: 176
Actuated Cycle Length: 149.3
Natural Cycle: 145
Control Type: Semi Act-Uncoord
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 19: Route 16 (Revere Beach Pkwy) & Garfield Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1143	115	378	1408	6	213	251	142	179	176	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	10	10	10	11	11	12	12	12	12
Total Lost time (s)		6.0		5.0	5.0		5.0	5.0	5.0	7.0	7.0	7.0
Lane Util. Factor		0.91		1.00	0.91		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes		1.00		1.00	1.00		1.00	1.00	0.97	1.00	1.00	0.98
Flpb, ped/bikes		1.00		1.00	1.00		1.00	1.00	1.00	0.98	1.00	1.00
Frt		0.99		1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		4896		1668	4790		1726	1818	1551	1751	1881	1572
Flt Permitted		1.00		0.95	1.00		0.46	1.00	1.00	0.59	1.00	1.00
Satd. Flow (perm)		4896		1668	4790		838	1818	1551	1081	1881	1572
Peak-hour factor, PHF	0.95	0.95	0.95	0.97	0.97	0.97	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	0	1203	121	390	1452	6	239	282	160	192	189	118
RTOR Reduction (vph)	0	6	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1318	0	390	1458	0	239	282	160	192	189	118
Confl. Peds. (#/hr)	5					5	3		18	18		3
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type				Prot			D.P+P		Perm	Perm		Perm
Protected Phases		2		1	1 2		4	4 9			9	
Permitted Phases							9		4 9	9		9
Actuated Green, G (s)		49.0		35.0	89.0		40.0	45.0	45.0	28.0	28.0	28.0
Effective Green, g (s)		49.0		35.0	89.0		40.0	45.0	45.0	28.0	28.0	28.0
Actuated g/C Ratio		0.32		0.23	0.58		0.26	0.29	0.29	0.18	0.18	0.18
Clearance Time (s)		6.0		5.0			5.0			7.0	7.0	7.0
Vehicle Extension (s)		3.0		3.0			3.0			3.0	3.0	3.0
Lane Grp Cap (vph)		1558		379	2768		287	531	453	197	342	286
v/s Ratio Prot		c0.27		c0.23	0.30		c0.06	0.16			0.10	
v/s Ratio Perm							0.15		0.10	c0.18		0.08
v/c Ratio		0.85		1.03	0.53		0.83	0.53	0.35	0.97	0.55	0.41
Uniform Delay, d1		49.0		59.5	19.7		52.2	45.7	43.0	62.6	57.3	55.7
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		5.8		53.9	0.2		18.3	1.0	0.5	56.3	1.9	1.0
Delay (s)		54.8		113.4	19.9		70.5	46.7	43.5	119.0	59.2	56.7
Level of Service		D		F	B		E	D	D	F	E	E
Approach Delay (s)		54.8			39.6			54.3			81.6	
Approach LOS		D			D			D			F	

Intersection Summary

HCM Average Control Delay	51.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	154.0	Sum of lost time (s)	30.0
Intersection Capacity Utilization	87.9%	ICU Level of Service	E
Analysis Period (min)	15		

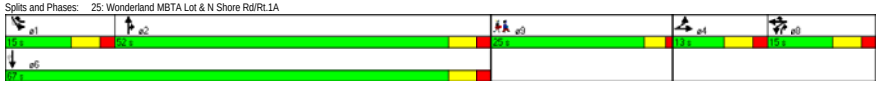
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR	ø9
Lane Configurations														
Volume (vph)	0	0	0	15	0	60	0	1329	18	1	44	1229	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		0	0		0	0		175		370		50	
Storage Lanes	1		0	1		1	0		1		1		1	
Taper Length (ft)	25		25	25		25	25		25		25		25	
Right Turn on Red			Yes			Yes			Yes				Yes	
Link Speed (mph)		30			30			30				30		
Link Distance (ft)		452			461			392				1885		
Travel Time (s)		10.3			10.5			8.9				42.8		
Peak Hour Factor	0.92	0.92	0.92	0.81	0.81	0.81	0.90	0.90	0.90	0.89	0.89	0.89	0.89	
Heavy Vehicles (%)	2%	2%	2%	16%	16%	16%	1%	1%	1%	1%	1%	1%	1%	
Shared Lane Traffic (%)	0%			10%		49%								
Lane Group Flow (vph)	0	0	0	17	38	38	0	1477	20	0	50	1381	0	
Turn Type	Split			Split		pt+ov			pt+ov	custom	Prot		Perm	
Protected Phases	4	4		8	8	1 8!		2	2 8		1	6		9
Permitted Phases										1!			6	
Detector Phase	4	4		8	8	1 8		2	2 8	1	1	6	6	
Switch Phase														
Minimum Initial (s)	5.0	5.0		5.0	5.0			10.0		6.0	6.0	10.0	10.0	5.0
Minimum Split (s)	11.0	11.0		11.0	11.0			16.0		12.0	12.0	16.0	16.0	25.0
Total Split (s)	13.0	13.0	0.0	15.0	15.0	30.0	0.0	52.0	67.0	15.0	15.0	67.0	67.0	25.0
Total Split (%)	10.8%	10.8%	0.0%	12.5%	12.5%	25.0%	0.0%	43.3%	55.8%	12.5%	12.5%	55.8%	55.8%	21%
Yellow Time (s)	4.0	4.0		4.0	4.0			4.0		4.0	4.0	4.0	4.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0			2.0		2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0	4.0	6.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lead/Lag								Lag		Lead	Lead			
Lead-Lag Optimize?														
Recall Mode	None	None		None	None			C-Min		None	None	C-Min	C-Min	None
v/c Ratio				0.22	0.38	0.13		0.71	0.02		0.70	0.53		
Control Delay				60.4	28.9	11.1		26.4	4.6		42.4	27.7		
Queue Delay				0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Total Delay				60.4	28.9	11.1		26.4	4.6		42.4	27.7		
Queue Length 50th (ft)				13	2	0		499	1		41	547		
Queue Length 95th (ft)				34	32	23		#735	8		m37	m458		
Internal Link Dist (ft)		372			381			312				1805		
Turn Bay Length (ft)									175		370			
Base Capacity (vph)				111	129	268		2094	1036		72	2607		
Starvation Cap Reductn				0	0	0		0	0		0	0		
Spillback Cap Reductn				0	0	0		0	0		0	0		
Storage Cap Reductn				0	0	0		0	0		0	0		
Reduced v/c Ratio				0.15	0.29	0.14		0.71	0.02		0.69	0.53		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 110
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.
! Phase conflict between lane groups.

Splits and Phases: 25: Wonderland MBTA Lot & N Shore Rd/Rt.1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	0	0	0	15	0	60	0	1329	18	1	44	1229	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor				0.95	0.91	0.95		0.95	1.00		1.00	0.95	
Frt				1.00	0.86	0.85		1.00	0.85		1.00	1.00	
Flt Protected				0.95	1.00	1.00		1.00	1.00		0.95	1.00	
Satd. Flow (prot)				1478	1275	1323		3574	1599		1787	3574	
Flt Permitted				0.95	1.00	1.00		1.00	1.00		0.32	1.00	
Satd. Flow (perm)				1478	1275	1323		3574	1599		607	3574	
Peak-hour factor, PHF	0.92	0.92	0.92	0.81	0.81	0.81	0.90	0.90	0.90	0.89	0.89	0.89	0.89
Adj. Flow (vph)	0	0	0	19	0	74	0	1477	20	1	49	1381	0
RTOR Reduction (vph)	0	0	0	0	34	30	0	0	4	0	0	0	0
Lane Group Flow (vph)	0	0	0	17	4	8	0	1477	16	0	50	1381	0
Heavy Vehicles (%)	2%	2%	2%	16%	16%	16%	1%	1%	1%	1%	1%	1%	1%
Turn Type	Split			Split		pt+ov			pt+ov	custom	Prot		Perm
Protected Phases	4	4		8	8	1 8!		2	2 8		1	6	
Permitted Phases										1!			6
Actuated Green, G (s)				5.3	5.3	23.7		65.9	71.2		12.4	84.3	
Effective Green, g (s)				5.3	5.3	23.7		65.9	71.2		12.4	84.3	
Actuated g/C Ratio				0.04	0.04	0.20		0.55	0.59		0.10	0.70	
Clearance Time (s)				6.0	6.0			6.0			6.0	6.0	
Vehicle Extension (s)				2.0	2.0			3.0			3.0	3.0	
Lane Grp Cap (vph)				65	56	261		1963	949		63	2511	
v/s Ratio Prot				c0.01	0.00	0.01		c0.41	0.01			0.39	
v/s Ratio Perm											c0.08		
v/c Ratio				0.26	0.06	0.03		0.75	0.02		0.79	0.55	
Uniform Delay, d1				55.5	55.0	38.9		20.8	10.0		52.6	8.7	
Progression Factor				1.00	1.00	1.00		1.00	1.00		0.73	2.80	
Incremental Delay, d2				0.8	0.2	0.0		2.7	0.0		6.2	0.1	
Delay (s)				56.2	55.1	38.9		23.5	10.0		44.6	24.3	
Level of Service				E	E	D		C	B		D	C	
Approach Delay (s)		0.0			48.7			23.3				25.0	
Approach LOS		A			D			C				C	

Intersection Summary

HCM Average Control Delay	24.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	36.4
Intersection Capacity Utilization	52.4%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations														
Volume (vph)	258	235	81	113	356	58	4	151	1192	115	118	1076	303	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		0	80		0		200		0	75		0	
Storage Lanes	1		0	1		0		1		0	1		0	
Taper Length (ft)	25		25	25		25		25		25	25		25	
Right Turn on Red			Yes			Yes				Yes			Yes	
Link Speed (mph)		30			30				30			30		
Link Distance (ft)		2000			713				1885			1623		
Travel Time (s)		45.5			16.2				42.8			36.9		
Confl. Bikes (#/hr)			2			1								
Peak Hour Factor	0.80	0.80	0.80	0.86	0.86	0.86	0.88	0.88	0.88	0.88	0.92	0.92	0.92	
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	2%	2%	2%	2%	1%	1%	1%	
Bus Blockages (#/hr)	0	10	0	0	0	0	0	0	0	0	0	0	0	
Shared Lane Traffic (%)														
Lane Group Flow (vph)	322	395	0	131	481	0	0	177	1486	0	128	1499	0	
Turn Type	pm+pt			pm+pt			pm+pt	pm+pt			pm+pt			
Protected Phases	7	4		3	8		5	5	2		1	6		9
Permitted Phases	4			8			2	2			6			
Detector Phase	7	4		3	8		5	5	2		1	6		
Switch Phase														
Minimum Initial (s)	6.0	10.0		6.0	10.0		6.0	6.0	30.0		6.0	30.0		4.0
Minimum Split (s)	11.0	15.0		11.0	15.0		12.0	12.0	36.0		12.0	36.0		24.0
Total Split (s)	13.0	32.0	0.0	13.0	32.0	0.0	17.0	17.0	47.0	0.0	17.0	47.0	0.0	11.0
Total Split (%)	10.8%	26.7%	0.0%	10.8%	26.7%	0.0%	14.2%	14.2%	39.2%	0.0%	14.2%	39.2%	0.0%	9%
Yellow Time (s)	3.0	3.0		3.0	3.0		4.0	4.0	4.0		4.0	4.0		3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0		2.0	2.0		3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lead	Lag		Lead	Lag		
Lead-Lag Optimize?														
Recall Mode	None	None		None	None		None	None	C-Min		None	C-Min		None
v/c Ratio	1.52	0.91		0.68	1.14			0.80	1.20		0.61	1.24		
Control Delay	284.9	69.5		48.3	129.7			63.8	137.4		33.5	148.1		
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0		
Total Delay	284.9	69.5		48.3	129.7			63.8	137.4		33.5	148.1		
Queue Length 50th (ft)	~333	298		73	~433			121	~715		54	~756		
Queue Length 95th (ft)	#439	#411		#121	#601			m#215	#837		107	#897		
Internal Link Dist (ft)		1920			633				1805			1543		
Turn Bay Length (ft)				80				200			75			
Base Capacity (vph)	212	435		195	422			226	1238		229	1212		
Starvation Cap Reductn	0	0		0	0			0	0		0	0		
Spillback Cap Reductn	0	0		0	0			0	0		0	0		
Storage Cap Reductn	0	0		0	0			0	0		0	0		
Reduced v/c Ratio	1.52	0.91		0.67	1.14			0.78	1.20		0.56	1.24		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 26: Revere St & N Shore Rd/Rt.1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	258	235	81	113	356	58	4	151	1192	115	118	1076	303
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.98			1.00	0.99		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1787	1731		1805	1857			1770	3492		1787	3457	
Flt Permitted	0.14	1.00		0.17	1.00			0.10	1.00		0.10	1.00	
Satd. Flow (perm)	256	1731		332	1857			181	3492		188	3457	
Peak-hour factor, PHF	0.80	0.80	0.80	0.86	0.86	0.86	0.88	0.88	0.88	0.88	0.92	0.92	0.92
Adj. Flow (vph)	322	294	101	131	414	67	5	172	1355	131	128	1170	329
RTOR Reduction (vph)	0	10	0	0	5	0	0	0	6	0	0	22	0
Lane Group Flow (vph)	322	385	0	131	476	0	0	177	1480	0	128	1477	0
Confl. Bikes (#/hr)			2			1							
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	2%	2%	2%	2%	1%	1%	1%
Bus Blockages (#/hr)	0	10	0	0	0	0	0	0	0	0	0	0	0
Turn Type	pm+pt			pm+pt			pm+pt	pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	5	2		1	6	
Permitted Phases	4			8			2	2			6		
Actuated Green, G (s)	39.6	29.4		34.8	27.0			51.8	41.1		49.8	40.1	
Effective Green, g (s)	39.6	29.4		34.8	27.0			51.8	41.1		49.8	40.1	
Actuated g/C Ratio	0.33	0.24		0.29	0.22			0.43	0.34		0.41	0.33	
Clearance Time (s)	5.0	5.0		5.0	5.0			6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	215	424		192	418			220	1196		207	1155	
v/s Ratio Prot	c0.13	0.22		0.04	0.26			c0.07	0.42		0.05	c0.43	
v/s Ratio Perm	c0.37			0.15				0.28			0.21		
v/c Ratio	1.50	0.91		0.68	1.14			0.80	1.24		0.62	1.28	
Uniform Delay, d1	35.0	44.0		34.2	46.5			27.9	39.5		27.9	40.0	
Progression Factor	1.00	1.00		1.00	1.00			1.72	1.23		1.00	1.00	
Incremental Delay, d2	246.8	22.4		7.7	87.9			15.0	112.6		5.4	132.2	
Delay (s)	281.9	66.4		41.9	134.4			62.9	161.1		33.4	172.2	
Level of Service	F	E		D	F			E	F		C	F	
Approach Delay (s)		163.1			114.6				150.7			161.3	
Approach LOS		F			F				F			F	

Intersection Summary

HCM Average Control Delay	151.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.28		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	27.0
Intersection Capacity Utilization	102.9%	ICU Level of Service	G
Analysis Period (min)	15		

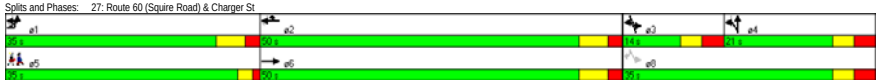
c Critical Lane Group

Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø5	ø8
Lane Configurations															
Volume (vph)	3	182	1561	0	0	1695	317	35	67	32	316	0	189		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)		400		0	0		50	0		0	0		125		
Storage Lanes		1		0	0		1	1		0	1		1		
Taper Length (ft)		25		25	25		25	25		25	25		25		
Right Turn on Red				Yes			Yes			Yes			Yes		
Link Speed (mph)			30			30			30			30			
Link Distance (ft)			930			2104			1965			1139			
Travel Time (s)			21.1			47.8			44.7			25.9			
Confl. Peds. (#/hr)													7		
Confl. Bikes (#/hr)													2		
Peak Hour Factor	0.98	0.98	0.98	0.98	0.90	0.90	0.90	0.96	0.96	0.96	0.92	0.92	0.92		
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%	1%	0%	0%	0%	0%	0%	0%		
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	189	1593	0	0	1883	352	36	103	0	343	0	205		
Turn Type	Prot	Prot					Prot	Prot			custom		custom		
Protected Phases		1	6			2	2	3 4	4		3			5	8
Permitted Phases											8		1 2 4 8		
Detector Phase	1	1	6			2	2	3 4	4		3		1 2 4 8		
Switch Phase															
Minimum Initial (s)	6.0	6.0	20.0			20.0	20.0		6.0		6.0			4.0	6.0
Minimum Split (s)	12.0	12.0	26.0			26.0	26.0		12.0		12.0			30.0	20.0
Total Split (s)	35.0	35.0	50.0	0.0	0.0	50.0	50.0	35.0	21.0	0.0	14.0	0.0	141.0	35.0	35.0
Total Split (%)	29.2%	29.2%	41.7%	0.0%	0.0%	41.7%	41.7%	29.2%	17.5%	0.0%	11.7%	0.0%	117.5%	29%	29%
Yellow Time (s)	4.0	4.0	4.0			4.0	4.0		3.0		3.0			2.0	3.0
All-Red Time (s)	2.0	2.0	2.0			2.0	2.0		3.0		3.0			1.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	6.0	6.0	6.0	4.0	4.0	6.0	6.0	6.0	6.0	4.0	6.0	4.0	6.0		
Lead/Lag	Lead	Lead	Lag			Lag	Lag		Lag		Lead			Lead	
Lead-Lag Optimize?															
Recall Mode	None	None	C-Min			C-Min	C-Min		None		None			None	None
v/c Ratio		0.71	0.58			0.75	0.43	0.10	0.57		1.47		0.13		
Control Delay		50.3	33.1			28.2	18.9	37.6	56.0		266.0		0.2		
Queue Delay		0.0	0.0			0.0	0.0	0.0	0.0		0.0		0.0		
Total Delay		50.3	33.1			28.2	18.9	37.6	56.0		266.0		0.2		
Queue Length 50th (ft)		148	226			417	134	23	65		~364		0		
Queue Length 95th (ft)		m182	526			567	251	50	120		#530		0		
Internal Link Dist (ft)			850			2024			1885			1059			
Turn Bay Length (ft)		400					50						125		
Base Capacity (vph)		428	2756			2524	822	436	240		234		1571		
Starvation Cap Reductn		0	0			0	0	0	0		0		0		
Spillback Cap Reductn		0	0			0	0	0	0		0		0		
Storage Cap Reductn		0	0			0	0	0	0		0		0		
Reduced v/c Ratio		0.44	0.58			0.75	0.43	0.08	0.43		1.47		0.13		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 27: Route 60 (Squire Road) & Charger St



Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	3	182	1561	0	0	1695	317	35	67	32	316	0	189
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0			6.0	6.0	6.0	6.0		6.0		6.0
Lane Util. Factor		1.00	0.91			0.91	1.00	1.00	1.00		1.00		1.00
Frpb, ped/bikes		1.00	1.00			1.00	1.00	1.00	1.00		1.00		0.99
Flpb, ped/bikes		1.00	1.00			1.00	1.00	1.00	1.00		1.00		1.00
Frt		1.00	1.00			1.00	0.85	1.00	0.95		1.00		0.85
Flt Protected		0.95	1.00			1.00	1.00	0.95	1.00		0.95		1.00
Satd. Flow (prot)		1770	5085			5136	1599	1805	1809		1805		1592
Flt Permitted		0.95	1.00			1.00	1.00	0.95	1.00		0.42		1.00
Satd. Flow (perm)		1770	5085			5136	1599	1805	1809		801		1592
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.90	0.90	0.90	0.96	0.96	0.96	0.92	0.92	0.92
Adj. Flow (vph)	3	186	1593	0	0	1883	352	36	70	33	343	0	205
RTOR Reduction (vph)	0	0	0	0	0	0	37	0	15	0	0	0	0
Lane Group Flow (vph)	0	189	1593	0	0	1883	315	36	88	0	343	0	205
Confl. Peds. (#/hr)													7
Confl. Bikes (#/hr)													2
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	Prot					Prot	Prot			custom		custom
Protected Phases	1	1	6			2	2	3 4	4		3		
Permitted Phases											8		1 2 4 8
Actuated Green, G (s)		18.1	63.8			58.9	58.9	25.0	11.0		25.0		120.0
Effective Green, g (s)		18.1	63.8			58.9	58.9	25.0	11.0		25.0		120.0
Actuated g/C Ratio		0.15	0.53			0.49	0.49	0.21	0.09		0.21		1.00
Clearance Time (s)		6.0	6.0			6.0	6.0		6.0		6.0		
Vehicle Extension (s)		3.0	3.0			3.0	3.0		3.0		3.0		
Lane Grp Cap (vph)		267	2704			2521	785	376	166		234		1592
v/s Ratio Prot		c0.11	c0.31			c0.37	0.20	0.02	0.05		c0.10		
v/s Ratio Perm											c0.21		0.13
v/c Ratio		0.71	0.59			0.75	0.40	0.10	0.53		1.47		0.13
Uniform Delay, d1		48.4	19.2			24.6	19.4	38.4	52.0		46.7		0.0
Progression Factor		0.87	1.48			1.00	1.00	1.00	1.00		1.00		1.00
Incremental Delay, d2		4.9	0.6			2.1	1.5	0.1	3.3		231.5		0.0
Delay (s)		46.9	28.9			26.6	20.9	38.5	55.3		278.2		0.0
Level of Service		D	C			C	C	D	E		F		A
Approach Delay (s)			30.9			25.7			51.0			174.2	
Approach LOS			C			C			D			F	

Intersection Summary

HCM Average Control Delay	45.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	80.6%	ICU Level of Service	D
Analysis Period (min)	15		

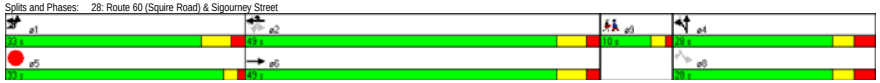
c Critical Lane Group

Lane Group	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø5	ø9
Lane Configurations																
Volume (vph)	4	318	1448	0	12	0	1731	179	102	52	36	256	0	216		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)		325		0		0		0	0		0	0		0		
Storage Lanes		1		0		0		1	1		0	1		1		
Taper Length (ft)		25		25		25		25	25		25	25		25		
Right Turn on Red				No				Yes			Yes			Yes		
Link Speed (mph)			30				30			30			30			
Link Distance (ft)			924				930			1560			1008			
Travel Time (s)			21.0				21.1			35.5			22.9			
Confl. Peds. (#/hr)														2		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.93	0.93	0.93	0.93	0.88	0.88	0.88	0.88	0.88	0.88		
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%		
Shared Lane Traffic (%)																
Lane Group Flow (vph)	0	332	1493	0	0	0	1874	192	116	100	0	291	0	245		
Turn Type	Prot	Prot			Perm	Perm		Prot	Split			custom		custom		
Protected Phases	1	1	6				2	2	4	4					5	9
Permitted Phases					2	2						8		1 2 4 8		
Detector Phase	1	1	6		2	2	2	2	4	4		8		1 2 4 8		
Switch Phase																
Minimum Initial (s)	10.0	10.0	20.0		20.0	20.0	20.0	20.0	6.0	6.0		12.0			4.0	4.0
Minimum Split (s)	16.0	16.0	26.0		26.0	26.0	26.0	26.0	12.0	12.0		18.0			33.0	21.0
Total Split (s)	33.0	33.0	49.0	0.0	49.0	49.0	49.0	49.0	28.0	28.0	0.0	28.0	0.0	138.0	33.0	10.0
Total Split (%)	27.5%	27.5%	40.8%	0.0%	40.8%	40.8%	40.8%	40.8%	23.3%	23.3%	0.0%	23.3%	0.0%	115.0%	28%	8%
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0	3.0	3.0		3.0			2.0	2.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0	2.0	3.0	3.0		3.0			1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	6.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	4.0	6.0	4.0	6.0		
Lead/Lag	Lead	Lead	Lag		Lag	Lag	Lag	Lag							Lead	
Lead-Lag Optimize?																
Recall Mode	None	None	C-Min		C-Min	C-Min	C-Min	C-Min	None	None		None			None	None
v/c Ratio		0.89	0.80				1.62	0.29	0.26	0.22		0.90		0.16		
Control Delay		71.2	30.6				301.9	2.8	39.3	28.9		73.7		0.3		
Queue Delay		0.0	0.0				0.0	0.0	0.0	0.0		0.0		0.0		
Total Delay		71.2	30.6				301.9	2.8	39.3	28.9		73.7		0.3		
Queue Length 50th (ft)		247	356				~1131	34	71	44		214		0		
Queue Length 95th (ft)		#395	#862				#1232	m1	133	98		#439		7		
Internal Link Dist (ft)			844				850			1480			928			
Turn Bay Length (ft)		325														
Base Capacity (vph)		402	1871				1157	654	447	461		325		1535		
Starvation Cap Reductn		0	0				0	0	0	0		0		0		
Spillback Cap Reductn		0	0				0	0	0	0		0		0		
Storage Cap Reductn		0	0				0	0	0	0		0		0		
Reduced v/c Ratio		0.83	0.80				1.62	0.29	0.26	0.22		0.90		0.16		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 21 (18%), Referenced to phase 2:WBTL and 6:EBT, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 28: Route 60 (Squire Road) & Sigourney Street



Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Volume (vph)	4	318	1448	0	12	0	1731	179	102	52	36	256	0	216
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0				6.0	6.0	6.0	6.0		6.0		6.0
Lane Util. Factor		1.00	0.95				0.95	1.00	1.00	1.00		1.00		1.00
Frpb, ped/bikes		1.00	1.00				1.00	1.00	1.00	1.00		1.00		0.99
Flpb, ped/bikes		1.00	1.00				1.00	1.00	1.00	1.00		1.00		1.00
Frt		1.00	1.00				1.00	0.85	1.00	0.94		1.00		0.85
Flt Protected		0.95	1.00				1.00	1.00	0.95	1.00		0.95		1.00
Satd. Flow (prot)		1787	3574				3538	1583	1787	1765		1787		1579
Flt Permitted		0.95	1.00				0.88	1.00	0.95	1.00		0.69		1.00
Satd. Flow (perm)		1787	3574				3098	1583	1787	1765		1302		1579
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.93	0.93	0.93	0.93	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	4	328	1493	0	13	0	1861	192	116	59	41	291	0	245
RTOR Reduction (vph)	0	0	0	0	0	0	0	65	0	20	0	0	0	21
Lane Group Flow (vph)	0	332	1493	0	0	0	1874	127	116	81	0	291	0	224
Confl. Peds. (#/hr)														2
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Turn Type	Prot	Prot			Perm	Perm		Prot	Split			custom		custom
Protected Phases	1	1	6				2	2	4	4				
Permitted Phases					2	2						8		1 2 4 8
Actuated Green, G (s)		25.2	58.6				42.4	42.4	30.0	30.0		30.0		109.6
Effective Green, g (s)		25.2	58.6				42.4	42.4	30.0	30.0		30.0		109.6
Actuated g/C Ratio		0.21	0.49				0.35	0.35	0.25	0.25		0.25		0.91
Clearance Time (s)		6.0	6.0				6.0	6.0	6.0	6.0		6.0		
Vehicle Extension (s)		3.0	3.0				3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		375	1745				1095	559	447	441		326		1442
v/s Ratio Prot		c0.19	c0.42					0.08	0.06	0.05				
v/s Ratio Perm							c0.60					c0.22		0.14
v/c Ratio		0.89	0.86				1.71	0.23	0.26	0.18		0.89		0.16
Uniform Delay, d1		46.0	27.0				38.8	27.3	36.1	35.4		43.4		0.5
Progression Factor		1.00	1.00				0.43	0.15	1.00	1.00		1.00		1.00
Incremental Delay, d2		21.2	5.6				323.0	0.7	0.3	0.2		24.9		0.1
Delay (s)		67.2	32.6				339.9	4.7	36.4	35.6		68.4		0.6
Level of Service		E	C				F	A	D	D		E		A
Approach Delay (s)			38.9				308.7			36.0			37.4	
Approach LOS			D				F			D			D	

Intersection Summary

HCM Average Control Delay	158.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.33		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	28.4
Intersection Capacity Utilization	127.5%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	ø2	ø3	ø9
Lane Configurations									
Volume (vph)	248	790	934	179	133	209			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	11	11	11	12	15	12			
Storage Length (ft)	120			0	0	150			
Storage Lanes	1			0	1	1			
Taper Length (ft)	25			25	25	25			
Right Turn on Red				Yes		Yes			
Link Speed (mph)		30	30		30				
Link Distance (ft)		1857	236		865				
Travel Time (s)		42.2	5.4		19.7				
Peak Hour Factor	0.92	0.92	0.90	0.90	0.88	0.88			
Heavy Vehicles (%)	0%	0%	1%	1%	1%	1%			
Bus Blockages (#/hr)	0	2	0	0	0	0			
Shared Lane Traffic (%)									
Lane Group Flow (vph)	270	859	1237	0	151	238			
Turn Type	Prot					custom			
Protected Phases	5	2 3 5	2 3		7	7	2	3	9
Permitted Phases						2 3 5			
Detector Phase	5	2 3 5	2 3		7	7			
Switch Phase									
Minimum Initial (s)	3.0				2.0	2.0	3.0	3.0	1.0
Minimum Split (s)	8.0				8.0	8.0	12.0	8.0	7.0
Total Split (s)	30.0	95.0	65.0	0.0	25.0	25.0	30.0	35.0	20.0
Total Split (%)	21.4%	67.9%	46.4%	0.0%	17.9%	17.9%	21%	25%	14%
Yellow Time (s)	4.0				4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0				1.0	1.0	2.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-2.0	-2.0	0.0	-1.0	-1.0			
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lag				Lead	Lead	Lag	Lead	
Lead-Lag Optimize?	Yes				Yes	Yes	Yes	Yes	
Recall Mode	None				C-Max	C-Max	Max	None	None
v/c Ratio	0.83	0.26	0.58		0.26	0.15			
Control Delay	76.8	10.6	29.5		39.5	0.2			
Queue Delay	0.0	0.0	6.3		0.2	0.0			
Total Delay	76.8	10.6	35.8		39.6	0.2			
Queue Length 50th (ft)	240	113	244		106	0			
Queue Length 95th (ft)	#385	135	282		163	0			
Internal Link Dist (ft)		1777	156		785				
Turn Bay Length (ft)	120					150			
Base Capacity (vph)	324	3251	2131		576	1599			
Starvation Cap Reductn	0	0	836		0	0			
Spillback Cap Reductn	0	88	0		90	0			
Storage Cap Reductn	0	0	0		0	0			
Reduced v/c Ratio	0.83	0.27	0.96		0.31	0.15			

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 116 (83%), Referenced to phase 7:SBL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 41: Route 145 & N Shore Rd



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	248	790	934	179	133	209
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	15	12
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.91	0.91		1.00	1.00
Frt	1.00	1.00	0.98		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1745	5001	4845		1966	1599
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1745	5001	4845		1966	1599
Peak-hour factor, PHF	0.92	0.92	0.90	0.90	0.88	0.88
Adj. Flow (vph)	270	859	1038	199	151	238
RTOR Reduction (vph)	0	0	20	0	0	22
Lane Group Flow (vph)	270	859	1217	0	151	216
Heavy Vehicles (%)	0%	0%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	2	0	0	0	0
Turn Type	Prot					custom
Protected Phases	5	2 3 5	2 3		7	7
Permitted Phases						2 3 5
Actuated Green, G (s)	25.0	90.0	60.0		40.0	130.0
Effective Green, g (s)	26.0	89.0	62.0		41.0	127.0
Actuated g/C Ratio	0.19	0.64	0.44		0.29	0.91
Clearance Time (s)	5.0				5.0	5.0
Vehicle Extension (s)	3.0				3.0	3.0
Lane Grp Cap (vph)	324	3179	2146		576	1542
v/s Ratio Prot	c0.15	0.17	c0.25		c0.08	0.04
v/s Ratio Perm						0.09
v/c Ratio	0.83	0.27	0.57		0.26	0.14
Uniform Delay, d1	54.9	11.2	29.0		37.9	0.7
Progression Factor	1.00	1.00	0.98		1.00	1.00
Incremental Delay, d2	16.6	0.0	0.3		1.1	0.0
Delay (s)	71.5	11.3	28.7		39.0	0.7
Level of Service	E	B	C		D	A
Approach Delay (s)		25.7	28.7		15.6	
Approach LOS		C	C		B	

Intersection Summary

HCM Average Control Delay	25.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	53.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2	ø7	ø9
Lane Configurations															
Volume (vph)	0	696	226	140	679	0	435	0	413	0	0	0			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	12	11	11	9	11	12	10	12	12	12	12	16			
Storage Length (ft)	0		0	100		0	0		100	0		0			
Storage Lanes	0		0	1		0	1		1	0		1			
Taper Length (ft)	25		25	25		25	25		25	25		25			
Right Turn on Red			No			Yes			No			No			
Link Speed (mph)		30			30			30			30				
Link Distance (ft)		236			635			5227			589				
Travel Time (s)		5.4			14.4			118.8			13.4				
Peak Hour Factor	0.92	0.92	0.92	0.80	0.80	0.80	0.90	0.90	0.90	0.65	0.65	0.65			
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	0%	0%	0%			
Bus Blockages (#/hr)	0	0	0	0	2	0	0	0	0	0	0	0			
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	1003	0	175	849	0	483	0	459	0	0	0			
Turn Type				Prot			Prot		custom			custom			
Protected Phases		2 7		5	2 5 7		3		3				2	7	9
Permitted Phases									2 5 7			3			
Detector Phase		2 7		5	2 5 7		3		3			3			
Switch Phase															
Minimum Initial (s)				3.0			3.0		3.0			3.0	3.0	2.0	1.0
Minimum Split (s)				8.0			8.0		8.0			8.0	12.0	8.0	7.0
Total Split (s)	0.0	55.0	0.0	30.0	85.0	0.0	35.0	0.0	35.0	0.0	0.0	35.0	30.0	25.0	20.0
Total Split (%)	0.0%	39.3%	0.0%	21.4%	60.7%	0.0%	25.0%	0.0%	25.0%	0.0%	0.0%	25.0%	21%	18%	14%
Yellow Time (s)				4.0			4.0		4.0			4.0	4.0	4.0	2.0
All-Red Time (s)				1.0			1.0		1.0			1.0	2.0	1.0	1.0
Lost Time Adjust (s)	0.0	-2.0	0.0	-1.0	-2.0	0.0	-1.0	0.0	-1.0	0.0	0.0	-1.0			
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			
Lead/Lag				Lag			Lead		Lead			Lead	Lag	Lead	
Lead-Lag Optimize?				Yes			Yes		Yes			Yes	Yes	Yes	
Recall Mode				None			None		None			None	Max	C-Max	None
v/c Ratio		0.41		0.59	0.24		0.67		0.29						
Control Delay		18.3		61.0	6.7		55.3		0.5						
Queue Delay		6.0		0.0	0.1		0.0		0.0						
Total Delay		24.3		61.0	6.9		55.3		0.5						
Queue Length 50th (ft)		162		147	86		209		0						
Queue Length 95th (ft)		188		199	89		271		0						
Internal Link Dist (ft)		156			555			5147			509				
Turn Bay Length (ft)				100					100						
Base Capacity (vph)		2449		299	3572		717		1599						
Starvation Cap Reductn		1378		0	0		0		0						
Spillback Cap Reductn		0		0	1552		0		0						
Storage Cap Reductn		0		0	0		0		0						
Reduced v/c Ratio		0.94		0.59	0.42		0.67		0.29						

Intersection Summary	
Area Type:	Other
Cycle Length: 140	
Actuated Cycle Length: 140	
Offset: 116 (83%), Referenced to phase 7:SBL, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	

Splits and Phases: 42: Winthrop Ave & Suffolk Downs



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	696	226	140	679	0	435	0	413	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	9	11	12	10	12	12	12	12	16
Total Lost time (s)		4.0		4.0	4.0		4.0		4.0			
Lane Util. Factor		0.91		1.00	0.91		0.97		1.00			
Frt		0.96		1.00	1.00		1.00		0.85			
Flt Protected		1.00		0.95	1.00		0.95		1.00			
Satd. Flow (prot)		4830		1608	4951		3236		1599			
Flt Permitted		1.00		0.95	1.00		0.95		1.00			
Satd. Flow (perm)		4830		1608	4951		3236		1599			
Peak-hour factor, PHF	0.92	0.92	0.92	0.80	0.80	0.80	0.90	0.90	0.90	0.65	0.65	0.65
Adj. Flow (vph)	0	757	246	175	849	0	483	0	459	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1003	0	175	849	0	483	0	459	0	0	0
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	2	0	0	0	0	0	0	0
Turn Type				Prot			Prot		custom			custom
Protected Phases		2 7		5	2 5 7		3		3			
Permitted Phases									2 5 7			3
Actuated Green, G (s)		69.0		25.0	99.0		30.0		129.0			
Effective Green, g (s)		68.0		26.0	95.0		31.0		131.0			
Actuated g/C Ratio		0.49		0.19	0.68		0.22		0.94			
Clearance Time (s)				5.0			5.0		5.0			
Vehicle Extension (s)				3.0			3.0		3.0			
Lane Grp Cap (vph)		2346		299	3360		717		1542			
v/s Ratio Prot		c0.21		c0.11	0.17		c0.15		0.07			
v/s Ratio Perm									0.22			
v/c Ratio		0.43		0.59	0.25		0.67		0.30			
Uniform Delay, d1		23.4		52.1	8.7		49.9		0.4			
Progression Factor		0.82		1.00	1.00		1.00		1.00			
Incremental Delay, d2		0.6		2.9	0.0		2.5		0.1			
Delay (s)		19.8		55.0	8.8		52.4		0.5			
Level of Service		B		D	A		D		A			
Approach Delay (s)		19.8			16.7			27.1			0.0	
Approach LOS		B			B			C			A	

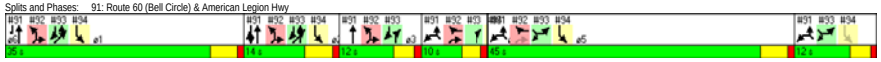
Intersection Summary			
HCM Average Control Delay	21.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	50.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NWL	NWR	NEL	NER	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations																
Volume (vph)	0	881	0	0	810	562	1418	419	0	0						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900						
Lane Width (ft)	12	13	12	12	13	16	16	16	12	12						
Storage Length (ft)	0		0	0		130	0	0	0	0						
Storage Lanes	0		0	0		1	2	1	0	0						
Taper Length (ft)	25		25	25		25	25	25	25	25						
Right Turn on Red			No			Yes		Yes								
Link Speed (mph)		30			30		30		30							
Link Distance (ft)		324			508		202		252							
Travel Time (s)		7.4			11.5		4.6		5.7							
Peak Hour Factor	0.92	0.87	0.92	0.92	0.87	0.68	0.97	0.64	0.92	0.92						
Heavy Vehicles (%)	2%	4%	2%	2%	2%	0%	2%	10%	2%	2%						
Shared Lane Traffic (%)																
Lane Group Flow (vph)	0	1013	0	0	931	826	1462	655	0	0						
Turn Type						Prot		Prot								
Protected Phases		1 2 3			1 2	1 2	4 5 6	4 5 6			1	2	3	4	5	6
Permitted Phases																
Minimum Split (s)											35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	0.0	61.0	0.0	0.0	49.0	49.0	67.0	67.0	0.0	0.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	0.0%	47.7%	0.0%	0.0%	38.3%	38.3%	52.3%	52.3%	0.0%	0.0%	27%	11%	9%	8%	35%	9%
Yellow Time (s)											4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)											1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	-1.0	0.0	0.0	-1.0	-1.0	-1.0	-1.0	0.0	0.0						
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	4.0	4.0						
Lead/Lag											Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?											Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio		0.63			0.72	1.11	0.75	0.65								
Control Delay		0.6			40.0	98.3	19.6	15.8								
Queue Delay		0.8			0.0	0.0	52.5	24.2								
Total Delay		1.4			40.0	98.3	72.1	40.0								
Queue Length 50th (ft)		0			351	~691	458	240								
Queue Length 95th (ft)		m0			409	500	473	146								
Internal Link Dist (ft)		244			428		122		172							
Turn Bay Length (ft)						130										
Base Capacity (vph)		1597			1286	746	1946	1005								
Starvation Cap Reductn		289			0	0	629	364								
Spillback Cap Reductn		0			0	0	0	0								
Storage Cap Reductn		0			0	0	0	0								
Reduced v/c Ratio		0.77			0.72	1.11	1.11	1.02								

Intersection Summary	
Area Type:	Other
Cycle Length: 128	
Actuated Cycle Length: 128	
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green	
Natural Cycle: 150	
Control Type: Pretimed	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 91: Route 60 (Bell Circle) & American Legion Hwy



Movement	NBL	NBT	NBR	SBL	SBT	SBR	NWL	NWR	NEL	NER
Lane Configurations										
Volume (vph)	0	881	0	0	810	562	1418	419	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	13	12	12	13	16	16	16	12	12
Total Lost time (s)		4.0			4.0	4.0	3.0	3.0		
Lane Util. Factor		0.95			0.95	1.00	0.97	1.00		
Frt		1.00			1.00	0.85	1.00	1.00		
Flt Protected		1.00			1.00	1.00	0.95	1.00		
Satd. Flow (prot)		3587			3657	1830	3891	1958		
Flt Permitted		1.00			1.00	1.00	1.00	1.00		
Satd. Flow (perm)		3587			3657	1830	4096	1958		
Peak-hour factor, PHF	0.92	0.87	0.92	0.92	0.87	0.68	0.97	0.64	0.92	0.92
Adj. Flow (vph)	0	1013	0	0	931	826	1462	655	0	0
RTOR Reduction (vph)	0	0	0	0	0	103	0	28	0	0
Lane Group Flow (vph)	0	1013	0	0	931	723	1462	627	0	0
Heavy Vehicles (%)	2%	4%	2%	2%	2%	0%	2%	10%	2%	2%
Turn Type						Prot		Prot		
Protected Phases		1 2 3			1 2	1 2	4 5 6	4 5 6		
Permitted Phases										
Actuated Green, G (s)		57.0			44.0	44.0	63.0	63.0		
Effective Green, g (s)		58.0			45.0	45.0	60.0	60.0		
Actuated g/C Ratio		0.45			0.35	0.35	0.47	0.47		
Clearance Time (s)										
Lane Grp Cap (vph)		1625			1286	643	1824	918		
v/s Ratio Prot		c0.28			0.25	c0.39	c0.38	0.32		
v/s Ratio Perm										
v/c Ratio		0.62			0.72	1.12	0.80	0.68		
Uniform Delay, d1		26.7			36.1	41.5	28.9	26.6		
Progression Factor		0.00			1.00	1.00	0.68	0.61		
Incremental Delay, d2		0.5			3.6	74.8	2.8	3.0		
Delay (s)		0.5			39.7	116.3	22.4	19.2		
Level of Service		A			D	F	C	B		
Approach Delay (s)		0.5			75.7		21.4		0.0	
Approach LOS		A			E		C		A	

Intersection Summary					
HCM Average Control Delay		36.6	HCM Level of Service		D
HCM Volume to Capacity ratio		0.90			
Actuated Cycle Length (s)		128.0	Sum of lost time (s)		10.0
Intersection Capacity Utilization		71.5%	ICU Level of Service		C
Analysis Period (min)		15			

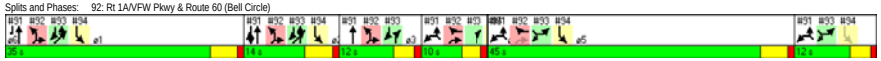
c Critical Lane Group

Lane Group	WBL	WBR	SEL	SER	NEL	NER	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations												
Volume (vph)	0	1351	0	0	476	1705						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900						
Lane Width (ft)	16	16	12	12	16	14						
Right Turn on Red		Yes		Yes	Yes	Yes						
Link Speed (mph)	30		30		30							
Link Distance (ft)	646		202		216							
Travel Time (s)	14.7		4.6		4.9							
Peak Hour Factor	0.92	0.86	0.92	0.92	0.92	0.92						
Heavy Vehicles (%)	2%	0%	2%	2%	2%	2%						
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1571	0	0	517	1853						
Turn Type		custom				custom						
Protected Phases		4 5			1 2 3	1 2 3 4	1	2	3	4	5	6
Permitted Phases						5						
Minimum Split (s)							35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	0.0	55.0	0.0	0.0	61.0	71.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	0.0%	43.0%	0.0%	0.0%	47.7%	55.5%	27%	11%	9%	8%	35%	9%
Yellow Time (s)							4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)							1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	-1.0	0.0	0.0	-1.0	0.0						
Total Lost Time (s)	4.0	3.0	4.0	4.0	4.0	5.0						
Lead/Lag							Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio		0.82			0.26	0.57						
Control Delay		23.4			9.0	0.1						
Queue Delay		1.8			3.4	1.3						
Total Delay		25.3			12.4	1.3						
Queue Length 50th (ft)		413			39	0						
Queue Length 95th (ft)		467			m41	m0						
Internal Link Dist (ft)	566		122		136							
Turn Bay Length (ft)												
Base Capacity (vph)		1920			2003	3279						
Starvation Cap Reductn		0			1366	1118						
Spillback Cap Reductn		200			855	0						
Storage Cap Reductn		0			0	0						
Reduced v/c Ratio		0.91			0.81	0.86						

Intersection Summary	
Area Type:	Other
Cycle Length: 128	
Actuated Cycle Length: 128	
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green	
Natural Cycle: 150	
Control Type: Pretimed	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 92: Rt 1A/VFW Pkwy & Route 60 (Bell Circle)



Movement	WBL	WBR	SEL	SER	NEL	NER
Lane Configurations						
Volume (vph)	0	1351	0	0	476	1705
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	16	16	12	12	16	14
Total Lost time (s)		3.0			4.0	5.0
Lane Util. Factor		0.88			0.97	0.88
Frt		1.00			1.00	1.00
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		3790			4096	3497
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		3790			4096	3497
Peak-hour factor, PHF	0.92	0.86	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1571	0	0	517	1853
RTOR Reduction (vph)	0	385	0	0	176	362
Lane Group Flow (vph)	0	1186	0	0	341	1491
Heavy Vehicles (%)	2%	0%	2%	2%	2%	2%
Turn Type		custom				custom
Protected Phases		4 5			1 2 3	1 2 3 4
Permitted Phases						5
Actuated Green, G (s)		50.0			57.0	107.0
Effective Green, g (s)		51.0			58.0	103.0
Actuated g/C Ratio		0.40			0.45	0.80
Clearance Time (s)						
Lane Grp Cap (vph)		1510			1856	2814
v/s Ratio Prot		c0.31			0.08	c0.26
v/s Ratio Perm						0.17
v/c Ratio		0.79			0.18	0.53
Uniform Delay, d1		33.7			20.9	4.3
Progression Factor		1.00			1.13	0.00
Incremental Delay, d2		4.2			0.0	0.1
Delay (s)		37.9			23.5	0.1
Level of Service		D			C	A
Approach Delay (s)	37.9		0.0		5.2	
Approach LOS	D		A		A	

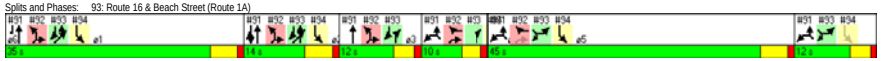
Intersection Summary			
HCM Average Control Delay	18.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	63.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	NBR	SBR	SEL	SER2	NEL	NET	ø2	ø3	ø4	ø5	ø6
Lane Configurations											
Volume (vph)	710	810	737	1237	881	733					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900					
Lane Width (ft)	12	13	12	14	12	16					
Storage Length (ft)	0	0	100		0						
Storage Lanes	2	2	0		2						
Taper Length (ft)	25	25	25		25						
Right Turn on Red	No			Yes							
Link Speed (mph)			30			30					
Link Distance (ft)			189			610					
Travel Time (s)			4.3			13.9					
Peak Hour Factor	0.94	0.94	0.79	0.93	0.73	0.94					
Heavy Vehicles (%)	3%	4%	2%	2%	4%	3%					
Shared Lane Traffic (%)											
Lane Group Flow (vph)	755	862	933	1330	1207	780					
Turn Type	custom	custom		Prot	Prot						
Protected Phases	2 3 4	1 2 3	5 6	5 6	1 2	1	2	3	4	5	6
Permitted Phases											
Minimum Split (s)						35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	36.0	61.0	57.0	57.0	49.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	28.1%	47.7%	44.5%	44.5%	38.3%	27.3%	11%	9%	8%	35%	9%
Yellow Time (s)						4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)						1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0					
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0					
Lead/Lag						Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio	0.93	0.69	0.62	0.81	0.97	1.54					
Control Delay	65.7	4.9	24.5	20.6	60.0	287.5					
Queue Delay	0.0	0.4	22.9	5.3	0.0	0.0					
Total Delay	65.7	5.3	47.5	25.8	60.0	287.5					
Queue Length 50th (ft)	349	62	253	331	504	~906					
Queue Length 95th (ft)	#479	60	255	427	440	#1152					
Internal Link Dist (ft)			109			530					
Turn Bay Length (ft)			100	100							
Base Capacity (vph)	812	1258	1496	1651	1246	506					
Starvation Cap Reductn	0	101	587	263	0	0					
Spillback Cap Reductn	0	0	0	0	0	0					
Storage Cap Reductn	0	0	0	0	0	0					
Reduced v/c Ratio	0.93	0.75	1.03	0.96	0.97	1.54					

Intersection Summary	
Area Type:	Other
Cycle Length: 128	
Actuated Cycle Length: 128	
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green	
Natural Cycle: 150	
Control Type: Pretimed	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 93: Route 16 & Beach Street (Route 1A)



Movement	NBR	SBR	SEL	SER2	NEL	NET
Lane Configurations						
Volume (vph)	710	810	737	1237	881	733
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	13	12	14	12	16
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.88	0.88	0.97	0.88	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	1.00
Flt Protected	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	3247	2824	3614	3497	3544	2091
Flt Permitted	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	3247	2824	3614	3497	3544	2091
Peak-hour factor, PHF	0.94	0.94	0.79	0.93	0.73	0.94
Adj. Flow (vph)	755	862	933	1330	1207	780
RTOR Reduction (vph)	0	0	0	201	0	0
Lane Group Flow (vph)	755	862	933	1129	1207	780
Heavy Vehicles (%)	3%	4%	2%	2%	4%	3%
Turn Type	custom	custom		Prot	Prot	
Protected Phases	2 3 4	1 2 3	5 6	5 6	1 2	1
Permitted Phases						
Actuated Green, G (s)	32.0	57.0	53.0	53.0	44.0	30.0
Effective Green, g (s)	30.0	58.0	54.0	54.0	45.0	31.0
Actuated g/C Ratio	0.23	0.45	0.42	0.42	0.35	0.24
Clearance Time (s)						5.0
Lane Grp Cap (vph)	761	1280	1525	1475	1246	506
v/s Ratio Prot	c0.23	0.31	0.26	c0.32	c0.34	c0.37
v/s Ratio Perm						
v/c Ratio	0.99	0.67	0.61	0.77	0.97	1.54
Uniform Delay, d1	48.9	27.5	28.8	31.6	40.8	48.5
Progression Factor	1.00	0.10	0.76	0.69	1.00	1.00
Incremental Delay, d2	30.8	1.9	1.7	3.6	19.0	253.4
Delay (s)	79.7	4.7	23.6	25.3	59.8	301.9
Level of Service	E	A	C	C	E	F
Approach Delay (s)			24.6			154.9
Approach LOS			C			F

Intersection Summary			
HCM Average Control Delay	72.9	HCM Level of Service	E
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	Err%	ICU Level of Service	H
Analysis Period (min)	15		

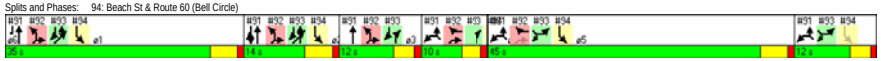
c Critical Lane Group

Lane Group	EBL	EBR	SBL	SBR	NWL	NWR	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations												
Volume (vph)	0	481	1474	487	0	0						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900						
Lane Width (ft)	12	16	16	16	12	12						
Right Turn on Red		Yes	Yes	Yes		Yes						
Link Speed (mph)	30		30		30							
Link Distance (ft)	1028		252		189							
Travel Time (s)	23.4		5.7		4.3							
Confl. Peds. (#/hr)		100			100							
Peak Hour Factor	0.92	0.89	0.92	0.92	0.92	0.92						
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	540	1602	529	0	0						
Turn Type		Free		Free								
Protected Phases			1 2 4 5				1	2	3	4	5	6
Permitted Phases		Free	6	Free								
Minimum Split (s)							35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	0.0	0.0	104.0	0.0	0.0	0.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	0.0%	0.0%	81.3%	0.0%	0.0%	0.0%	27%	11%	9%	8%	35%	9%
Yellow Time (s)							4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)							1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	-1.0	0.0	0.0	0.0						
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0						
Lead/Lag							Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio		0.31	0.47	0.29								
Control Delay		0.5	0.3	0.2								
Queue Delay		0.3	0.4	0.0								
Total Delay		0.8	0.7	0.2								
Queue Length 50th (ft)		0	0	0								
Queue Length 95th (ft)		0	m0	m0								
Internal Link Dist (ft)	948		172		109							
Turn Bay Length (ft)												
Base Capacity (vph)		1751	3373	1794								
Starvation Cap Reductn		0	1104	0								
Spillback Cap Reductn		637	1063	0								
Storage Cap Reductn		0	0	0								
Reduced v/c Ratio		0.48	0.71	0.29								

Intersection Summary	
Area Type:	Other
Cycle Length: 128	
Actuated Cycle Length: 128	
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green	
Natural Cycle: 150	
Control Type: Pretimed	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 94: Beach St & Route 60 (Bell Circle)



Movement	EBL	EBR	SBL	SBR	NWL	NWR
Lane Configurations						
Volume (vph)	0	481	1474	487	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	16	16	16	12	12
Total Lost time (s)		4.0	4.0	4.0		
Lane Util. Factor		1.00	0.97	1.00		
Frpb, ped/bikes		0.96	1.00	1.00		
Flpb, ped/bikes		1.00	1.00	1.00		
Frt		0.86	1.00	0.85		
Flt Protected		1.00	0.95	1.00		
Satd. Flow (prot)		1751	3891	1794		
Flt Permitted		1.00	1.00	1.00		
Satd. Flow (perm)		1751	4096	1794		
Peak-hour factor, PHF	0.92	0.89	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	540	1602	529	0	0
RTOR Reduction (vph)	0	0	215	0	0	0
Lane Group Flow (vph)	0	540	1387	529	0	0
Confl. Peds. (#/hr)		100			100	
Turn Type		Free		Free		
Protected Phases			1 2 4 5			
Permitted Phases		Free	6	Free		
Actuated Green, G (s)		128.0	102.0	128.0		
Effective Green, g (s)		128.0	102.0	128.0		
Actuated g/C Ratio		1.00	0.80	1.00		
Clearance Time (s)						
Lane Grp Cap (vph)		1751	3115	1794		
v/s Ratio Prot			c0.32			
v/s Ratio Perm		c0.31	c0.03	0.29		
v/c Ratio		0.31	0.45	0.29		
Uniform Delay, d1		0.0	4.1	0.0		
Progression Factor		1.00	0.17	1.00		
Incremental Delay, d2		0.5	0.2	0.2		
Delay (s)		0.5	0.9	0.2		
Level of Service		A	A	A		
Approach Delay (s)	0.5		0.7		0.0	
Approach LOS	A		A		A	

Intersection Summary			
HCM Average Control Delay	0.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	61.7%	ICU Level of Service	B
Analysis Period (min)	15		

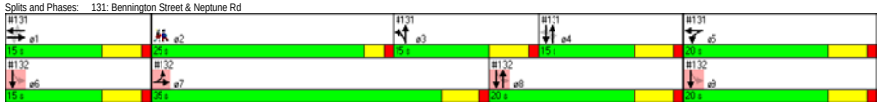
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2	ø6	ø7	ø8	ø9
Lane Configurations																	
Volume (vph)	15	371	103	323	261	63	119	231	3	16	91	122					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900					
Lane Width (ft)	12	12	10	10	12	10	11	11	11	11	11	11					
Right Turn on Red			Yes			Yes			Yes			Yes					
Link Speed (mph)		30			30			30			30						
Link Distance (ft)		669			3390			95			119						
Travel Time (s)		15.2			77.0			2.2			2.7						
Confl. Peds. (#/hr)										23		101					
Confl. Bikes (#/hr)									112								
Peak Hour Factor	0.81	0.81	0.81	0.90	0.90	0.90	0.93	0.93	0.93	0.78	0.78	0.78					
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	3%	3%	3%	8%	8%	8%					
Bus Blockages (#/hr)	0	0	0	0	0	8	0	0	0	0	0	0					
Parking (#/hr)					0	0					10	10					
Shared Lane Traffic (%)																	
Lane Group Flow (vph)	0	604	0	359	360	0	0	379	0	0	294	0					
Turn Type	Perm			D.P+P			D.P+P			Perm							
Protected Phases		1		5	1 5		3	3 4			4		2	6	7	8	9
Permitted Phases	1			1			4			4							
Detector Phase	1	1		5	1 5		3	3 4		4	4						
Switch Phase																	
Minimum Initial (s)	4.0	4.0		4.0			4.0			4.0	4.0		6.0	4.0	4.0	4.0	4.0
Minimum Split (s)	13.0	13.0		13.0			11.0			11.0	11.0		25.0	13.0	19.0	17.0	9.0
Total Split (s)	15.0	15.0	0.0	20.0	35.0	0.0	15.0	30.0	0.0	15.0	15.0	0.0	25.0	15.0	35.0	20.0	20.0
Total Split (%)	16.7%	16.7%	0.0%	22.2%	38.9%	0.0%	16.7%	33.3%	0.0%	16.7%	16.7%	0.0%	28%	17%	39%	22%	22%
Yellow Time (s)	4.0	4.0		4.0			4.0			4.0	4.0		2.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0			1.0			1.0	1.0		1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0					
Lead/Lag							Lag						Lead		Lead	Lag	
Lead-Lag Optimize?							Yes						Yes		Yes	Yes	
Recall Mode	C-Max	C-Max		None			None			None	None		None	None	None	None	None
v/c Ratio		1.61		0.74	0.46			0.44			0.63						
Control Delay		312.4		32.1	20.4			8.5			23.3						
Queue Delay		0.0		0.0	0.0			0.5			0.0						
Total Delay		312.4		32.1	20.4			9.0			23.3						
Queue Length 50th (ft)		~285		132	127			11			34						
Queue Length 95th (ft)		#359		#361	262			137			#77						
Internal Link Dist (ft)		589			3310			15			39						
Turn Bay Length (ft)																	
Base Capacity (vph)		376		486	783			858			464						
Starvation Cap Reductn		0		0	0			180			0						
Spillback Cap Reductn		0		0	0			0			0						
Storage Cap Reductn		0		0	0			0			0						
Reduced v/c Ratio		1.61		0.74	0.46			0.56			0.63						

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 131: Bennington Street & Neptune Rd



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	371	103	323	261	63	119	231	3	16	91	122
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	10	10	12	10	11	11	11	11	11	11
Total Lost time (s)		5.0		5.0	5.0			5.0			5.0	
Lane Util. Factor		0.95		1.00	1.00			0.95			0.95	
Frpb, ped/bikes		1.00		1.00	1.00			1.00			0.84	
Flpb, ped/bikes		1.00		1.00	1.00			1.00			1.00	
Frt		0.97		1.00	0.97			1.00			0.92	
Flt Protected		1.00		0.95	1.00			0.98			1.00	
Satd. Flow (prot)		3422		1668	1644			3325			2308	
Flt Permitted		0.57		0.29	1.00			0.71			0.90	
Satd. Flow (perm)		1960		509	1644			2402			2092	
Peak-hour factor, PHF	0.81	0.81	0.81	0.90	0.90	0.90	0.93	0.93	0.93	0.78	0.78	0.78
Adj. Flow (vph)	19	458	127	359	290	70	128	248	3	21	117	156
RTOR Reduction (vph)	0	25	0	0	8	0	0	1	0	0	128	0
Lane Group Flow (vph)	0	579	0	359	352	0	0	378	0	0	166	0
Confl. Peds. (#/hr)										23		101
Confl. Bikes (#/hr)									112			
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	3%	3%	3%	8%	8%	8%
Bus Blockages (#/hr)	0	0	0	0	0	8	0	0	0	0	0	0
Parking (#/hr)					0	0					10	10
Turn Type	Perm			D.P+P			D.P+P			Perm		
Protected Phases		1		5	1 5		3	3 4			4	
Permitted Phases	1			1			4			4		
Actuated Green, G (s)		13.8		35.1	40.1			27.7			16.2	
Effective Green, g (s)		13.8		35.1	40.1			27.7			16.2	
Actuated g/C Ratio		0.15		0.39	0.45			0.31			0.18	
Clearance Time (s)		5.0		5.0							5.0	
Vehicle Extension (s)		3.0		3.0							3.0	
Lane Grp Cap (vph)		301		473	732			857			377	
v/s Ratio Prot				c0.18	0.21			c0.06				
v/s Ratio Perm		c0.30		0.12				c0.08			0.08	
v/c Ratio		1.92		0.76	0.48			0.44			0.44	
Uniform Delay, d1		38.1		22.0	17.6			25.0			32.9	
Progression Factor		1.00		1.00	1.00			0.34			1.00	
Incremental Delay, d2		427.1		6.9	0.5			0.3			0.8	
Delay (s)		465.2		28.9	18.1			8.7			33.7	
Level of Service		F		C	B			A			C	
Approach Delay (s)		465.2			23.5			8.7			33.7	
Approach LOS		F			C			A			C	

Intersection Summary

HCM Average Control Delay	155.9	HCM Level of Service	F
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	27.2
Intersection Capacity Utilization	71.7%	ICU Level of Service	C
Analysis Period (min)	15		

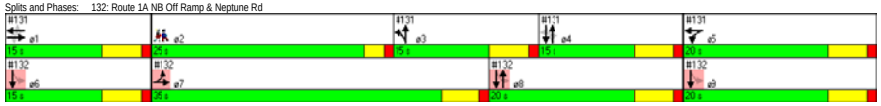
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø2	ø3	ø4	ø5	ø6	ø9
Lane Configurations																			
Volume (vph)	292	187	7	0	0	0	0	92	173	6	56	0							
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900							
Lane Width (ft)	10	11	12	12	12	12	11	11	11	11	11	11							
Right Turn on Red			Yes			Yes			Yes			Yes							
Link Speed (mph)		30			30			30			30								
Link Distance (ft)		106			312			647			107								
Travel Time (s)		2.4			7.1			14.7			2.4								
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.89	0.89	0.89	0.82	0.82	0.82							
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	7%	7%	7%	10%	10%	10%							
Shared Lane Traffic (%)																			
Lane Group Flow (vph)	317	211	0	0	0	0	0	297	0	0	75	0							
Turn Type	Split									Perm									
Protected Phases	7	7						8			6 8 9		1	2	3	4	5	6	9
Permitted Phases										6 8 9									
Detector Phase	7	7						8		6 8 9	6 8 9								
Switch Phase																			
Minimum Initial (s)	4.0	4.0						4.0					4.0	6.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	19.0	19.0						17.0					13.0	25.0	11.0	11.0	13.0	13.0	9.0
Total Split (s)	35.0	35.0	0.0	0.0	0.0	0.0	0.0	20.0	0.0	55.0	55.0	0.0	15.0	25.0	15.0	15.0	20.0	15.0	20.0
Total Split (%)	38.9%	38.9%	0.0%	0.0%	0.0%	0.0%	0.0%	22.2%	0.0%	61.1%	61.1%	0.0%	17%	28%	17%	17%	22%	17%	22%
Yellow Time (s)	4.0	4.0						4.0					4.0	2.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0						1.0					1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0							
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	5.0	5.0	4.0							
Lead/Lag	Lead	Lead						Lag						Lead	Lag				
Lead-Lag Optimize?	Yes	Yes						Yes						Yes	Yes				
Recall Mode	None	None						None					C-Max	None	None	None	None	None	None
v/c Ratio	0.76	0.46						0.62			0.04								
Control Delay	42.3	30.1						19.4			5.5								
Queue Delay	0.8	0.0						0.0			0.0								
Total Delay	43.1	30.1						19.4			5.5								
Queue Length 50th (ft)	165	99						29			4								
Queue Length 95th (ft)	235	149						63			m6								
Internal Link Dist (ft)		26			232			567			27								
Turn Bay Length (ft)																			
Base Capacity (vph)	540	586						652			1793								
Starvation Cap Reductn	0	0						0			0								
Spillback Cap Reductn	64	0						7			0								
Storage Cap Reductn	0	0						0			0								
Reduced v/c Ratio	0.67	0.36						0.46			0.04								

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 132: Route 1A NB Off Ramp & Neptune Rd



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	292	187	7	0	0	0	0	92	173	6	56	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)	5.0	5.0						5.0			5.0	
Lane Util. Factor	1.00	1.00						0.95			0.95	
Frt	1.00	0.99						0.90			1.00	
Flt Protected	0.95	1.00						1.00			1.00	
Satd. Flow (prot)	1620	1756						2942			3158	
Flt Permitted	0.95	1.00						1.00			0.93	
Satd. Flow (perm)	1620	1756						2942			2956	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.89	0.89	0.89	0.82	0.82	0.82
Adj. Flow (vph)	317	203	8	0	0	0	0	103	194	7	68	0
RTOR Reduction (vph)	0	1	0	0	0	0	0	169	0	0	0	0
Lane Group Flow (vph)	317	210	0	0	0	0	0	128	0	0	75	0
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	7%	7%	7%	10%	10%	10%
Turn Type	Split									Perm		
Protected Phases	7	7						8			6 8 9	
Permitted Phases										6 8 9		
Actuated Green, G (s)	23.2	23.2						11.7			56.8	
Effective Green, g (s)	23.2	23.2						11.7			56.8	
Actuated g/C Ratio	0.26	0.26						0.13			0.63	
Clearance Time (s)	5.0	5.0						5.0				
Vehicle Extension (s)	3.0	3.0						3.0				
Lane Grp Cap (vph)	418	453						382			1866	
v/s Ratio Prot	c0.20	0.12						c0.04				
v/s Ratio Perm											c0.03	
v/c Ratio	0.76	0.46						0.34			0.04	
Uniform Delay, d1	30.8	28.1						35.6			6.3	
Progression Factor	1.00	1.00						1.00			0.70	
Incremental Delay, d2	7.7	0.7						0.5			0.0	
Delay (s)	38.5	28.9						36.1			4.4	
Level of Service	D	C						D			A	
Approach Delay (s)		34.7			0.0			36.1			4.4	
Approach LOS		C			A			D			A	

Intersection Summary					
HCM Average Control Delay	32.6	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.29				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		14.5	
Intersection Capacity Utilization	32.6%	ICU Level of Service		A	
Analysis Period (min)	15				

c Critical Lane Group



Movement	WBL	WBR	NBU	NBT	NBR	SBU	SBL	SBT
Lane Configurations								
Volume (veh/h)	44	62	18	1933	173	4	23	1850
Sign Control	Stop			Free				Free
Grade	0%			0%				0%
Peak Hour Factor	0.80	0.80	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	55	78	0	2056	184	0	24	1968
Pedestrians								
Lane Width (ft)								
Walking Speed (ft/s)								
Percent Blockage								
Right turn flare (veh)								
Median type				None				None
Median storage veh)								
Upstream signal (ft)								405
pX, platoon unblocked	0.50		0.00			0.00		
vC, conflicting volume	3181	1120	0			0	2240	
vC1, stage 1 conf vol								
vC2, stage 2 conf vol								
vCu, unblocked vol	3365	1120	0			0	2240	
tC, single (s)	6.8	6.9	0.0			0.0	4.2	
tC, 2 stage (s)								
tF (s)	3.5	3.3	0.0			0.0	2.2	
p0 queue free %	0	62	0			0	89	
cM capacity (veh/h)	3	202	0			0	224	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	55	78	1371	870	24	984	984
Volume Left	55	0	0	0	24	0	0
Volume Right	0	78	0	184	0	0	0
cSH	3	202	1700	1700	224	1700	1700
Volume to Capacity	20.89	0.38	0.81	0.51	0.11	0.58	0.58
Queue Length 95th (ft)	Err	42	0	0	9	0	0
Control Delay (s)	Err	33.4	0.0	0.0	23.0	0.0	0.0
Lane LOS	F	D			C		
Approach Delay (s)	4170.1		0.0		0.3		
Approach LOS	F						

Intersection Summary				
Average Delay	126.7			
Intersection Capacity Utilization	82.2%	ICU Level of Service		E
Analysis Period (min)	15			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	133	1904	145	0	1938
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.91	0.91	0.89	0.89	0.94	0.94
Hourly flow rate (vph)	0	146	2139	163	0	2062
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	3252	1151			2302	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3252	1151			2302	
tC, single (s)	6.9	7.0			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	22			100	
cM capacity (veh/h)	7	188			212	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	146	1426	876	1031	1031
Volume Left	0	0	0	0	0
Volume Right	146	0	163	0	0
cSH	188	1700	1700	1700	1700
Volume to Capacity	0.78	0.84	0.52	0.61	0.61
Queue Length 95th (ft)	131	0	0	0	0
Control Delay (s)	69.8	0.0	0.0	0.0	0.0
Lane LOS	F				
Approach Delay (s)	69.8	0.0		0.0	
Approach LOS	F				

Intersection Summary				
Average Delay	2.3			
Intersection Capacity Utilization	72.1%	ICU Level of Service		C
Analysis Period (min)	15			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	117	2008	125	0	1912
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.79	0.79	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	0	148	2136	133	0	2034
Pedestrians	1					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			976			829
pX, platoon unblocked	0.68	0.45			0.45	
vC, conflicting volume	3221	1136			2270	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0	0			1391	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	70			100	
cM capacity (veh/h)	699	492			221	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	148	1424	845	1017	1017
Volume Left	0	0	0	0	0
Volume Right	148	0	133	0	0
cSH	492	1700	1700	1700	1700
Volume to Capacity	0.30	0.84	0.50	0.60	0.60
Queue Length 95th (ft)	31	0	0	0	0
Control Delay (s)	15.5	0.0	0.0	0.0	0.0
Lane LOS	C				
Approach Delay (s)	15.5	0.0		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	73.4%	ICU Level of Service	D
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	61	183	415	0	0	407
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.84	0.84	0.82	0.82	0.86	0.86
Hourly flow rate (vph)	73	218	506	0	0	473
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						233
pX, platoon unblocked						
vC, conflicting volume	743	253			506	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	743	253			506	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	80	71			100	
cM capacity (veh/h)	355	753			1062	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	73	218	253	253	237	237
Volume Left	73	0	0	0	0	0
Volume Right	0	218	0	0	0	0
cSH	355	753	1700	1700	1700	1700
Volume to Capacity	0.20	0.29	0.15	0.15	0.14	0.14
Queue Length 95th (ft)	19	30	0	0	0	0
Control Delay (s)	17.7	11.7	0.0	0.0	0.0	0.0
Lane LOS	C	B				
Approach Delay (s)	13.2		0.0		0.0	
Approach LOS	B					

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	29.5%	ICU Level of Service	A
Analysis Period (min)	15		

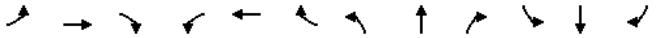


Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	243	0	0	2439	122
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.89	0.89	0.92	0.92	0.91	0.91
Hourly flow rate (vph)	0	273	0	0	2680	134
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2747	960	2814			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2747	960	2814			
tC, single (s)	6.9	7.0	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.2			
p0 queue free %	100	0	100			
cM capacity (veh/h)	15	249	134			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3
Volume Total	273	1072	1072	670
Volume Left	0	0	0	0
Volume Right	273	0	0	134
cSH	249	1700	1700	1700
Volume to Capacity	1.10	0.63	0.63	0.39
Queue Length 95th (ft)	293	0	0	0
Control Delay (s)	127.8	0.0	0.0	0.0
Lane LOS	F			
Approach Delay (s)	127.8	0.0		
Approach LOS	F			

Intersection Summary				
Average Delay	11.3			
Intersection Capacity Utilization	71.6%	ICU Level of Service	C	
Analysis Period (min)	15			

Intersection Sign configuration not allowed in HCM analysis.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	34	76	13	4	289	13	6	193	33
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.91	0.91	0.91	0.74	0.74	0.74	0.81	0.81	0.81
Hourly flow rate (vph)	0	0	0	37	84	14	5	391	18	7	238	41
Pedestrians		10			20			4			13	
Lane Width (ft)		0.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			2			0			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								119				
pX, platoon unblocked	0.95	0.95		0.95	0.95	0.95				0.95		
vC, conflicting volume	559	722	154	568	734	237	289			428		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	422	595	154	432	607	82	289			284		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	92	78	98	100			99		
cM capacity (veh/h)	387	383	862	466	381	891	1270			1187		

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	135	201	213	127	160
Volume Left	37	5	0	7	0
Volume Right	14	0	18	0	41
cSH	428	1270	1700	1187	1700
Volume to Capacity	0.32	0.00	0.13	0.01	0.09
Queue Length 95th (ft)	33	0	0	0	0
Control Delay (s)	17.2	0.2	0.0	0.5	0.0
Lane LOS	C	A		A	
Approach Delay (s)	17.2	0.1		0.2	
Approach LOS	C				

Intersection Summary				
Average Delay	2.9			
Intersection Capacity Utilization	28.1%	ICU Level of Service	A	
Analysis Period (min)	15			

Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

Synchro 7 Capacity Analysis
2022 Build Condition
Friday Evening Peak Hour

Signalized and Unsignalized Synchro Analysis

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1605	239	319	1683	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	9	11	12	12
Storage Length (ft)		0	130		0	0
Storage Lanes		0	1		0	0
Taper Length (ft)		25	25		25	25
Right Turn on Red		Yes				Yes
Link Speed (mph)	30			30	30	
Link Distance (ft)	572			1857	345	
Travel Time (s)	13.0			42.2	7.8	
Peak Hour Factor	0.93	0.93	0.92	0.92	0.95	0.95
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Bus Blockages (#/hr)	0	0	0	2	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1983	0	347	1829	0	0
Turn Type			Prot			
Protected Phases	2		1	1 2		
Permitted Phases						
Detector Phase	2		1	1 2		
Switch Phase						
Minimum Initial (s)	4.0		4.0			
Minimum Split (s)	20.0		20.0			
Total Split (s)	75.0	0.0	30.0	105.0	0.0	0.0
Total Split (%)	71.4%	0.0%	28.6%	100.0%	0.0%	0.0%
Yellow Time (s)	3.5		3.5			
All-Red Time (s)	0.5		0.5			
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	Max		None			
v/c Ratio	0.60		0.87	0.37		
Control Delay	9.8		61.3	0.2		
Queue Delay	0.5		0.0	0.0		
Total Delay	10.3		61.3	0.2		
Queue Length 50th (ft)	229		225	0		
Queue Length 95th (ft)	270		#384	0		
Internal Link Dist (ft)	492			1777	265	
Turn Bay Length (ft)			130			
Base Capacity (vph)	3312		398	4951		
Starvation Cap Reductn	763		0	0		
Spillback Cap Reductn	0		0	0		
Storage Cap Reductn	0		0	0		
Reduced v/c Ratio	0.78		0.87	0.37		

Intersection Summary	
Area Type:	Other
Cycle Length: 105	
Actuated Cycle Length: 105	
Natural Cycle: 50	
Control Type: Semi Act-Uncoord	

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Route 145 & Route 1A on-ramp



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1605	239	319	1683	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	11	11	9	11	12	12
Total Lost time (s)	4.0		4.0	4.0		
Lane Util. Factor	0.91		1.00	0.91		
Frt	0.98		1.00	1.00		
Flt Protected	1.00		0.95	1.00		
Satd. Flow (prot)	4868		1608	4951		
Flt Permitted	1.00		0.95	1.00		
Satd. Flow (perm)	4868		1608	4951		
Peak-hour factor, PHF	0.93	0.93	0.92	0.92	0.95	0.95
Adj. Flow (vph)	1726	257	347	1829	0	0
RTOR Reduction (vph)	19	0	0	0	0	0
Lane Group Flow (vph)	1964	0	347	1829	0	0
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Bus Blockages (#/hr)	0	0	0	2	0	0
Turn Type			Prot			
Protected Phases	2		1	1 2		
Permitted Phases						
Actuated Green, G (s)	71.0		26.0	105.0		
Effective Green, g (s)	71.0		26.0	105.0		
Actuated g/C Ratio	0.68		0.25	1.00		
Clearance Time (s)	4.0		4.0			
Vehicle Extension (s)	3.0		3.0			
Lane Grp Cap (vph)	3292		398	4951		
v/s Ratio Prot	c0.40		c0.22	0.37		
v/s Ratio Perm						
v/c Ratio	0.60		0.87	0.37		
Uniform Delay, d1	9.2		37.9	0.0		
Progression Factor	1.00		1.00	1.00		
Incremental Delay, d2	0.8		18.5	0.0		
Delay (s)	10.0		56.4	0.0		
Level of Service	B		E	A		
Approach Delay (s)	10.0			9.0	0.0	
Approach LOS	B			A	A	

Intersection Summary			
HCM Average Control Delay	9.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations													
Volume (vph)	100	280	218	0	0	0	410	460	91	68	248	113	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	10	12	12	12	10	11	12	12	12	12	
Storage Length (ft)	0		50	0		0	0		0	0		0	
Storage Lanes	0		1	0		0	1		0	0		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		988			531			233			338		
Travel Time (s)		22.5			12.1			5.3			7.7		
Peak Hour Factor	0.98	0.98	0.98	0.92	0.92	0.92	0.96	0.96	0.96	0.97	0.97	0.97	
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%	
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	2	
Parking (#/hr)									0				
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	388	222	0	0	0	427	574	0	0	442	0	
Turn Type	Split		Prot				D.P+P			Perm			
Protected Phases	4	4	4				2	2 6			6		9
Permitted Phases							6			6			
Detector Phase	4	4	4				2	2 6		6	6		
Switch Phase													
Minimum Initial (s)	1.0	1.0	1.0				1.0			1.0	1.0		1.0
Minimum Split (s)	7.0	7.0	7.0				6.0			7.0	7.0		5.0
Total Split (s)	29.0	29.0	29.0	0.0	0.0	0.0	13.0	31.0	0.0	18.0	18.0	0.0	22.0
Total Split (%)	35.4%	35.4%	35.4%	0.0%	0.0%	0.0%	15.9%	37.8%	0.0%	22.0%	22.0%	0.0%	27%
Yellow Time (s)	4.0	4.0	4.0				4.0			5.0	5.0		3.5
All-Red Time (s)	2.0	2.0	2.0				1.0			1.0	1.0		0.5
Lost Time Adjust (s)	-2.0	-2.0	-2.0	0.0	0.0	0.0	-1.0	-1.0	0.0	-2.0	-2.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lag	Lag	Lag				Lead			Lag	Lag		Lead
Lead-Lag Optimize?	Yes	Yes	Yes				Yes			Yes	Yes		Yes
Recall Mode	None	None	None				None			Max	Max		None
v/c Ratio		0.69	0.43				1.14	0.77			0.72		
Control Delay		26.8	12.4				113.7	26.5			29.9		
Queue Delay		0.0	0.0				0.0	0.0			0.0		
Total Delay		26.8	12.4				113.7	26.5			29.9		
Queue Length 50th (ft)		102	25				~112	142			62		
Queue Length 95th (ft)		#339	115				#458	#561			#216		
Internal Link Dist (ft)		908			451			153			258		
Turn Bay Length (ft)			50										
Base Capacity (vph)		708	626				373	744			618		
Starvation Cap Reductn		0	0				0	0			0		
Spillback Cap Reductn		0	0				0	0			0		
Storage Cap Reductn		0	0				0	0			0		
Reduced v/c Ratio		0.55	0.35				1.14	0.77			0.72		

Intersection Summary

Area Type: CBD
Cycle Length: 82
Actuated Cycle Length: 60.7
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Winthrop Avenue & State Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	100	280	218	0	0	0	410	460	91	68	248	113
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	10	12	12	12	10	11	12	12	12	12
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	
Lane Util. Factor		1.00	1.00				1.00	1.00			0.95	
Frt		1.00	0.85				1.00	0.98			0.96	
Flt Protected		0.99	1.00				0.95	1.00			0.99	
Satd. Flow (prot)		1655	1319				1501	1596			3066	
Flt Permitted		0.99	1.00				0.38	1.00			0.78	
Satd. Flow (perm)		1655	1319				594	1596			2415	
Peak-hour factor, PHF	0.98	0.98	0.98	0.92	0.92	0.92	0.96	0.96	0.96	0.97	0.97	0.97
Adj. Flow (vph)	102	286	222	0	0	0	427	479	95	70	256	116
RTOR Reduction (vph)	0	0	73	0	0	0	0	8	0	0	40	0
Lane Group Flow (vph)	0	388	149	0	0	0	427	566	0	0	402	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	2
Parking (#/hr)									0			
Turn Type	Split		Prot				D.P+P			Perm		
Protected Phases	4	4	4				2	2 6			6	
Permitted Phases							6			6		
Actuated Green, G (s)		18.6	18.6				20.8	25.8			12.5	
Effective Green, g (s)		20.6	20.6				22.8	26.8			14.5	
Actuated g/C Ratio		0.32	0.32				0.36	0.42			0.23	
Clearance Time (s)		6.0	6.0				5.0				6.0	
Vehicle Extension (s)		3.0	3.0				3.0				3.0	
Lane Grp Cap (vph)		537	428				346	674			551	
v/s Ratio Prot		c0.23	0.11				c0.18	0.35				
v/s Ratio Perm							c0.26				0.17	
v/c Ratio		0.72	0.35				1.23	0.84			0.73	
Uniform Delay, d1		18.9	16.3				18.4	16.4			22.7	
Progression Factor		1.00	1.00				1.00	1.00			1.00	
Incremental Delay, d2		4.8	0.5				127.9	9.3			8.2	
Delay (s)		23.7	16.8				146.3	25.7			30.9	
Level of Service		C	B				F	C			C	
Approach Delay (s)		21.2			0.0			77.1			30.9	
Approach LOS		C			A			E			C	

Intersection Summary

HCM Average Control Delay	50.6	HCM Level of Service		D	
HCM Volume to Capacity ratio	0.97				
Actuated Cycle Length (s)	63.5	Sum of lost time (s)		19.1	
Intersection Capacity Utilization	79.4%	ICU Level of Service		D	
Analysis Period (min)	15				

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø3
Lane Configurations													
Volume (vph)	34	379	492	147	259	73	304	268	113	101	308	17	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	10	12	12	10	12	12	10	16	12	12	12	
Storage Length (ft)	0		0	0		0	250		305	0		150	
Storage Lanes	0		1	1		0	1		1	0		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			No			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		3390			1736			677			1166		
Travel Time (s)		77.0			39.5			15.4			26.5		
Peak Hour Factor	0.92	0.92	0.92	0.79	0.79	0.79	0.84	0.84	0.84	0.91	0.91	0.91	
Heavy Vehicles (%)	2%	2%	2%	6%	6%	6%	4%	4%	4%	2%	2%	2%	
Parking (#/hr)			1			1				1			
Shared Lane Traffic (%)							10%						
Lane Group Flow (vph)	0	449	535	186	420	0	326	355	135	0	468	0	
Turn Type	Perm		pm+ov	D.P+P			Split		pt+ov	Split			
Protected Phases		1	2	7	1 7		2	2	2 7	4	4		3
Permitted Phases	1		1	1									
Detector Phase	1	1	2	7	1 7		2	2	2 7	4	4		
Switch Phase													
Minimum Initial (s)	4.0	4.0	4.0	4.0			4.0	4.0		4.0	4.0		4.0
Minimum Split (s)	13.0	13.0	20.0	8.0			20.0	20.0		20.0	20.0		30.0
Total Split (s)	37.0	37.0	34.0	13.0	50.0	0.0	34.0	34.0	47.0	45.0	45.0	0.0	30.0
Total Split (%)	23.3%	23.3%	21.4%	8.2%	31.4%	0.0%	21.4%	21.4%	29.6%	28.3%	28.3%	0.0%	19%
Yellow Time (s)	3.0	3.0	3.0	3.0			3.0	3.0		3.0	3.0		3.0
All-Red Time (s)	1.0	1.0	1.0	1.0			1.0	1.0		1.0	1.0		1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lead	Lag				Lag	Lag		Lag	Lag		Lead
Lead-Lag Optimize?	Yes	Yes	Yes				Yes	Yes		Yes	Yes		Yes
Recall Mode	None	None	None	None			None	None		None	None		None
v/c Ratio		5.61	0.87	1.28	0.86		1.02	1.14	0.25		0.96		
Control Delay		2125.9	51.4	203.1	63.2		109.9	142.5	5.0		82.3		
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0		
Total Delay		2125.9	51.4	203.1	63.2		109.9	142.5	5.0		82.3		
Queue Length 50th (ft)		~648	359	~142	309		284	~341	0		371		
Queue Length 95th (ft)		#1064	#808	#319	#520		#571	#646	29		#779		
Internal Link Dist (ft)		3310			1656			597			1086		
Turn Bay Length (ft)							250		305				
Base Capacity (vph)		80	612	145	486		319	312	540		485		
Starvation Cap Reductn		0	0	0	0		0	0	0		0		
Spillback Cap Reductn		0	0	0	0		0	0	0		0		
Storage Cap Reductn		0	0	0	0		0	0	0		0		
Reduced v/c Ratio		5.61	0.87	1.28	0.86		1.02	1.14	0.25		0.96		

Intersection Summary

Area Type: CBD
Cycle Length: 159
Actuated Cycle Length: 141
Natural Cycle: 145
Control Type: Actuated-Uncoordinated
Description: WB defacto left recoded

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Bennington Street & Saratoga Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	379	492	147	259	73	304	268	113	101	308	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	10	12	12	10	16	12	12	12
Total Lost time (s)		4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		0.95	0.95	1.00		1.00	
Frt		1.00	0.85	1.00	0.97		1.00	1.00	0.85		0.99	
Flt Protected		1.00	1.00	0.95	1.00		0.95	0.99	1.00		0.99	
Satd. Flow (prot)		1558	1275	1533	1456		1484	1451	1584		1648	
Flt Permitted		0.21	1.00	0.12	1.00		0.95	0.99	1.00		0.99	
Satd. Flow (perm)		334	1275	194	1456		1484	1451	1584		1648	
Peak-hour factor, PHF	0.92	0.92	0.92	0.79	0.79	0.79	0.84	0.84	0.84	0.91	0.91	0.91
Adj. Flow (vph)	37	412	535	186	328	92	362	319	135	111	338	19
RTOR Reduction (vph)	0	0	0	0	6	0	0	0	98	0	1	0
Lane Group Flow (vph)	0	449	535	186	414	0	326	355	37	0	467	0
Heavy Vehicles (%)	2%	2%	2%	6%	6%	6%	4%	4%	4%	2%	2%	2%
Parking (#/hr)			1			1			1			
Turn Type	Perm		pm+ov	D.P+P			Split		pt+ov	Split		
Protected Phases		1	2	7	1 7		2	2	2 7	4	4	
Permitted Phases	1		1	1								
Actuated Green, G (s)		33.3	63.6	42.4	46.4		30.3	30.3	39.4		41.4	
Effective Green, g (s)		33.3	63.6	42.4	46.4		30.3	30.3	39.4		41.4	
Actuated g/C Ratio		0.23	0.44	0.30	0.32		0.21	0.21	0.27		0.29	
Clearance Time (s)		4.0	4.0	4.0			4.0	4.0			4.0	
Vehicle Extension (s)		3.0	3.0	3.0			3.0	3.0			3.0	
Lane Grp Cap (vph)		78	601	142	471		314	307	436		476	
v/s Ratio Prot			0.19	c0.08	0.28		0.22	c0.24	0.02		c0.28	
v/s Ratio Perm		c1.34	0.23	0.30								
v/c Ratio		5.76	0.89	1.31	0.88		1.04	1.16	0.09		0.98	
Uniform Delay, d1		55.0	36.6	45.1	45.8		56.5	56.5	38.6		50.6	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2		2168.0	15.3	180.8	16.8		61.1	100.7	0.1		36.3	
Delay (s)		2223.0	51.9	225.8	62.6		117.6	157.2	38.7		86.9	
Level of Service		F	D	F	E		F	F	D		F	
Approach Delay (s)		1042.6			112.7			121.7			86.9	
Approach LOS		F			F			F			F	

Intersection Summary

HCM Average Control Delay	429.4	HCM Level of Service	F
HCM Volume to Capacity ratio	2.46		
Actuated Cycle Length (s)	143.3	Sum of lost time (s)	29.2
Intersection Capacity Utilization	100.2%	ICU Level of Service	G
Analysis Period (min)	15		

Description: WB defacto left recoded
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBT	NBR	SBT	SBR	SEL2	SEL	SER	SER2
Lane Configurations															
Volume (vph)	10	255	13	1099	423	97	65	655	1460	580	18	1	128	16	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	10	16	12	12	12	12	12	14	16	12	12	12	12	12
Storage Length (ft)	50		0	0		0			0		0		0	0	
Storage Lanes	1		1	2		0			1		0		1	0	
Taper Length (ft)	25		25	25		25			25		25		25	25	
Right Turn on Red			Yes				No		Yes						Yes
Link Speed (mph)		30			30			30		30			30		
Link Distance (ft)		485			572			480		673			302		
Travel Time (s)		11.0			13.0			10.9		15.3			6.9		
Peak Hour Factor	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.97	0.97	0.94	0.94	0.76	0.76	0.76	0.76
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	2%	3%	3%	3%	3%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	294	14	1195	636	0	0	675	1505	636	0	0	191	0	0
Turn Type	Split		Prot	Split					custom			Split			
Protected Phases	4	4	4	8	8			2	2	6		12	12		
Permitted Phases									4 8 12						
Detector Phase	4	4	4	8	8			2	2	6		12	12		
Switch Phase															
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0	4.0		4.0	4.0		
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0			21.0	21.0	21.0		21.0	21.0		
Total Split (s)	35.0	35.0	35.0	80.0	80.0	0.0	0.0	70.0	70.0	70.0	0.0	30.0	30.0	0.0	0.0
Total Split (%)	16.3%	16.3%	16.3%	37.2%	37.2%	0.0%	0.0%	32.6%	32.6%	32.6%	0.0%	14.0%	14.0%	0.0%	0.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0	4.0		4.0	4.0		
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0			1.0	1.0	1.0		1.0	1.0		
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	0.0	0.0	-1.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag															
Lead-Lag Optimize?															
Recall Mode	None	None	None	None	None			Max	Max	Max		None	None		
v/c Ratio		0.76	0.06	0.95	0.98			0.61	0.90	0.51			0.90		
Control Delay		102.0	29.9	80.4	93.8			63.6	8.5	60.2			128.8		
Queue Delay		0.0	0.0	156.6	168.5			0.0	0.0	0.0			0.0		
Total Delay		102.0	29.9	237.0	262.3			63.6	8.5	60.2			128.8		
Queue Length 50th (ft)		210	0	836	874			420	0	380			264		
Queue Length 95th (ft)		270	26	#1024	#1200			511	0	464			#322		
Internal Link Dist (ft)		405			492			400		593			222		
Turn Bay Length (ft)															
Base Capacity (vph)		476	269	1252	651			1110	1672	1253			219		
Starvation Cap Reductn		0	0	372	196			0	0	0			0		
Spillback Cap Reductn		0	0	0	0			0	0	0			0		
Storage Cap Reductn		0	0	0	0			0	0	0			0		
Reduced v/c Ratio		0.62	0.05	1.36	1.40			0.61	0.90	0.51			0.87		

Intersection Summary

Area Type: Other
Cycle Length: 215
Actuated Cycle Length: 208.5
Natural Cycle: 115
Control Type: Semi Act-Uncoord
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Winthrop Avenue & Route 16



Movement	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBT	NBR	SBT	SBR	SEL2	SEL	SER	SER2
Lane Configurations															
Volume (vph)	10	255	13	1099	423	97	65	655	1460	580	18	1	128	16	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	16	12	12	12	12	12	14	16	12	12	12	12	12
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0	4.0	4.0			4.0		
Lane Util. Factor		0.95	1.00	0.97	1.00			0.95	1.00	0.95			1.00		
Frt		1.00	0.85	1.00	0.96			1.00	0.85	1.00			0.98		
Flt Protected		1.00	1.00	0.95	1.00			1.00	1.00	1.00			0.96		
Satd. Flow (prot)		3203	1729	3433	1785			3505	1672	3954			1756		
Flt Permitted		1.00	1.00	0.95	1.00			1.00	1.00	1.00			0.96		
Satd. Flow (perm)		3203	1729	3433	1785			3505	1672	3954			1756		
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.97	0.97	0.94	0.94	0.76	0.76	0.76	0.76
Adj. Flow (vph)	11	283	14	1195	460	105	71	675	1505	617	19	1	168	21	1
RTOR Reduction (vph)	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	294	2	1195	636	0	0	675	1505	636	0	0	191	0	0
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	2%	3%	3%	3%	3%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Turn Type	Split		Prot	Split					custom			Split			
Protected Phases	4	4	4	8	8			2	2	6		12	12		
Permitted Phases									4 8 12						
Actuated Green, G (s)		24.2	24.2	75.1	75.1			65.0	198.5	65.0			24.2		
Effective Green, g (s)		25.2	25.2	76.1	76.1			66.0	200.5	66.0			25.2		
Actuated g/C Ratio		0.12	0.12	0.36	0.36			0.32	0.96	0.32			0.12		
Clearance Time (s)		5.0	5.0	5.0	5.0			5.0	5.0	5.0			5.0		
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0	3.0	3.0			3.0		
Lane Grp Cap (vph)		387	209	1253	652			1109	1672	1252			212		
v/s Ratio Prot		0.09	0.00	0.35	c0.36			0.19	c0.28	0.16			0.11		
v/s Ratio Perm									0.62						
v/c Ratio		0.76	0.01	0.95	0.98			0.61	0.90	0.51			0.90		
Uniform Delay, d1		88.7	80.7	64.5	65.3			60.3	1.1	58.0			90.4		
Progression Factor		1.00	1.00	1.00	1.00			1.00	1.00	1.00			1.00		
Incremental Delay, d2		8.3	0.0	15.6	28.9			2.5	7.0	1.5			35.9		
Delay (s)		97.0	80.7	80.1	94.2			62.8	8.2	59.5			126.3		
Level of Service		F	F	F	F			E	A	E			F		
Approach Delay (s)		96.3			85.0			25.1		59.5			126.3		
Approach LOS		F			F			C		E			F		

Intersection Summary

HCM Average Control Delay	58.7	HCM Level of Service	E
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	208.5	Sum of lost time (s)	4.0
Intersection Capacity Utilization	104.4%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations											
Volume (vph)	236	27	56	0	239	1137	357	291	297	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	16	12	12	12	12	12	12	12	12
Storage Length (ft)		0	0	0		0	115		200	0	0
Storage Lanes		1	1	0		2	1		1	0	0
Taper Length (ft)		25	25	25		25	25		25	25	25
Right Turn on Red			Yes			Yes			Yes		
Link Speed (mph)		30			30			30		30	
Link Distance (ft)		335			262			919		278	
Travel Time (s)		7.6			6.0			20.9		6.3	
Confl. Peds. (#/hr)	1					2	2				
Peak Hour Factor	0.87	0.87	0.87	0.91	0.91	0.91	0.88	0.88	0.88	0.92	0.92
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%
Shared Lane Traffic (%)	50%										
Lane Group Flow (vph)	135	167	64	0	263	1249	406	331	338	0	0
Turn Type	Split		Prot			Free	Prot		Prot		
Protected Phases	8	8	8		6		1	1 6	1 6		
Permitted Phases						Free					
Detector Phase	8	8	8		6		1	1 6	1 6		
Switch Phase											
Minimum Initial (s)	4.0	4.0	4.0		4.0		4.0				
Minimum Split (s)	20.0	20.0	20.0		20.0		8.0				
Total Split (s)	20.0	20.0	20.0	0.0	20.0	0.0	30.0	50.0	50.0	0.0	0.0
Total Split (%)	28.6%	28.6%	28.6%	0.0%	28.6%	0.0%	42.9%	71.4%	71.4%	0.0%	0.0%
Yellow Time (s)	3.0	3.0	3.0		3.0		3.0				
All-Red Time (s)	1.0	1.0	1.0		1.0		1.0				
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lag	Lag		Lead						
Lead-Lag Optimize?	Yes	Yes	Yes		Yes						
Recall Mode	None	None	None		Max		None				
v/c Ratio	0.47	0.29	0.17		0.26	0.79	0.69	0.14	0.28		
Control Delay	28.6	23.2	8.0		19.6	4.1	23.8	3.7	1.2		
Queue Delay	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		
Total Delay	28.6	23.2	8.0		19.6	4.1	23.8	3.7	1.2		
Queue Length 50th (ft)	47	28	0		37	0	118	16	0		
Queue Length 95th (ft)	102	55	25		81	0	219	36	21		
Internal Link Dist (ft)		255			182			839		198	
Turn Bay Length (ft)							115		200		
Base Capacity (vph)	457	914	555		1004	1579	816	2403	1186		
Starvation Cap Reductn	0	0	0		0	0	0	0	0		
Spillback Cap Reductn	0	0	0		0	0	0	0	0		
Storage Cap Reductn	0	0	0		0	0	0	0	0		
Reduced v/c Ratio	0.30	0.18	0.12		0.26	0.79	0.50	0.14	0.28		

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 58.4
Natural Cycle: 60
Control Type: Actuated-Uncoordinated

Splits and Phases: 10: State Road & Ocean Avenue



Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations											
Volume (vph)	236	27	56	0	239	1137	357	291	297	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	16	12	12	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0		
Lane Util. Factor	0.91	0.91	1.00		0.95	1.00	1.00	0.95	1.00		
Frpb, ped/bikes	1.00	1.00	1.00		1.00	0.99	1.00	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00		
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85		
Flt Protected	0.95	0.95	1.00		1.00	1.00	0.95	1.00	1.00		
Satd. Flow (prot)	1626	3253	1812		3574	1579	1787	3574	1599		
Flt Permitted	0.95	0.95	1.00		1.00	1.00	0.95	1.00	1.00		
Satd. Flow (perm)	1626	3253	1812		3574	1579	1787	3574	1599		
Peak-hour factor, PHF	0.87	0.87	0.87	0.91	0.91	0.91	0.88	0.88	0.88	0.92	0.92
Adj. Flow (vph)	271	31	64	0	263	1249	406	331	338	0	0
RTOR Reduction (vph)	0	0	53	0	0	0	0	0	107	0	0
Lane Group Flow (vph)	135	167	11	0	263	1249	406	331	231	0	0
Confl. Peds. (#/hr)	1					2	2				
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%
Turn Type	Split		Prot			Free	Prot		Prot		
Protected Phases	8	8	8		6		1	1 6	1 6		
Permitted Phases						Free					
Actuated Green, G (s)	10.4	10.4	10.4		16.4	58.1	19.3	39.7	39.7		
Effective Green, g (s)	10.4	10.4	10.4		16.4	58.1	19.3	39.7	39.7		
Actuated g/C Ratio	0.18	0.18	0.18		0.28	1.00	0.33	0.68	0.68		
Clearance Time (s)	4.0	4.0	4.0		4.0		4.0				
Vehicle Extension (s)	3.0	3.0	3.0		3.0		3.0				
Lane Grp Cap (vph)	291	582	324		1009	1579	594	2442	1093		
v/s Ratio Prot	0.08	0.05	0.01		0.07		0.23	0.09	0.14		
v/s Ratio Perm						c0.79					
v/c Ratio	0.46	0.29	0.04		0.26	0.79	0.68	0.14	0.21		
Uniform Delay, d1	21.4	20.6	19.7		16.2	0.0	16.8	3.2	3.4		
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00		
Incremental Delay, d2	1.2	0.3	0.0		0.6	4.1	3.3	0.0	0.1		
Delay (s)	22.5	20.9	19.8		16.8	4.1	20.0	3.2	3.5		
Level of Service	C	C	B		B	A	C	A	A		
Approach Delay (s)		21.3			6.3			9.7		0.0	
Approach LOS		C			A			A		A	

Intersection Summary

HCM Average Control Delay	9.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	58.1	Sum of lost time (s)	0.0
Intersection Capacity Utilization	49.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Volume (vph)	35	262	73	69	234	71	14	144	1412	75	30	412	1349	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	50		0		150		0		800		0
Storage Lanes	1		0	1		0		1		0		1		0
Taper Length (ft)	25		25	25		25		25		25		25		25
Right Turn on Red			Yes			Yes				Yes				Yes
Link Speed (mph)		30			30				30				30	
Link Distance (ft)		1202			2003				910				1421	
Travel Time (s)		27.3			45.5				20.7				32.3	
Confl. Peds. (#/hr)	17		14	14		17				2				8
Confl. Bikes (#/hr)			1			1								
Peak Hour Factor	0.88	0.88	0.88	0.94	0.94	0.94	0.92	0.92	0.92	0.92	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)														
Lane Group Flow (vph)	40	381	0	73	325	0	0	172	1617	0	0	466	1442	0
Turn Type	Perm			Perm				Prot				Prot		
Protected Phases		4			8			1	6			5	2	
Permitted Phases	4			8										
Detector Phase	4	4		8	8			1	6			5	2	
Switch Phase														
Minimum Initial (s)	4.0	4.0		4.0	4.0			4.0	4.0			4.0	4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0			31.0	11.0			11.0	11.0	
Total Split (s)	36.0	36.0	0.0	36.0	36.0	0.0	0.0	36.0	56.0	0.0	0.0	36.0	56.0	0.0
Total Split (%)	28.1%	28.1%	0.0%	28.1%	28.1%	0.0%	0.0%	28.1%	43.8%	0.0%	0.0%	28.1%	43.8%	0.0%
Yellow Time (s)	4.0	4.0		4.0	4.0			4.0	4.0			4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0			2.0	2.0			2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	4.0	6.0	6.0	4.0	4.0	6.0	6.0	4.0	4.0	6.0	6.0	4.0
Lead/Lag								Lead	Lag			Lead	Lag	
Lead-Lag Optimize?								Yes	Yes			Yes	Yes	
Recall Mode	None	None		None	None			None	Max			None	Max	
v/c Ratio	0.34	0.90		0.97	0.76			no cap	1.19			no cap	1.05	
Control Delay	50.9	71.9		147.7	56.5				127.8				78.1	
Queue Delay	0.0	0.0		0.0	0.0				0.0				0.0	
Total Delay	50.9	71.9		147.7	56.5			Error	127.8			Error	78.1	
Queue Length 50th (ft)	28	302		60	244			−296	−852			−803	−688	
Queue Length 95th (ft)	65	#466		#164	#360			#443	#994			#1015	#831	
Internal Link Dist (ft)		1122			1923				830				1341	
Turn Bay Length (ft)	50			50				150				800		
Base Capacity (vph)	116	423		75	431			1	1361			1	1367	
Starvation Cap Reductn	0	0		0	0			0	0			0	0	
Spillback Cap Reductn	0	0		0	0			0	0			0	0	
Storage Cap Reductn	0	0		0	0			0	0			0	0	
Reduced v/c Ratio	0.34	0.90		0.97	0.75			172.00	1.19			466.00	1.05	

Intersection Summary

Area Type: Other
Cycle Length: 128
Actuated Cycle Length: 127.9
Natural Cycle: 110
Control Type: Semi Act-Uncoord
- Volume exceeds capacity, queue is theoretically infinite.
  Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
  Queue shown is maximum after two cycles.

Splits and Phases: 15: Revere St & Route 60



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Volume (vph)	35	262	73	69	234	71	14	144	1412	75	30	412	1349	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	0.95			1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00	1.00			1.00	1.00	
Flpb, ped/bikes	0.99	1.00		0.99	1.00			1.00	1.00			1.00	1.00	
Frt	1.00	0.97		1.00	0.96			1.00	0.99			1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00			0.95	1.00	
Satd. Flow (prot)	1734	1773		1775	1801			1752	3474			1752	3495	
Flt Permitted	0.27	1.00		0.17	1.00			0.13	1.00			0.13	1.00	
Satd. Flow (perm)	493	1773		321	1801			246	3474			246	3495	
Peak-hour factor, PHF	0.88	0.88	0.88	0.94	0.94	0.94	0.92	0.92	0.92	0.92	0.95	0.95	0.95	0.95
Adj. Flow (vph)	40	298	83	73	249	76	15	157	1535	82	32	434	1420	22
RTOR Reduction (vph)	0	8	0	0	8	0	0	0	3	0	0	0	1	0
Lane Group Flow (vph)	40	373	0	73	317	0	0	172	1614	0	0	466	1441	0
Confl. Peds. (#/hr)	17		14	14		17				2				8
Confl. Bikes (#/hr)			1			1								
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Perm			Perm				Prot				Prot		
Protected Phases		4			8			1	6			5	2	
Permitted Phases	4			8										
Actuated Green, G (s)	29.9	29.9		29.9	29.9			30.0	50.0			30.0	50.0	
Effective Green, g (s)	29.9	29.9		29.9	29.9			30.0	50.0			30.0	50.0	
Actuated g/C Ratio	0.23	0.23		0.23	0.23			0.23	0.39			0.23	0.39	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			3.0	3.0	
Lane Grp Cap (vph)	115	414		75	421			58	1358			58	1366	
v/s Ratio Prot		0.21			0.18				c0.46				0.41	
v/s Ratio Perm	0.08			c0.23				0.70				c1.89		
v/c Ratio	0.35	0.90		0.97	0.75			2.97	1.19			8.03	1.06	
Uniform Delay, d1	40.9	47.6		48.6	45.6			49.0	39.0			49.0	39.0	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00			1.00	1.00	
Incremental Delay, d2	1.8	22.3		94.2	7.4			929.1	92.5			3200.6	40.3	
Delay (s)	42.7	69.9		142.8	53.0			978.0	131.4			3249.5	79.3	
Level of Service	D	E		F	D			F	F			F	E	
Approach Delay (s)		67.3			69.4				212.8				853.6	
Approach LOS		E			E				F				F	

Intersection Summary

HCM Average Control Delay	457.3	HCM Level of Service	F
HCM Volume to Capacity ratio	3.01		
Actuated Cycle Length (s)	127.9	Sum of lost time (s)	18.0
Intersection Capacity Utilization	108.3%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

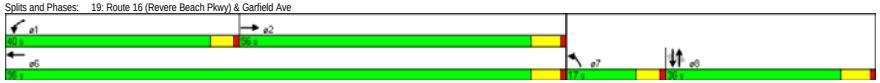
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1474	163	458	1742	6	280	289	152	178	189	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	10	10	10	11	11	12	12	12	12
Storage Length (ft)	0		0	200		0	300		50	0		80
Storage Lanes	0		0	1		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			No			No
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2232			2756			1675			1148	
Travel Time (s)		50.7			62.6			38.1			26.1	
Confl. Peds. (#/hr)	6					6	5		30	30		5
Peak Hour Factor	0.98	0.98	0.98	0.93	0.93	0.93	0.86	0.86	0.86	0.96	0.96	0.96
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	2%	2%	2%	1%	1%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1670	0	492	1879	0	326	336	177	185	197	157
Turn Type				Prot			pm+pt		Perm	Perm		Perm
Protected Phases		2		1	6		7	8			8	
Permitted Phases							8		8	8		8
Detector Phase		2		1	6		7	8	8	8	8	8
Switch Phase												
Minimum Initial (s)		15.0		8.0	15.0		8.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)		55.0		13.0	21.0		13.0	16.0	16.0	16.0	16.0	16.0
Total Split (s)	0.0	56.0	0.0	40.0	96.0	0.0	17.0	36.0	36.0	36.0	36.0	36.0
Total Split (%)	0.0%	37.6%	0.0%	26.8%	64.4%	0.0%	11.4%	24.2%	24.2%	24.2%	24.2%	24.2%
Yellow Time (s)		5.0		4.0	5.0		4.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)		1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	5.0	6.0	4.0	5.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag		Lag		Lead			Lead	Lag	Lag	Lag	Lag	Lag
Lead-Lag Optimize?								Yes	Yes	Yes	Yes	Yes
Recall Mode		Max		None	None		None	None	None	None	None	None
v/c Ratio		1.03		1.28	0.66		1.06	0.93	0.59	3.08	0.52	0.50
Control Delay		78.6		190.0	20.9		113.4	89.8	62.9	999.4	58.7	59.1
Queue Delay		0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		78.6		190.0	20.9		113.4	89.8	62.9	999.4	58.7	59.1
Queue Length 50th (ft)		~632		~604	421		~289	324	158	~312	173	137
Queue Length 95th (ft)		#729		#830	472		#478	#473	230	#475	257	214
Internal Link Dist (ft)		2152			2676			1595			1068	
Turn Bay Length (ft)				200			300		50			80
Base Capacity (vph)		1618		384	2839		307	363	301	60	379	316
Starvation Cap Reductn		0		0	0		0	0	0	0	0	0
Spillback Cap Reductn		0		0	0		0	0	0	0	0	0
Storage Cap Reductn		0		0	0		0	0	0	0	0	0
Reduced v/c Ratio		1.03		1.28	0.66		1.06	0.93	0.59	3.08	0.52	0.50

Intersection Summary

Area Type: Other
Cycle Length: 149
Actuated Cycle Length: 149
Natural Cycle: 150
Control Type: Semi Act-Uncoord
Description: HAS EXCL PED PHASE

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 19: Route 16 (Revere Beach Pkwy) & Garfield Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1474	163	458	1742	6	280	289	152	178	189	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	10	10	10	11	11	12	12	12	12
Total Lost time (s)		6.0		5.0	6.0		5.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor		0.91		1.00	0.91		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes		1.00		1.00	1.00		1.00	1.00	0.94	1.00	1.00	0.98
Flpb, ped/bikes		1.00		1.00	1.00		1.00	1.00	1.00	0.98	1.00	1.00
Frt		0.99		1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		4795		1636	4698		1708	1801	1495	1755	1881	1568
Flt Permitted		1.00		0.95	1.00		0.45	1.00	1.00	0.16	1.00	1.00
Satd. Flow (perm)		4795		1636	4698		812	1801	1495	299	1881	1568
Peak-hour factor, PHF	0.98	0.98	0.98	0.93	0.93	0.93	0.86	0.86	0.86	0.96	0.96	0.96
Adj. Flow (vph)	0	1504	166	492	1873	6	326	336	177	185	197	157
RTOR Reduction (vph)	0	9	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1661	0	492	1879	0	326	336	177	185	197	157
Confl. Peds. (#/hr)	6					6	5		30	30		5
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	2%	2%	2%	1%	1%	1%
Turn Type				Prot			pm+pt		Perm	Perm		Perm
Protected Phases		2		1	6		7	8			8	
Permitted Phases							8		8	8		8
Actuated Green, G (s)		50.0		35.0	90.0		42.0	30.0	30.0	30.0	30.0	30.0
Effective Green, g (s)		50.0		35.0	90.0		42.0	30.0	30.0	30.0	30.0	30.0
Actuated g/C Ratio		0.34		0.23	0.60		0.28	0.20	0.20	0.20	0.20	0.20
Clearance Time (s)		6.0		5.0	6.0		5.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)		4.0		1.0	4.0		1.0	8.0	8.0	8.0	8.0	8.0
Lane Grp Cap (vph)		1609		384	2838		301	363	301	60	379	316
v/s Ratio Prot		c0.35		c0.30	0.40		c0.09	0.19			0.10	
v/s Ratio Perm							0.22		0.12	c0.62		0.10
v/c Ratio		1.03		1.28	0.66		1.08	0.93	0.59	3.08	0.52	0.50
Uniform Delay, d1		49.5		57.0	19.5		52.2	58.4	53.9	59.5	53.1	52.8
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		31.1		145.2	0.6		75.8	31.7	7.6	980.0	4.7	5.2
Delay (s)		80.6		202.2	20.1		128.1	90.1	61.5	1039.5	57.8	58.0
Level of Service		F		F	C		F	F	E	F	E	E
Approach Delay (s)		80.6			57.9			98.8			394.8	
Approach LOS		F			E			F			F	

Intersection Summary

HCM Average Control Delay	104.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.59		
Actuated Cycle Length (s)	149.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	101.8%	ICU Level of Service	G
Analysis Period (min)	15		

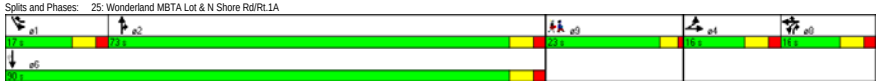
Description: HAS EXCL PED PHASE
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations													
Volume (vph)	0	0	0	70	0	374	0	1641	50	77	1219	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		0	0		0	0		175	370		50	
Storage Lanes	1		0	1		1	0		1	1		1	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		452			461			392			1885		
Travel Time (s)		10.3			10.5			8.9			42.8		
Peak Hour Factor	0.92	0.92	0.92	0.73	0.73	0.73	0.96	0.96	0.96	0.92	0.92	0.92	
Heavy Vehicles (%)	2%	2%	2%	5%	5%	5%	1%	1%	1%	2%	2%	2%	
Shared Lane Traffic (%)	0%			10%		49%							
Lane Group Flow (vph)	0	0	0	86	261	261	0	1709	52	84	1325	0	
Turn Type	Split			Split		pt+ov			pt+ov	Prot		Perm	
Protected Phases	4	4		8	8	1 8		2	2 8	1	6		9
Permitted Phases												6	
Detector Phase	4	4		8	8	1 8		2	2 8	1	6	6	
Switch Phase													
Minimum Initial (s)	5.0	5.0		5.0	5.0			10.0		6.0	10.0	10.0	5.0
Minimum Split (s)	11.0	11.0		11.0	11.0			16.0		12.0	16.0	16.0	23.0
Total Split (s)	16.0	16.0	0.0	16.0	16.0	33.0	0.0	73.0	89.0	17.0	90.0	90.0	23.0
Total Split (%)	11.0%	11.0%	0.0%	11.0%	11.0%	22.8%	0.0%	50.3%	61.4%	11.7%	62.1%	62.1%	16%
Yellow Time (s)	4.0	4.0		4.0	4.0			4.0		4.0	4.0	4.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0			2.0		2.0	2.0	2.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0	4.0	6.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	
Lead/Lag								Lag		Lead			
Lead-Lag Optimize?													
Recall Mode	None	None		None	None			C-Min		None	C-Min	C-Min	None
v/c Ratio				0.80	0.80	0.53		0.80	0.05	0.56	0.52		
Control Delay				110.6	26.9	9.3		28.5	3.5	68.9	13.0		
Queue Delay				0.0	0.0	0.0		0.0	0.0	0.0	0.0		
Total Delay				110.6	26.9	9.3		28.5	3.5	68.9	13.0		
Queue Length 50th (ft)				85	9	0		687	5	84	250		
Queue Length 95th (ft)				#127	36	21		860	13	m98	m363		
Internal Link Dist (ft)		372			381			312			1805		
Turn Bay Length (ft)									175	370			
Base Capacity (vph)				113	331	492		2138	1088	160	2564		
Starvation Cap Reductn				0	0	0		0	0	0	0		
Spillback Cap Reductn				0	0	0		0	0	0	0		
Storage Cap Reductn				0	0	0		0	0	0	0		
Reduced v/c Ratio				0.76	0.79	0.53		0.80	0.05	0.53	0.52		

Intersection Summary

Area Type: Other
Cycle Length: 145
Actuated Cycle Length: 145
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 120
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 25: Wonderland MBTA Lot & N Shore Rd/Rt.1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	70	0	374	0	1641	50	77	1219	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0	6.0		6.0	6.0	6.0	6.0	
Lane Util. Factor				0.95	0.91	0.95		0.95	1.00	1.00	0.95	
Frt				1.00	0.86	0.85		1.00	0.85	1.00	1.00	
Flt Protected				0.95	1.00	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)				1633	1406	1461		3574	1599	1770	3539	
Flt Permitted				0.95	1.00	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (perm)				1633	1406	1461		3574	1599	1770	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.73	0.73	0.73	0.96	0.96	0.96	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	96	0	512	0	1709	52	84	1325	0
RTOR Reduction (vph)	0	0	0	0	235	211	0	0	8	0	0	0
Lane Group Flow (vph)	0	0	0	86	26	50	0	1709	44	84	1325	0
Heavy Vehicles (%)	2%	2%	2%	5%	5%	5%	1%	1%	1%	2%	2%	2%
Turn Type	Split			Split		pt+ov			pt+ov	Prot		Perm
Protected Phases	4	4		8	8	1 8		2	2 8	1	6	
Permitted Phases												6
Actuated Green, G (s)				9.5	9.5	27.8		86.0	95.5	12.3	104.3	
Effective Green, g (s)				9.5	9.5	27.8		86.0	95.5	12.3	104.3	
Actuated g/C Ratio				0.07	0.07	0.19		0.59	0.66	0.08	0.72	
Clearance Time (s)				6.0	6.0			6.0		6.0	6.0	
Vehicle Extension (s)				2.0	2.0			3.0		3.0	3.0	
Lane Grp Cap (vph)				107	92	280		2120	1053	150	2546	
v/s Ratio Prot				c0.05	0.02	0.03		c0.48	0.03	0.05	c0.37	
v/s Ratio Perm												
v/c Ratio				0.80	0.29	0.18		0.81	0.04	0.56	0.52	
Uniform Delay, d1				66.8	64.5	49.0		23.0	8.7	63.8	9.1	
Progression Factor				1.00	1.00	1.00		1.00	1.00	0.98	1.27	
Incremental Delay, d2				32.3	0.6	0.3		3.4	0.0	2.4	0.4	
Delay (s)				99.1	65.2	49.4		26.4	8.7	64.8	11.9	
Level of Service				F	E	D		C	A	E	B	
Approach Delay (s)		0.0			63.2			25.9			15.1	
Approach LOS		A			E			C			B	

Intersection Summary

HCM Average Control Delay	27.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	37.2
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

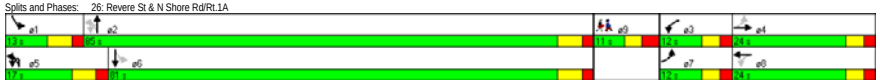
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations														
Volume (vph)	267	173	82	132	286	91	1	315	1632	153	60	997	242	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		0	80		0		200		0	75		0	
Storage Lanes	1		0	1		0		1		0	1		0	
Taper Length (ft)	25		25	25		25		25		25	25		25	
Right Turn on Red			Yes			Yes				Yes			Yes	
Link Speed (mph)		30			30				30			30		
Link Distance (ft)		2000			713				1885			1623		
Travel Time (s)		45.5			16.2				42.8			36.9		
Confl. Bikes (#/hr)			1			3								
Peak Hour Factor	0.79	0.79	0.79	0.80	0.80	0.80	0.90	0.90	0.90	0.90	0.89	0.89	0.89	
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	2%	2%	2%	2%	1%	1%	1%	
Bus Blockages (#/hr)	0	10	0	0	0	0	0	0	0	0	0	0	0	
Shared Lane Traffic (%)														
Lane Group Flow (vph)	338	323	0	165	472	0	0	351	1983	0	67	1392	0	
Turn Type	pm+pt			pm+pt			pm+pt	pm+pt			pm+pt			
Protected Phases	7	4		3	8		5	5	2		1	6		9
Permitted Phases	4			8			2	2			6			
Detector Phase	7	4		3	8		5	5	2		1	6		
Switch Phase														
Minimum Initial (s)	6.0	10.0		6.0	10.0		6.0	6.0	30.0		6.0	30.0		4.0
Minimum Split (s)	11.0	15.0		11.0	15.0		12.0	12.0	36.0		12.0	36.0		27.0
Total Split (s)	12.0	24.0	0.0	12.0	24.0	0.0	17.0	17.0	85.0	0.0	13.0	81.0	0.0	11.0
Total Split (%)	8.3%	16.6%	0.0%	8.3%	16.6%	0.0%	11.7%	11.7%	58.6%	0.0%	9.0%	55.9%	0.0%	8%
Yellow Time (s)	3.0	3.0		3.0	3.0		4.0	4.0	4.0		4.0	4.0		3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0		2.0	2.0		3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lead	Lag		Lead	Lag		
Lead-Lag Optimize?														
Recall Mode	None	None		None	None		None	None	C-Min		None	C-Min		None
v/c Ratio	2.47	1.38		1.18	1.91			1.64	1.01		0.50	0.77		
Control Delay	704.6	238.5		177.0	456.3			330.2	47.3		29.8	31.0		
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0		
Total Delay	704.6	238.5		177.0	456.3			330.2	47.3		29.8	31.0		
Queue Length 50th (ft)	~475	~394		~134	~681			~407	~1036		23	531		
Queue Length 95th (ft)	#568	#489		#234	#777			m#593	#1174		61	612		
Internal Link Dist (ft)		1920			633				1805			1543		
Turn Bay Length (ft)				80				200			75			
Base Capacity (vph)	137	234		140	247			214	1971		138	1810		
Starvation Cap Reductn	0	0		0	0			0	0		0	0		
Spillback Cap Reductn	0	0		0	0			0	0		0	0		
Storage Cap Reductn	0	0		0	0			0	0		0	0		
Reduced v/c Ratio	2.47	1.38		1.18	1.91			1.64	1.01		0.49	0.77		

Intersection Summary

Area Type: Other
Cycle Length: 145
Actuated Cycle Length: 145
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 145
Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 26: Revere St & N Shore Rd/Rt.1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	267	173	82	132	286	91	1	315	1632	153	60	997	242
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.96			1.00	0.99		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1694		1805	1824			1770	3494		1787	3469	
Flt Permitted	0.21	1.00		0.21	1.00			0.08	1.00		0.05	1.00	
Satd. Flow (perm)	392	1694		400	1824			148	3494		100	3469	
Peak-hour factor, PHF	0.79	0.79	0.79	0.80	0.80	0.80	0.90	0.90	0.90	0.90	0.89	0.89	0.89
Adj. Flow (vph)	338	219	104	165	358	114	1	350	1813	170	67	1120	272
RTOR Reduction (vph)	0	12	0	0	8	0	0	0	5	0	0	14	0
Lane Group Flow (vph)	338	311	0	165	464	0	0	351	1978	0	67	1378	0
Confl. Bikes (#/hr)			1			3							
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	2%	2%	2%	2%	1%	1%	1%
Bus Blockages (#/hr)	0	10	0	0	0	0	0	0	0	0	0	0	0
Turn Type	pm+pt			pm+pt			pm+pt	pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	5	2		1	6	
Permitted Phases	4			8			2	2			6		
Actuated Green, G (s)	26.0	19.0		26.0	19.0			91.4	80.4		80.6	75.0	
Effective Green, g (s)	26.0	19.0		26.0	19.0			91.4	80.4		80.6	75.0	
Actuated g/C Ratio	0.18	0.13		0.18	0.13			0.63	0.55		0.56	0.52	
Clearance Time (s)	5.0	5.0		5.0	5.0			6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	137	222		140	239			216	1937		121	1794	
v/s Ratio Prot	c0.12	0.18		0.06	0.25			c0.12	0.57		0.02	0.40	
v/s Ratio Perm	c0.32			0.15				c0.90			0.29		
v/c Ratio	2.47	1.40		1.18	1.94			1.62	1.02		0.55	0.77	
Uniform Delay, d1	57.7	63.0		57.7	63.0			38.3	32.3		32.9	28.0	
Progression Factor	1.00	1.00		1.00	1.00			1.38	0.91		1.00	1.00	
Incremental Delay, d2	681.6	205.0		132.0	439.0			295.0	22.3		5.4	3.2	
Delay (s)	739.3	268.0		189.8	502.0			348.0	51.8		38.3	31.2	
Level of Service	F	F		F	F			F	D		D	C	
Approach Delay (s)		509.0			421.1				96.3			31.6	
Approach LOS		F			F				F			C	

Intersection Summary

HCM Average Control Delay	172.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.86		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	33.0
Intersection Capacity Utilization	108.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

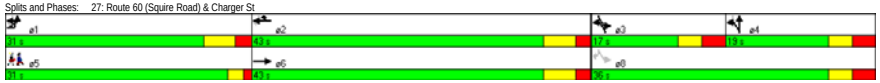
Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø5	ø8
Lane Configurations															
Volume (vph)	5	174	1776	0	0	1506	295	42	82	35	312	0	135		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)		400		0	0		50	0		0	0		125		
Storage Lanes		1		0	0		1	1		0	1		1		
Taper Length (ft)		25		25	25		25	25		25	25		25		
Right Turn on Red				Yes			Yes			Yes			Yes		
Link Speed (mph)			30			30			30			30			
Link Distance (ft)			930			2104			1965			1139			
Travel Time (s)			21.1			47.8			44.7			25.9			
Confl. Peds. (#/hr)													10		
Confl. Bikes (#/hr)										1					
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	0.84	0.84	0.84	0.81	0.81	0.81		
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%		
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	188	1869	0	0	1585	295	50	140	0	385	0	167		
Turn Type	Prot	Prot					Prot	Prot			custom		custom		
Protected Phases		1	6			2	2	3 4	4		3			5	8
Permitted Phases											8		1 2 4 8		
Detector Phase	1	1	6			2	2	3 4	4		3		1 2 4 8		
Switch Phase															
Minimum Initial (s)	6.0	6.0	20.0			20.0	20.0		6.0		6.0			4.0	6.0
Minimum Split (s)	12.0	12.0	26.0			26.0	26.0		12.0		12.0			30.0	20.0
Total Split (s)	31.0	31.0	43.0	0.0	0.0	43.0	43.0	36.0	19.0	0.0	17.0	0.0	129.0	31.0	36.0
Total Split (%)	28.2%	28.2%	39.1%	0.0%	0.0%	39.1%	39.1%	32.7%	17.3%	0.0%	15.5%	0.0%	117.3%	28%	33%
Yellow Time (s)	4.0	4.0	4.0			4.0	4.0		3.0		3.0			2.0	3.0
All-Red Time (s)	2.0	2.0	2.0			2.0	2.0		3.0		3.0			1.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	6.0	6.0	6.0	4.0	4.0	6.0	6.0	6.0	6.0	4.0	6.0	4.0	6.0		
Lead/Lag	Lead	Lead	Lag			Lag	Lag		Lag		Lead			Lead	
Lead-Lag Optimize?															
Recall Mode	None	None	C-Min			C-Min	C-Min		None		None			None	None
v/c Ratio		0.69	0.78			0.73	0.41	0.11	0.69		1.34		0.10		
Control Delay		37.7	39.4			30.2	19.7	31.0	59.6		208.2		0.1		
Queue Delay		0.0	0.0			0.0	0.0	0.0	0.0		0.0		0.0		
Total Delay		37.7	39.4			30.2	19.7	31.0	59.6		208.2		0.1		
Queue Length 50th (ft)		137	~521			344	107	26	84		~333		0		
Queue Length 95th (ft)		m143	m#541			447	201	53	139		#463		0		
Internal Link Dist (ft)			850			2024			1885			1059			
Turn Bay Length (ft)		400					50						125		
Base Capacity (vph)		402	2383			2157	715	492	228		287		1548		
Starvation Cap Reductn		0	0			0	0	0	0		0		0		
Spillback Cap Reductn		0	0			0	0	0	0		0		0		
Storage Cap Reductn		0	0			0	0	0	0		0		0		
Reduced v/c Ratio		0.47	0.78			0.73	0.41	0.10	0.61		1.34		0.11		

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 120
Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 27: Route 60 (Squire Road) & Charger St



Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	5	174	1776	0	0	1506	295	42	82	35	312	0	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0			6.0	6.0	6.0	6.0		6.0		6.0
Lane Util. Factor		1.00	0.91			0.91	1.00	1.00	1.00		1.00		1.00
Frpb, ped/bikes		1.00	1.00			1.00	1.00	1.00	1.00		1.00		0.99
Flpb, ped/bikes		1.00	1.00			1.00	1.00	1.00	1.00		1.00		1.00
Frt		1.00	1.00			1.00	0.85	1.00	0.95		1.00		0.85
Flt Protected		0.95	1.00			1.00	1.00	0.95	1.00		0.95		1.00
Satd. Flow (prot)		1770	5085			5085	1583	1805	1807		1805		1591
Flt Permitted		0.95	1.00			1.00	1.00	0.95	1.00		0.35		1.00
Satd. Flow (perm)		1770	5085			5085	1583	1805	1807		666		1591
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	1.00	0.84	0.84	0.84	0.81	0.81	0.81
Adj. Flow (vph)	5	183	1869	0	0	1585	295	50	98	42	385	0	167
RTOR Reduction (vph)	0	0	0	0	0	0	43	0	14	0	0	0	0
Lane Group Flow (vph)	0	188	1869	0	0	1585	252	50	126	0	385	0	167
Confl. Peds. (#/hr)													10
Confl. Bikes (#/hr)										1			
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	Prot					Prot	Prot			custom		custom
Protected Phases	1	1	6			2	2	3 4	4		3		
Permitted Phases											8		1 2 4 8
Actuated Green, G (s)		16.9	50.3			46.6	46.6	28.5	11.5		28.5		110.0
Effective Green, g (s)		16.9	50.3			46.6	46.6	28.5	11.5		28.5		110.0
Actuated g/C Ratio		0.15	0.46			0.42	0.42	0.26	0.10		0.26		1.00
Clearance Time (s)		6.0	6.0			6.0	6.0		6.0		6.0		
Vehicle Extension (s)		3.0	3.0			3.0	3.0		3.0		3.0		
Lane Grp Cap (vph)		272	2325			2154	671	468	189		286		1591
v/s Ratio Prot		c0.11	c0.37			0.31	0.16	0.03	0.07		c0.13		
v/s Ratio Perm											c0.21		0.10
v/c Ratio		0.69	0.80			0.74	0.38	0.11	0.66		1.35		0.10
Uniform Delay, d1		44.1	25.6			26.5	21.7	31.1	47.4		38.8		0.0
Progression Factor		0.79	1.42			1.00	1.00	1.00	1.00		1.00		1.00
Incremental Delay, d2		1.9	0.8			2.3	1.6	0.1	8.5		177.3		0.0
Delay (s)		36.6	37.1			28.8	23.3	31.2	55.9		216.1		0.0
Level of Service		D	D			C	C	C	E		F		A
Approach Delay (s)			37.0			28.0			49.4			150.7	
Approach LOS			D			C			D			F	

Intersection Summary

HCM Average Control Delay	47.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	76.3%	ICU Level of Service	D
Analysis Period (min)	15		

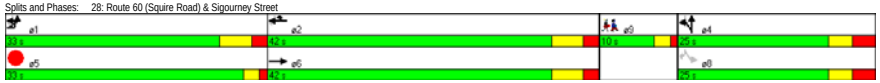
c Critical Lane Group

Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø5	ø9
Lane Configurations															
Volume (vph)	20	277	1700	0	0	1558	129	79	71	18	228	0	181		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)		325		0	0		0	0		0	0		0		
Storage Lanes		1		0	0		1	1		0	1		1		
Taper Length (ft)		25		25	25		25	25		25	25		25		
Right Turn on Red				No			Yes			Yes			Yes		
Link Speed (mph)			30			30			30			30			
Link Distance (ft)			924			930			1560			1008			
Travel Time (s)			21.0			21.1			35.5			22.9			
Confl. Bikes (#/hr)							2						2		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.88	0.88	0.88	0.80	0.80	0.80	0.93	0.93	0.93		
Heavy Vehicles (%)	3%	3%	3%	3%	2%	2%	2%	0%	0%	0%	1%	1%	1%		
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	320	1828	0	0	1770	147	99	111	0	245	0	195		
Turn Type	Prot	Prot					Prot	Split			custom		custom		
Protected Phases	1	1	6			2	2	4	4					5	9
Permitted Phases											8		1 2 4 8		
Detector Phase	1	1	6			2	2	4	4		8		1 2 4 8		
Switch Phase															
Minimum Initial (s)	10.0	10.0	20.0			20.0	20.0	6.0	6.0		12.0			4.0	4.0
Minimum Split (s)	16.0	16.0	26.0			26.0	26.0	12.0	12.0		18.0			33.0	21.0
Total Split (s)	33.0	33.0	42.0	0.0	0.0	42.0	42.0	25.0	25.0	0.0	25.0	0.0	125.0	33.0	10.0
Total Split (%)	30.0%	30.0%	38.2%	0.0%	0.0%	38.2%	38.2%	22.7%	22.7%	0.0%	22.7%	0.0%	113.6%	30%	9%
Yellow Time (s)	4.0	4.0	4.0			4.0	4.0	3.0	3.0		3.0			2.0	2.0
All-Red Time (s)	2.0	2.0	2.0			2.0	2.0	3.0	3.0		3.0			1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	6.0	6.0	6.0	4.0	4.0	6.0	6.0	6.0	6.0	4.0	6.0	4.0	6.0		
Lead/Lag	Lead	Lead	Lag			Lag	Lag							Lead	
Lead-Lag Optimize?															
Recall Mode	None	None	C-Min			C-Min	C-Min	None	None		None			None	None
v/c Ratio		0.84	1.03			1.40	0.24	0.22	0.24		0.77		0.13		
Control Delay		61.1	57.3			206.9	2.2	36.2	33.2		57.5		0.3		
Queue Delay		0.0	0.0			0.0	0.0	0.0	0.0		0.0		0.0		
Total Delay		61.1	57.3			206.9	2.2	36.2	33.2		57.5		0.3		
Queue Length 50th (ft)		214	489			~932	16	55	56		158		0		
Queue Length 95th (ft)		#330	#1111			#1061	m4	99	102		#356		7		
Internal Link Dist (ft)			844			850			1480			928			
Turn Bay Length (ft)		325													
Base Capacity (vph)		430	1778			1261	618	443	460		317		1525		
Starvation Cap Reductn		0	0			0	0	0	0		0		0		
Spillback Cap Reductn		0	0			0	0	0	0		0		0		
Storage Cap Reductn		0	0			0	0	0	0		0		0		
Reduced v/c Ratio		0.74	1.03			1.40	0.24	0.22	0.24		0.77		0.13		

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 25 (23%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 28: Route 60 (Squire Road) & Sigourney Street



Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	20	277	1700	0	0	1558	129	79	71	18	228	0	181
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0			6.0	6.0	6.0	6.0		6.0		6.0
Lane Util. Factor		1.00	0.95			0.95	1.00	1.00	1.00		1.00		1.00
Frpb, ped/bikes		1.00	1.00			1.00	1.00	1.00	1.00		1.00		0.99
Flpb, ped/bikes		1.00	1.00			1.00	1.00	1.00	1.00		1.00		1.00
Frt		1.00	1.00			1.00	0.85	1.00	0.97		1.00		0.85
Flt Protected		0.95	1.00			1.00	1.00	0.95	1.00		0.95		1.00
Satd. Flow (prot)		1752	3505			3539	1583	1805	1844		1787		1579
Flt Permitted		0.95	1.00			1.00	1.00	0.95	1.00		0.69		1.00
Satd. Flow (perm)		1752	3505			3539	1583	1805	1844		1289		1579
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.88	0.88	0.88	0.80	0.80	0.80	0.93	0.93	0.93
Adj. Flow (vph)	22	298	1828	0	0	1770	147	99	89	22	245	0	195
RTOR Reduction (vph)	0	0	0	0	0	0	56	0	8	0	0	0	18
Lane Group Flow (vph)	0	320	1828	0	0	1770	91	99	103	0	245	0	177
Confl. Bikes (#/hr)							2						2
Heavy Vehicles (%)	3%	3%	3%	3%	2%	2%	2%	0%	0%	0%	1%	1%	1%
Turn Type	Prot	Prot					Prot	Split			custom		custom
Protected Phases	1	1	6			2	2	4	4				
Permitted Phases											8		1 2 4 8
Actuated Green, G (s)		23.8	51.6			36.8	36.8	27.0	27.0		27.0		99.6
Effective Green, g (s)		23.8	51.6			36.8	36.8	27.0	27.0		27.0		99.6
Actuated g/C Ratio		0.22	0.47			0.33	0.33	0.25	0.25		0.25		0.91
Clearance Time (s)		6.0	6.0			6.0	6.0	6.0	6.0		6.0		
Vehicle Extension (s)		3.0	3.0			3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		379	1644			1184	530	443	453		316		1430
v/s Ratio Prot		c0.18	c0.52			c0.50	0.06	0.05	0.06				
v/s Ratio Perm											c0.19		0.11
v/c Ratio		0.84	1.11			1.49	0.17	0.22	0.23		0.78		0.12
Uniform Delay, d1		41.3	29.2			36.6	25.8	33.1	33.2		38.7		0.6
Progression Factor		1.00	1.00			0.50	0.12	1.00	1.00		1.00		1.00
Incremental Delay, d2		15.7	59.6			226.3	0.6	0.3	0.3		11.3		0.0
Delay (s)		57.0	88.8			244.5	3.6	33.4	33.4		50.0		0.6
Level of Service		E	F			F	A	C	C		D		A
Approach Delay (s)			84.0			226.1			33.4			28.1	
Approach LOS			F			F			C			C	

Intersection Summary

HCM Average Control Delay	134.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	28.4
Intersection Capacity Utilization	95.7%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	ø2	ø3	ø9
Lane Configurations									
Volume (vph)	478	1429	1270	272	180	355			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	11	11	11	12	15	12			
Storage Length (ft)	120			0	0	150			
Storage Lanes	1			0	1	1			
Taper Length (ft)	25			25	25	25			
Right Turn on Red				Yes		Yes			
Link Speed (mph)		30	30		30				
Link Distance (ft)		1857	236		865				
Travel Time (s)		42.2	5.4		19.7				
Peak Hour Factor	0.91	0.91	0.86	0.86	0.79	0.79			
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%			
Bus Blockages (#/hr)	0	2	0	0	0	0			
Shared Lane Traffic (%)									
Lane Group Flow (vph)	525	1570	1793	0	228	449			
Turn Type	Prot					custom			
Protected Phases	5	2 3 5	2 3		7	7	2	3	9
Permitted Phases						2 3 5			
Detector Phase	5	2 3 5	2 3		7	7			
Switch Phase									
Minimum Initial (s)	3.0				2.0	2.0	3.0	3.0	1.0
Minimum Split (s)	8.0				8.0	8.0	12.0	8.0	7.0
Total Split (s)	30.0	95.0	65.0	0.0	25.0	25.0	30.0	35.0	20.0
Total Split (%)	21.4%	67.9%	46.4%	0.0%	17.9%	17.9%	21%	25%	14%
Yellow Time (s)	4.0				4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0				1.0	1.0	2.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-2.0	-2.0	0.0	-1.0	-1.0			
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lag				Lead	Lead	Lag	Lead	
Lead-Lag Optimize?	Yes				Yes	Yes	Yes	Yes	
Recall Mode	None				C-Max	C-Max	Max	None	None
v/c Ratio	1.64	0.49	0.84		0.40	0.28			
Control Delay	335.3	13.2	39.5		42.2	0.5			
Queue Delay	0.0	3.5	95.2		0.5	0.0			
Total Delay	335.3	16.7	134.7		42.8	0.5			
Queue Length 50th (ft)	~689	251	428		167	0			
Queue Length 95th (ft)	#914	286	476		211	0			
Internal Link Dist (ft)		1777	156		785				
Turn Bay Length (ft)	120					150			
Base Capacity (vph)	321	3218	2130		570	1583			
Starvation Cap Reductn	0	0	648		0	0			
Spillback Cap Reductn	0	1526	0		113	0			
Storage Cap Reductn	0	0	0		0	0			
Reduced v/c Ratio	1.64	0.93	1.21		0.50	0.28			

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 116 (83%), Referenced to phase 7:SBL, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 41: Route 145 & N Shore Rd



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	478	1429	1270	272	180	355
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	15	12
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.91	0.91		1.00	1.00
Frt	1.00	1.00	0.97		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1728	4951	4833		1947	1583
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1728	4951	4833		1947	1583
Peak-hour factor, PHF	0.91	0.91	0.86	0.86	0.79	0.79
Adj. Flow (vph)	525	1570	1477	316	228	449
RTOR Reduction (vph)	0	0	23	0	0	42
Lane Group Flow (vph)	525	1570	1770	0	228	407
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Bus Blockages (#/hr)	0	2	0	0	0	0
Turn Type	Prot					custom
Protected Phases	5	2 3 5	2 3		7	7
Permitted Phases						2 3 5
Actuated Green, G (s)	25.0	90.0	60.0		40.0	130.0
Effective Green, g (s)	26.0	89.0	62.0		41.0	127.0
Actuated g/C Ratio	0.19	0.64	0.44		0.29	0.91
Clearance Time (s)	5.0				5.0	5.0
Vehicle Extension (s)	3.0				3.0	3.0
Lane Grp Cap (vph)	321	3147	2140		570	1526
v/s Ratio Prot	c0.30	0.32	c0.37		c0.12	0.08
v/s Ratio Perm						0.18
v/c Ratio	1.64	0.50	0.83		0.40	0.27
Uniform Delay, d1	57.0	13.6	34.3		39.6	0.8
Progression Factor	1.00	1.00	1.03		1.00	1.00
Incremental Delay, d2	299.7	0.1	2.5		2.1	0.1
Delay (s)	356.7	13.7	37.9		41.7	0.9
Level of Service	F	B	D		D	A
Approach Delay (s)		99.7	37.9		14.6	
Approach LOS		F	D		B	

Intersection Summary

HCM Average Control Delay	62.8	HCM Level of Service	E
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	77.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2	ø7	ø9
Lane Configurations															
Volume (vph)	0	1245	363	163	1024	0	518	0	440	0	0	0			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	12	11	11	9	11	12	10	12	12	12	12	16			
Storage Length (ft)	0		0	100		0	0		100	0		0			
Storage Lanes	0		0	1		0	1		1	0		1			
Taper Length (ft)	25		25	25		25	25		25	25		25			
Right Turn on Red			No			Yes			No			No			
Link Speed (mph)		30			30			30			30				
Link Distance (ft)		236			635			5227			589				
Travel Time (s)		5.4			14.4			118.8			13.4				
Peak Hour Factor	0.85	0.85	0.85	0.83	0.83	0.83	0.91	0.91	0.91	1.00	1.00	1.00			
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	2%	2%	2%	0%	0%	0%			
Bus Blockages (#/hr)	0	0	0	0	2	0	0	0	0	0	0	0			
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	1892	0	196	1234	0	569	0	484	0	0	0			
Turn Type				Prot			Prot		custom			custom			
Protected Phases		2 7		5	2 5 7		3		3				2	7	9
Permitted Phases									2 5 7			3			
Detector Phase		2 7		5	2 5 7		3		3			3			
Switch Phase															
Minimum Initial (s)				3.0			3.0		3.0			3.0	3.0	2.0	1.0
Minimum Split (s)				8.0			8.0		8.0			8.0	12.0	8.0	7.0
Total Split (s)	0.0	55.0	0.0	30.0	85.0	0.0	35.0	0.0	35.0	0.0	0.0	35.0	30.0	25.0	20.0
Total Split (%)	0.0%	39.3%	0.0%	21.4%	60.7%	0.0%	25.0%	0.0%	25.0%	0.0%	0.0%	25.0%	21%	18%	14%
Yellow Time (s)				4.0			4.0		4.0			4.0	4.0	4.0	2.0
All-Red Time (s)				1.0			1.0		1.0			1.0	2.0	1.0	1.0
Lost Time Adjust (s)	0.0	-2.0	0.0	-1.0	-2.0	0.0	-1.0	0.0	-1.0	0.0	0.0	-1.0			
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			
Lead/Lag				Lag			Lead		Lead			Lead	Lag	Lead	
Lead-Lag Optimize?				Yes			Yes		Yes			Yes	Yes	Yes	
Recall Mode				None			None		None			None	Max	C-Max	None
v/c Ratio		0.78		0.65	0.34		0.80		0.31						
Control Delay		29.7		63.9	7.5		61.3		0.5						
Queue Delay		105.0		0.0	40.9		0.0		0.0						
Total Delay		134.7		63.9	48.4		61.3		0.5						
Queue Length 50th (ft)		405		167	137		255		0						
Queue Length 95th (ft)		436		232	142		324		0						
Internal Link Dist (ft)		156			555			5147			509				
Turn Bay Length (ft)				100					100						
Base Capacity (vph)		2432		302	3608		709		1583						
Starvation Cap Reductn		895		0	0		0		0						
Spillback Cap Reductn		0		0	2464		0		0						
Storage Cap Reductn		0		0	0		0		0						
Reduced v/c Ratio		1.23		0.65	1.08		0.80		0.31						

Intersection Summary	
Area Type:	Other
Cycle Length: 140	
Actuated Cycle Length: 140	
Offset: 116 (83%), Referenced to phase 7:SBL, Start of Green	
Natural Cycle: 120	
Control Type: Actuated-Coordinated	

Splits and Phases: 42: Winthrop Ave & Suffolk Downs



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1245	363	163	1024	0	518	0	440	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	9	11	12	10	12	12	12	12	16
Total Lost time (s)		4.0		4.0	4.0		4.0		4.0			
Lane Util. Factor		0.91		1.00	0.91		0.97		1.00			
Frt		0.97		1.00	1.00		1.00		0.85			
Flt Protected		1.00		0.95	1.00		0.95		1.00			
Satd. Flow (prot)		4796		1624	5001		3204		1583			
Flt Permitted		1.00		0.95	1.00		0.95		1.00			
Satd. Flow (perm)		4796		1624	5001		3204		1583			
Peak-hour factor, PHF	0.85	0.85	0.85	0.83	0.83	0.83	0.91	0.91	0.91	1.00	1.00	1.00
Adj. Flow (vph)	0	1465	427	196	1234	0	569	0	484	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1892	0	196	1234	0	569	0	484	0	0	0
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	2	0	0	0	0	0	0	0
Turn Type				Prot			Prot		custom			custom
Protected Phases		2 7		5	2 5 7		3		3			
Permitted Phases									2 5 7			3
Actuated Green, G (s)		69.0		25.0	99.0		30.0		129.0			
Effective Green, g (s)		68.0		26.0	95.0		31.0		131.0			
Actuated g/C Ratio		0.49		0.19	0.68		0.22		0.94			
Clearance Time (s)				5.0			5.0		5.0			
Vehicle Extension (s)				3.0			3.0		3.0			
Lane Grp Cap (vph)		2329		302	3394		709		1526			
v/s Ratio Prot		c0.39		c0.12	0.25		c0.18		0.07			
v/s Ratio Perm									0.24			
v/c Ratio		0.81		0.65	0.36		0.80		0.32			
Uniform Delay, d1		30.6		52.8	9.6		51.6		0.4			
Progression Factor		0.97		1.00	1.00		1.00		1.00			
Incremental Delay, d2		2.9		4.8	0.1		6.5		0.1			
Delay (s)		32.5		57.5	9.7		58.1		0.5			
Level of Service		C		E	A		E		A			
Approach Delay (s)		32.5			16.2			31.7			0.0	
Approach LOS		C			B			C			A	

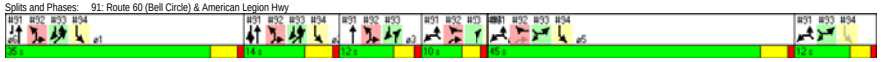
Intersection Summary			
HCM Average Control Delay	27.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NWL	NWR	NEL	NER	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations																
Volume (vph)	0	1316	0	0	972	345	1244	387	0	0						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900						
Lane Width (ft)	12	13	12	12	13	16	16	16	12	12						
Storage Length (ft)	0		0	0		130	0	0	0	0						
Storage Lanes	0		0	0		1	2	1	0	0						
Taper Length (ft)	25		25	25		25	25	25	25	25						
Right Turn on Red			No			Yes		Yes								
Link Speed (mph)		30			30		30		30							
Link Distance (ft)		324			508		202		225							
Travel Time (s)		7.4			11.5		4.6		5.1							
Peak Hour Factor	0.92	0.94	0.92	0.92	0.78	0.77	0.91	0.91	0.92	0.92						
Heavy Vehicles (%)	2%	4%	2%	2%	7%	3%	5%	5%	2%	2%						
Shared Lane Traffic (%)																
Lane Group Flow (vph)	0	1400	0	0	1246	448	1367	425	0	0						
Turn Type						Prot		Prot								
Protected Phases		1 2 3			1 2	1 2	4 5 6	4 5 6			1	2	3	4	5	6
Permitted Phases																
Minimum Split (s)											35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	0.0	61.0	0.0	0.0	49.0	49.0	67.0	67.0	0.0	0.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	0.0%	47.7%	0.0%	0.0%	38.3%	38.3%	52.3%	52.3%	0.0%	0.0%	27%	11%	9%	8%	35%	9%
Yellow Time (s)											4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)											1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	-1.0	0.0	0.0	-1.0	-1.0	-1.0	-1.0	0.0	0.0						
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	4.0	4.0						
Lead/Lag											Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?											Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio		0.88			1.02	0.61	0.72	0.41								
Control Delay		7.5			71.0	25.2	22.0	14.6								
Queue Delay		50.2			0.7	0.0	9.9	5.4								
Total Delay		57.6			71.7	25.2	32.0	20.0								
Queue Length 50th (ft)		63			~574	194	485	139								
Queue Length 95th (ft)		m0			523	229	586	202								
Internal Link Dist (ft)		244			428		122		145							
Turn Bay Length (ft)						130										
Base Capacity (vph)		1597			1226	731	1890	1033								
Starvation Cap Reductn		333			0	0	506	534								
Spillback Cap Reductn		0			3	0	0	0								
Storage Cap Reductn		0			0	0	0	0								
Reduced v/c Ratio		1.11			1.02	0.61	0.99	0.85								

Intersection Summary	
Area Type:	Other
Cycle Length: 128	
Actuated Cycle Length: 128	
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green	
Natural Cycle: 150	
Control Type: Pretimed	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 91: Route 60 (Bell Circle) & American Legion Hwy



Movement	NBL	NBT	NBR	SBL	SBT	SBR	NWL	NWR	NEL	NER
Lane Configurations										
Volume (vph)	0	1316	0	0	972	345	1244	387	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	13	12	12	13	16	16	16	12	12
Total Lost time (s)		4.0			4.0	4.0	3.0	3.0		
Lane Util. Factor		0.95			0.95	1.00	0.97	1.00		
Frt		1.00			1.00	0.85	1.00	1.00		
Flt Protected		1.00			1.00	1.00	0.95	1.00		
Satd. Flow (prot)		3587			3486	1777	3780	2051		
Flt Permitted		1.00			1.00	1.00	1.00	1.00		
Satd. Flow (perm)		3587			3486	1777	3979	2051		
Peak-hour factor, PHF	0.92	0.94	0.92	0.92	0.78	0.77	0.91	0.91	0.92	0.92
Adj. Flow (vph)	0	1400	0	0	1246	448	1367	425	0	0
RTOR Reduction (vph)	0	0	0	0	0	106	0	8	0	0
Lane Group Flow (vph)	0	1400	0	0	1246	342	1367	417	0	0
Heavy Vehicles (%)	2%	4%	2%	2%	7%	3%	5%	5%	2%	2%
Turn Type						Prot		Prot		
Protected Phases		1 2 3			1 2	1 2	4 5 6	4 5 6		
Permitted Phases										
Actuated Green, G (s)		57.0			44.0	44.0	63.0	63.0		
Effective Green, g (s)		58.0			45.0	45.0	60.0	60.0		
Actuated g/C Ratio		0.45			0.35	0.35	0.47	0.47		
Clearance Time (s)										
Lane Grp Cap (vph)		1625			1226	625	1772	961		
v/s Ratio Prot		c0.39			c0.36	0.19	c0.36	0.20		
v/s Ratio Perm										
v/c Ratio		0.86			1.02	0.55	0.77	0.43		
Uniform Delay, d1		31.4			41.5	33.3	28.3	22.7		
Progression Factor		0.19			1.00	1.00	0.79	0.69		
Incremental Delay, d2		0.6			29.8	3.4	2.8	1.2		
Delay (s)		6.7			71.3	36.7	25.0	16.9		
Level of Service		A			E	D	C	B		
Approach Delay (s)		6.7			62.2		23.1		0.0	
Approach LOS		A			E		C		A	

Intersection Summary					
HCM Average Control Delay		32.0	HCM Level of Service		C
HCM Volume to Capacity ratio		0.86			
Actuated Cycle Length (s)		128.0	Sum of lost time (s)		10.0
Intersection Capacity Utilization		78.5%	ICU Level of Service		D
Analysis Period (min)		15			

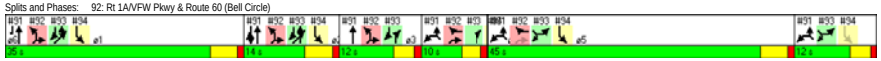
c Critical Lane Group

Lane Group	WBL	WBR	SEL	SER	NEL	NER	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations												
Volume (vph)	0	1197	0	0	352	1601						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900						
Lane Width (ft)	16	16	12	12	16	14						
Right Turn on Red		Yes		Yes	Yes	Yes						
Link Speed (mph)	30		30		30							
Link Distance (ft)	646		202		216							
Travel Time (s)	14.7		4.6		4.9							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.73	0.85						
Heavy Vehicles (%)	2%	3%	2%	2%	5%	5%						
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1301	0	0	482	1884						
Turn Type		custom				custom						
Protected Phases		4 5			1 2 3	1 2 3 4	1	2	3	4	5	6
Permitted Phases						5						
Minimum Split (s)							35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	0.0	55.0	0.0	0.0	61.0	71.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	0.0%	43.0%	0.0%	0.0%	47.7%	55.5%	27%	11%	9%	8%	35%	9%
Yellow Time (s)							4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)							1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	-1.0	0.0	0.0	-1.0	0.0						
Total Lost Time (s)	4.0	3.0	4.0	4.0	4.0	5.0						
Lead/Lag							Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio		0.69			0.25	0.59						
Control Delay		15.9			6.6	0.1						
Queue Delay		0.4			2.7	1.5						
Total Delay		16.3			9.3	1.6						
Queue Length 50th (ft)		240			22	0						
Queue Length 95th (ft)		326			m10	m0						
Internal Link Dist (ft)	566		122		136							
Turn Bay Length (ft)												
Base Capacity (vph)		1899			1958	3196						
Starvation Cap Reductn		0			1331	1049						
Spillback Cap Reductn		207			802	0						
Storage Cap Reductn		0			0	0						
Reduced v/c Ratio		0.77			0.77	0.88						

Intersection Summary	
Area Type:	Other
Cycle Length: 128	
Actuated Cycle Length: 128	
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green	
Natural Cycle: 150	
Control Type: Pretimed	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 92: Rt 1A/VFW Pkwy & Route 60 (Bell Circle)



Movement	WBL	WBR	SEL	SER	NEL	NER
Lane Configurations						
Volume (vph)	0	1197	0	0	352	1601
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	16	16	12	12	16	14
Total Lost time (s)		3.0			4.0	5.0
Lane Util. Factor		0.88			0.97	0.88
Frt		1.00			1.00	1.00
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		3679			3979	3397
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		3679			3979	3397
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.73	0.85
Adj. Flow (vph)	0	1301	0	0	482	1884
RTOR Reduction (vph)	0	410	0	0	184	368
Lane Group Flow (vph)	0	891	0	0	298	1516
Heavy Vehicles (%)	2%	3%	2%	2%	5%	5%
Turn Type		custom				custom
Protected Phases		4 5			1 2 3	1 2 3 4
Permitted Phases						5
Actuated Green, G (s)		50.0			57.0	107.0
Effective Green, g (s)		51.0			58.0	103.0
Actuated g/C Ratio		0.40			0.45	0.80
Clearance Time (s)						
Lane Grp Cap (vph)		1466			1803	2734
v/s Ratio Prot		c0.24			0.07	c0.27
v/s Ratio Perm						0.17
v/c Ratio		0.61			0.17	0.55
Uniform Delay, d1		30.6			20.7	4.4
Progression Factor		1.00			1.04	0.00
Incremental Delay, d2		1.9			0.0	0.1
Delay (s)		32.4			21.5	0.1
Level of Service		C			C	A
Approach Delay (s)	32.4		0.0		4.4	
Approach LOS	C		A		A	

Intersection Summary			
HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	60.2%	ICU Level of Service	B
Analysis Period (min)	15		

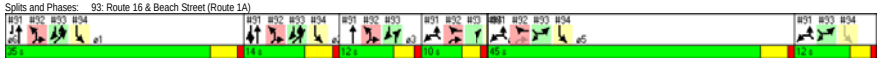
c Critical Lane Group

Lane Group	NBR	SBR	SEL	SER2	NEL	NET	ø2	ø3	ø4	ø5	ø6
Lane Configurations											
Volume (vph)	753	972	634	910	1316	663					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900					
Lane Width (ft)	12	13	12	14	12	16					
Storage Length (ft)	0	0	100		0						
Storage Lanes	2	2	0		2						
Taper Length (ft)	25	25	25		25						
Right Turn on Red	No			Yes							
Link Speed (mph)			30			30					
Link Distance (ft)			186			610					
Travel Time (s)			4.2			13.9					
Peak Hour Factor	0.86	0.78	0.85	0.93	0.73	0.73					
Heavy Vehicles (%)	2%	7%	3%	5%	2%	2%					
Shared Lane Traffic (%)											
Lane Group Flow (vph)	876	1246	746	978	1803	908					
Turn Type	custom	custom		Prot	Prot						
Protected Phases	2 3 4	1 2 3	5 6	5 6	1 2	1	2	3	4	5	6
Permitted Phases											
Minimum Split (s)						35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	36.0	61.0	57.0	57.0	49.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	28.1%	47.7%	44.5%	44.5%	38.3%	27.3%	11%	9%	8%	35%	9%
Yellow Time (s)						4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)						1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0					
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0					
Lead/Lag						Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio	1.07	1.02	0.50	0.63	1.42	1.78					
Control Delay	96.9	28.7	18.5	12.3	226.1	387.6					
Queue Delay	0.0	34.0	9.1	3.2	0.0	0.0					
Total Delay	96.9	62.7	27.6	15.5	226.1	387.6					
Queue Length 50th (ft)	~456	~153	144	112	~1037	~1124					
Queue Length 95th (ft)	#553	124	167	169	#844	#1033					
Internal Link Dist (ft)			106			530					
Turn Bay Length (ft)			100	100							
Base Capacity (vph)	820	1222	1482	1557	1271	511					
Starvation Cap Reductn	0	98	698	461	0	0					
Spillback Cap Reductn	0	0	0	0	0	0					
Storage Cap Reductn	0	0	0	0	0	0					
Reduced v/c Ratio	1.07	1.11	0.95	0.89	1.42	1.78					

Intersection Summary

Area Type: Other
Cycle Length: 128
Actuated Cycle Length: 128
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green
Natural Cycle: 150
Control Type: Pretimed
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 93: Route 16 & Beach Street (Route 1A)



Movement	NBR	SBR	SEL	SER2	NEL	NET
Lane Configurations						
Volume (vph)	753	972	634	910	1316	663
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	13	12	14	12	16
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.88	0.88	0.97	0.88	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	1.00
Flt Protected	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	3278	2745	3579	3397	3614	2111
Flt Permitted	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	3278	2745	3579	3397	3614	2111
Peak-hour factor, PHF	0.86	0.78	0.85	0.93	0.73	0.73
Adj. Flow (vph)	876	1246	746	978	1803	908
RTOR Reduction (vph)	0	0	0	148	0	0
Lane Group Flow (vph)	876	1246	746	830	1803	908
Heavy Vehicles (%)	2%	7%	3%	5%	2%	2%
Turn Type	custom	custom		Prot	Prot	
Protected Phases	2 3 4	1 2 3	5 6	5 6	1 2	1
Permitted Phases						
Actuated Green, G (s)	32.0	57.0	53.0	53.0	44.0	30.0
Effective Green, g (s)	30.0	58.0	54.0	54.0	45.0	31.0
Actuated g/C Ratio	0.23	0.45	0.42	0.42	0.35	0.24
Clearance Time (s)						5.0
Lane Grp Cap (vph)	768	1244	1510	1433	1271	511
v/s Ratio Prot	c0.27	0.45	0.21	c0.24	c0.50	c0.43
v/s Ratio Perm						
v/c Ratio	1.14	1.00	0.49	0.58	1.42	1.78
Uniform Delay, d1	49.0	35.0	27.0	28.3	41.5	48.5
Progression Factor	1.00	0.36	0.62	0.49	1.00	1.00
Incremental Delay, d2	78.6	8.0	1.1	1.6	193.0	357.5
Delay (s)	127.6	20.8	17.8	15.5	234.5	406.0
Level of Service	F	C	B	B	F	F
Approach Delay (s)			16.5			292.0
Approach LOS			B			F

Intersection Summary

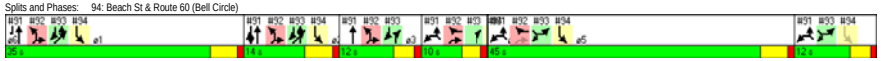
HCM Average Control Delay	146.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	Err%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	SBL	SBR	NWL	NWR	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations												
Volume (vph)	0	383	1135	446	0	0						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900						
Lane Width (ft)	12	16	16	16	12	12						
Right Turn on Red		Yes	Yes	Yes		Yes						
Link Speed (mph)	30		30		30							
Link Distance (ft)	999		225		186							
Travel Time (s)	22.7		5.1		4.2							
Confl. Peds. (#/hr)		100			100							
Peak Hour Factor	0.92	0.84	0.87	0.95	0.92	0.92						
Heavy Vehicles (%)	2%	3%	3%	4%	2%	2%						
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	456	1305	469	0	0						
Turn Type		Free		Free								
Protected Phases			1 2 4 5				1	2	3	4	5	6
Permitted Phases		Free	6	Free								
Minimum Split (s)							35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	0.0	0.0	104.0	0.0	0.0	0.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	0.0%	0.0%	81.3%	0.0%	0.0%	0.0%	27%	11%	9%	8%	35%	9%
Yellow Time (s)							4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)							1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	-1.0	0.0	0.0	0.0						
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0						
Lead/Lag							Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio		0.26	0.39	0.27								
Control Delay		0.4	0.3	0.3								
Queue Delay		0.1	0.2	0.0								
Total Delay		0.5	0.5	0.3								
Queue Length 50th (ft)		0	0	0								
Queue Length 95th (ft)		0	0	0								
Internal Link Dist (ft)	919		145		106							
Turn Bay Length (ft)												
Base Capacity (vph)		1734	3365	1760								
Starvation Cap Reductn		0	1153	0								
Spillback Cap Reductn		379	622	0								
Storage Cap Reductn		0	0	0								
Reduced v/c Ratio		0.34	0.59	0.27								

Intersection Summary	
Area Type:	Other
Cycle Length: 128	
Actuated Cycle Length: 128	
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green	
Natural Cycle: 150	
Control Type: Pretimed	

Splits and Phases: 94: Beach St & Route 60 (Bell Circle)



Movement	EBL	EBR	SBL	SBR	NWL	NWR
Lane Configurations						
Volume (vph)	0	383	1135	446	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	16	16	16	12	12
Total Lost time (s)		4.0	4.0	4.0		
Lane Util. Factor		1.00	0.97	1.00		
Frpb, ped/bikes		0.96	1.00	1.00		
Flpb, ped/bikes		1.00	1.00	1.00		
Frt		0.86	1.00	0.85		
Flt Protected		1.00	0.95	1.00		
Satd. Flow (prot)		1734	3853	1760		
Flt Permitted		1.00	1.00	1.00		
Satd. Flow (perm)		1734	4056	1760		
Peak-hour factor, PHF	0.92	0.84	0.87	0.95	0.92	0.92
Adj. Flow (vph)	0	456	1305	469	0	0
RTOR Reduction (vph)	0	0	240	0	0	0
Lane Group Flow (vph)	0	456	1065	469	0	0
Confl. Peds. (#/hr)		100			100	
Heavy Vehicles (%)	2%	3%	3%	4%	2%	2%
Turn Type		Free		Free		
Protected Phases			1 2 4 5			
Permitted Phases		Free	6	Free		
Actuated Green, G (s)		128.0	102.0	128.0		
Effective Green, g (s)		128.0	102.0	128.0		
Actuated g/C Ratio		1.00	0.80	1.00		
Clearance Time (s)						
Lane Grp Cap (vph)		1734	3085	1760		
v/s Ratio Prot			c0.25			
v/s Ratio Perm		0.26	0.02	c0.27		
v/c Ratio		0.26	0.35	0.27		
Uniform Delay, d1		0.0	3.6	0.0		
Progression Factor		1.00	0.21	1.00		
Incremental Delay, d2		0.4	0.2	0.3		
Delay (s)		0.4	1.0	0.3		
Level of Service		A	A	A		
Approach Delay (s)	0.4		0.8		0.0	
Approach LOS	A		A		A	

Intersection Summary			
HCM Average Control Delay	0.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	52.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

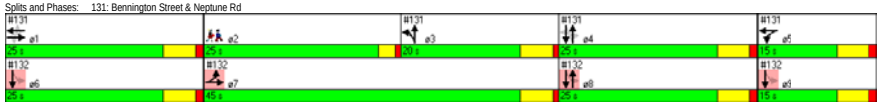
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2	ø6	ø7	ø8	ø9
Lane Configurations																	
Volume (vph)	23	575	161	354	414	64	259	351	8	24	107	67					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900					
Lane Width (ft)	12	12	10	12	12	12	11	11	11	11	11	11					
Right Turn on Red			Yes			Yes			Yes			Yes					
Link Speed (mph)		30			30			30			30						
Link Distance (ft)		669			3390			98			119						
Travel Time (s)		15.2			77.0			2.2			2.7						
Confl. Peds. (#/hr)										23		101					
Peak Hour Factor	0.89	0.89	0.89	0.95	0.95	0.95	0.93	0.93	0.93	0.86	0.86	0.86					
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	8%	8%	8%	4%	4%	4%					
Bus Blockages (#/hr)	0	0	0	0	0	8	0	0	0	0	0	0					
Parking (#/hr)					0	0					10	10					
Shared Lane Traffic (%)																	
Lane Group Flow (vph)	0	853	0	373	503	0	0	664	0	0	230	0					
Turn Type	Perm			D.P+P			D.P+P			Perm							
Protected Phases		1		5	1 5		3	3 4			4		2	6	7	8	9
Permitted Phases	1			1			4			4							
Detector Phase	1	1		5	1 5		3	3 4		4	4						
Switch Phase																	
Minimum Initial (s)	8.0	8.0		8.0			6.0			6.0	6.0		6.0	8.0	6.0	8.0	6.0
Minimum Split (s)	13.0	13.0		13.0			13.0			11.0	11.0		25.0	13.0	19.0	17.0	11.0
Total Split (s)	25.0	25.0	0.0	15.0	40.0	0.0	20.0	45.0	0.0	25.0	25.0	0.0	25.0	25.0	45.0	25.0	15.0
Total Split (%)	22.7%	22.7%	0.0%	13.6%	36.4%	0.0%	18.2%	40.9%	0.0%	22.7%	22.7%	0.0%	23%	23%	41%	23%	14%
Yellow Time (s)	4.0	4.0		4.0			4.0			4.0	4.0		2.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0			1.0			1.0	1.0		1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0					
Lead/Lag							Lag						Lead		Lead	Lag	
Lead-Lag Optimize?							Yes						Yes		Yes	Yes	
Recall Mode	C-Min	C-Min		None			None			None	None		None	None	None	None	None
v/c Ratio		2.34		0.99	0.78			0.60			0.37						
Control Delay		632.5		78.3	40.3			9.5			24.5						
Queue Delay		0.0		0.0	0.0			2.6			0.0						
Total Delay		632.5		78.3	40.3			12.1			24.5						
Queue Length 50th (ft)		~517		~239	311			25			42						
Queue Length 95th (ft)		#637		#514	#566			m244			87						
Internal Link Dist (ft)		589			3310			18			39						
Turn Bay Length (ft)																	
Base Capacity (vph)		365		376	649			1108			623						
Starvation Cap Reductn		0		0	0			315			0						
Spillback Cap Reductn		0		0	0			0			0						
Storage Cap Reductn		0		0	0			0			0						
Reduced v/c Ratio		2.34		0.99	0.78			0.84			0.37						

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
Description: Bennington WB defacto left recoded

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 131: Bennington Street & Neptune Rd



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	575	161	354	414	64	259	351	8	24	107	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	10	12	12	12	11	11	11	11	11	11
Total Lost time (s)		5.0		5.0	5.0			5.0			5.0	
Lane Util. Factor		0.95		1.00	1.00			0.95			0.95	
Frpb, ped/bikes		1.00		1.00	1.00			1.00			0.93	
Flpb, ped/bikes		1.00		1.00	1.00			1.00			1.00	
Frt		0.97		1.00	0.98			1.00			0.95	
Flt Protected		1.00		0.95	1.00			0.98			0.99	
Satd. Flow (prot)		3421		1736	1611			3158			2715	
Flt Permitted		0.55		0.23	1.00			0.73			0.83	
Satd. Flow (perm)		1883		415	1611			2340			2265	
Peak-hour factor, PHF	0.89	0.89	0.89	0.95	0.95	0.95	0.93	0.93	0.93	0.86	0.86	0.86
Adj. Flow (vph)	26	646	181	373	436	67	278	377	9	28	124	78
RTOR Reduction (vph)	0	23	0	0	4	0	0	1	0	0	54	0
Lane Group Flow (vph)	0	830	0	373	499	0	0	663	0	0	176	0
Confl. Peds. (#/hr)										23		101
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	8%	8%	8%	4%	4%	4%
Bus Blockages (#/hr)	0	0	0	0	0	8	0	0	0	0	0	0
Parking (#/hr)					0	0					10	10
Turn Type	Perm			D.P+P			D.P+P			Perm		
Protected Phases		1		5	1 5		3	3 4			4	
Permitted Phases	1			1			4			4		
Actuated Green, G (s)		17.6		36.6	41.6			46.0			28.5	
Effective Green, g (s)		17.6		36.6	41.6			46.0			28.5	
Actuated g/C Ratio		0.16		0.33	0.38			0.42			0.26	
Clearance Time (s)		5.0		5.0							5.0	
Vehicle Extension (s)		2.5		2.5							2.5	
Lane Grp Cap (vph)		301		366	609			1109			587	
v/s Ratio Prot				c0.18	0.31			c0.10				
v/s Ratio Perm		c0.44		0.16				c0.16			0.08	
v/c Ratio		2.76		1.02	0.82			0.60			0.30	
Uniform Delay, d1		46.2		32.4	30.8			24.8			32.7	
Progression Factor		1.00		1.00	1.00			0.37			1.00	
Incremental Delay, d2		800.6		52.0	8.2			0.5			0.2	
Delay (s)		846.8		84.4	39.0			9.6			32.9	
Level of Service		F		F	D			A			C	
Approach Delay (s)		846.8			58.4			9.6			32.9	
Approach LOS		F			E			A			C	

Intersection Summary

HCM Average Control Delay	300.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	27.4
Intersection Capacity Utilization	94.7%	ICU Level of Service	F
Analysis Period (min)	15		

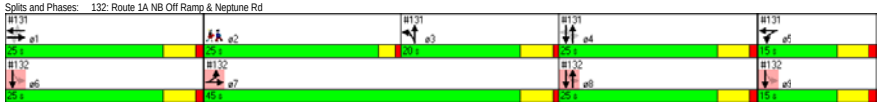
Description: Bennington WB defacto left recoded
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø2	ø3	ø4	ø5	ø6	ø9
Lane Configurations																			
Volume (vph)	497	446	14	0	0	0	0	168	325	0	67	0							
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900							
Lane Width (ft)	11	11	12	12	12	12	11	11	11	11	11	11							
Right Turn on Red			Yes			Yes			Yes			Yes							
Link Speed (mph)		30			30			30			30								
Link Distance (ft)		80			312			647			104								
Travel Time (s)		1.8			7.1			14.7			2.4								
Peak Hour Factor	0.97	0.97	0.97	0.92	0.92	0.92	0.90	0.90	0.90	0.75	0.75	0.75							
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	6%	6%	6%	8%	8%	8%							
Shared Lane Traffic (%)																			
Lane Group Flow (vph)	512	474	0	0	0	0	0	548	0	0	89	0							
Turn Type	Split									Perm									
Protected Phases	7	7						8			6 8 9		1	2	3	4	5	6	9
Permitted Phases										6 8 9									
Detector Phase	7	7						8		6 8 9	6 8 9								
Switch Phase																			
Minimum Initial (s)	6.0	6.0						8.0					8.0	6.0	6.0	6.0	8.0	8.0	6.0
Minimum Split (s)	19.0	19.0						17.0					13.0	25.0	13.0	11.0	13.0	13.0	11.0
Total Split (s)	45.0	45.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	65.0	65.0	0.0	25.0	25.0	20.0	25.0	15.0	25.0	15.0
Total Split (%)	40.9%	40.9%	0.0%	0.0%	0.0%	0.0%	0.0%	22.7%	0.0%	59.1%	59.1%	0.0%	23%	23%	18%	23%	14%	23%	14%
Yellow Time (s)	4.0	4.0						4.0					4.0	2.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0						1.0					1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0							
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	5.0	5.0	4.0							
Lead/Lag	Lead	Lead						Lag						Lead	Lag				
Lead-Lag Optimize?	Yes	Yes						Yes						Yes	Yes				
Recall Mode	None	None						None					C-Min	None	None	None	None	None	None
v/c Ratio	0.90	0.79						0.80			0.05								
Control Delay	54.7	43.2						24.6			7.2								
Queue Delay	13.9	0.0						0.1			0.0								
Total Delay	68.6	43.2						24.7			7.2								
Queue Length 50th (ft)	328	287						66			8								
Queue Length 95th (ft)	#512	415						121			m6								
Internal Link Dist (ft)		1			232			567			24								
Turn Bay Length (ft)																			
Base Capacity (vph)	610	641						835			1671								
Starvation Cap Reductn	0	0						0			0								
Spillback Cap Reductn	90	0						19			0								
Storage Cap Reductn	0	0						0			0								
Reduced v/c Ratio	0.98	0.74						0.67			0.05								

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 132: Route 1A NB Off Ramp & Neptune Rd



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	497	446	14	0	0	0	0	168	325	0	67	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)	5.0	5.0						5.0			5.0	
Lane Util. Factor	1.00	1.00						0.95			0.95	
Frt	1.00	1.00						0.90			1.00	
Flt Protected	0.95	1.00						1.00			1.00	
Satd. Flow (prot)	1678	1758						2967			3231	
Flt Permitted	0.95	1.00						1.00			1.00	
Satd. Flow (perm)	1678	1758						2967			3231	
Peak-hour factor, PHF	0.97	0.97	0.97	0.92	0.92	0.92	0.90	0.90	0.90	0.75	0.75	0.75
Adj. Flow (vph)	512	460	14	0	0	0	0	187	361	0	89	0
RTOR Reduction (vph)	0	1	0	0	0	0	0	308	0	0	0	0
Lane Group Flow (vph)	512	473	0	0	0	0	0	240	0	0	89	0
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	6%	6%	6%	8%	8%	8%
Turn Type	Split									Perm		
Protected Phases	7	7						8			6 8 9	
Permitted Phases										6 8 9		
Actuated Green, G (s)	37.3	37.3						16.1			62.7	
Effective Green, g (s)	37.3	37.3						16.1			62.7	
Actuated g/C Ratio	0.34	0.34						0.15			0.57	
Clearance Time (s)	5.0	5.0						5.0				
Vehicle Extension (s)	2.5	2.5						2.5				
Lane Grp Cap (vph)	569	596						434			1842	
v/s Ratio Prot	c0.31	0.27						c0.08			c0.03	
v/s Ratio Perm												
v/c Ratio	0.90	0.79						0.55			0.05	
Uniform Delay, d1	34.6	32.9						43.6			10.5	
Progression Factor	1.00	1.00						1.00			0.62	
Incremental Delay, d2	17.0	6.9						1.2			0.0	
Delay (s)	51.5	39.8						44.8			6.5	
Level of Service	D	D						D			A	
Approach Delay (s)		45.9			0.0			44.8			6.5	
Approach LOS		D			A			D			A	

Intersection Summary					
HCM Average Control Delay	43.4	HCM Level of Service		D	
HCM Volume to Capacity ratio	0.45				
Actuated Cycle Length (s)	110.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	51.0%	ICU Level of Service		A	
Analysis Period (min)	15				

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	530	151	2300	867	194	2028
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	3	1		1	2	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		333			412
Travel Time (s)	28.4		7.6			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	576	164	2500	942	211	2204
Turn Type		Free		Perm	Prot	
Protected Phases	3		2		1	1 2
Permitted Phases		Free		2		
Detector Phase	3		2	2	1	1 2
Switch Phase						
Minimum Initial (s)	6.0		6.0	6.0	10.0	
Minimum Split (s)	11.0		11.0	11.0	15.0	
Total Split (s)	25.0	0.0	58.0	58.0	17.0	75.0
Total Split (%)	25.0%	0.0%	58.0%	58.0%	17.0%	75.0%
Maximum Green (s)	20.0		53.0	53.0	12.0	
Yellow Time (s)	3.0		3.0	3.0	3.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead	Lead	Lag	
Lead-Lag Optimize?			Yes	Yes	Yes	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	None		C-Min	C-Min	None	
v/c Ratio	0.58	0.10	0.93	0.80	0.53	0.92
Control Delay	38.8	0.1	23.4	6.4	42.4	15.1
Queue Delay	0.0	0.0	28.6	0.9	0.0	35.6
Total Delay	38.8	0.1	52.1	7.3	42.4	50.7
Queue Length 50th (ft)	118	0	430	21	72	708
Queue Length 95th (ft)	156	0	#530	140	m80	876
Internal Link Dist (ft)	1168		253			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)	998	1583	2695	1178	400	2407
Starvation Cap Reductn	0	0	339	72	0	360
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.58	0.10	1.06	0.85	0.53	1.08

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 90 (90%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	530	151	2300	867	194	2028
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.94	1.00	0.91	1.00	0.97	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	4990	1583	5085	1583	3335	3438
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	4990	1583	5085	1583	3335	3438
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	576	164	2500	942	211	2204
RTOR Reduction (vph)	0	0	0	339	0	0
Lane Group Flow (vph)	576	164	2500	603	211	2204
Heavy Vehicles (%)	2%	2%	2%	2%	5%	5%
Turn Type		Free		Perm	Prot	
Protected Phases	3		2		1	1 2
Permitted Phases		Free		2		
Actuated Green, G (s)	20.0	100.0	53.0	53.0	12.0	70.0
Effective Green, g (s)	20.0	100.0	53.0	53.0	12.0	70.0
Actuated g/C Ratio	0.20	1.00	0.53	0.53	0.12	0.70
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	998	1583	2695	839	400	2407
v/s Ratio Prot	c0.12		0.49		0.06	c0.64
v/s Ratio Perm		0.10		0.38		
v/c Ratio	0.58	0.10	0.93	0.72	0.53	0.92
Uniform Delay, d1	36.2	0.0	21.7	17.8	41.3	12.5
Progression Factor	1.00	1.00	0.83	0.58	0.97	0.88
Incremental Delay, d2	0.8	0.1	4.9	3.5	0.5	2.8
Delay (s)	37.0	0.1	22.8	13.8	40.4	13.8
Level of Service	D	A	C	B	D	B
Approach Delay (s)	28.8		20.4			16.1
Approach LOS	C		C			B

Intersection Summary

HCM Average Control Delay	19.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	75.4%	ICU Level of Service	D
Analysis Period (min)	15		

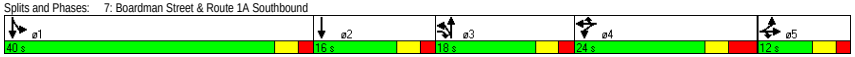
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	36	3	51	240	16	249	70	10	79	194	2375	12	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		100	200		200	200		200	475		0	
Storage Lanes	0		1	1		1	1		1	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		376			531			536			818		
Travel Time (s)		8.5			12.1			12.2			18.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	5%	5%	5%	
Shared Lane Traffic (%)				47%									
Lane Group Flow (vph)	0	42	55	138	140	271	76	11	86	211	2595	0	
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases									Free				
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			4.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0		17.0			21.0
Total Split (s)	12.0	12.0	30.0	24.0	24.0	24.0	18.0	18.0	0.0	40.0	56.0	0.0	16.0
Total Split (%)	10.9%	10.9%	27.3%	21.8%	21.8%	21.8%	16.4%	16.4%	0.0%	36.4%	50.9%	0.0%	15%
Maximum Green (s)	7.0	7.0		17.0	17.0	17.0	13.0	13.0		35.0			11.0
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag				Lag	Lag	Lag	Lead	Lead		Lead			Lag
Lead-Lag Optimize?													Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
Recall Mode	None	None		None	None	None	None	None		C-Max			None
Walk Time (s)	7.0	7.0					7.0	7.0					5.0
Flash Dont Walk (s)	20.0	20.0					20.0	20.0					11.0
Pedestrian Calls (#/hr)	5	5					5	5					0
v/c Ratio		0.40	0.22	0.66	0.67	0.63	0.49	0.07	0.06	0.30	0.94		
Control Delay		61.5	13.7	60.7	60.8	12.1	57.8	45.0	0.1	26.8	33.9		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay		61.5	13.7	60.7	60.8	12.1	57.8	45.0	0.1	26.8	33.9		
Queue Length 50th (ft)		29	10	97	98	0	52	7	0	108	~732		
Queue Length 95th (ft)		66	33	165	167	75	98	25	0	183	#880		
Internal Link Dist (ft)		296			451			456			738		
Turn Bay Length (ft)			100	200		200	200		200	475			
Base Capacity (vph)		107	298	250	252	465	201	212	1524	711	2761		
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio		0.39	0.18	0.55	0.56	0.58	0.38	0.05	0.06	0.30	0.94		

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 1:SBTL, Start of Green, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	3	51	240	16	249	70	10	79	194	2375	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.91	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1681	1495	1618	1631	1524	1703	1792	1524	1719	4936	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1681	1495	1618	1631	1524	1703	1792	1524	1719	4936	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	3	55	261	17	271	76	11	86	211	2582	13
RTOR Reduction (vph)	0	0	28	0	0	236	0	0	0	0	0	0
Lane Group Flow (vph)	0	42	27	138	140	35	76	11	86	211	2595	0
Heavy Vehicles (%)	8%	8%	8%	6%	6%	6%	6%	6%	6%	5%	5%	5%
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases									Free			
Actuated Green, G (s)		5.6	14.3	14.2	14.2	14.2	8.7	8.7	110.0	43.5	59.5	
Effective Green, g (s)		5.6	14.3	14.2	14.2	14.2	8.7	8.7	110.0	43.5	59.5	
Actuated g/C Ratio		0.05	0.13	0.13	0.13	0.13	0.08	0.08	1.00	0.40	0.54	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		86	194	209	211	197	135	142	1524	680	2670	
v/s Ratio Prot		c0.02	0.02	0.09	c0.09	0.02	c0.04	0.01		0.12	c0.53	
v/s Ratio Perm									0.06			
v/c Ratio		0.49	0.14	0.66	0.66	0.18	0.56	0.08	0.06	0.31	0.97	
Uniform Delay, d1		50.8	42.4	45.6	45.6	42.7	48.8	46.9	0.0	22.9	24.4	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		4.3	0.3	7.6	7.6	0.4	5.3	0.2	0.1	1.2	11.6	
Delay (s)		55.1	42.7	53.2	53.2	43.1	54.1	47.2	0.1	24.1	36.0	
Level of Service		E	D	D	D	D	D	D	A	C	D	
Approach Delay (s)		48.1			48.2			26.8			35.1	
Approach LOS		D			D			C			D	

Intersection Summary

HCM Average Control Delay	37.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	79.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2	ø3
Lane Configurations														
Volume (vph)	105	7	8	0	0	0	0	2442	0	0	2213	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	16	16	16	12	12	12	12	12	12	12	12	12		
Right Turn on Red			Yes			Yes			Yes			Yes		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		158			294			412			281			
Travel Time (s)		3.6			6.7			9.4			6.4			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92		
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	6%	6%	6%	5%	5%	5%		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	131	0	0	0	0	0	2654	0	0	2405	0		
Turn Type	Split													
Protected Phases	1	1						2 3			2 3		2	3
Permitted Phases														
Detector Phase	1	1						2 3			2 3			
Switch Phase														
Minimum Initial (s)	10.0	10.0											6.0	6.0
Minimum Split (s)	15.0	15.0											11.0	11.0
Total Split (s)	17.0	17.0	0.0	0.0	0.0	0.0	0.0	83.0	0.0	0.0	83.0	0.0	58.0	25.0
Total Split (%)	17.0%	17.0%	0.0%	0.0%	0.0%	0.0%	0.0%	83.0%	0.0%	0.0%	83.0%	0.0%	58%	25%
Maximum Green (s)	12.0	12.0											53.0	20.0
Yellow Time (s)	3.0	3.0											3.0	3.0
All-Red Time (s)	2.0	2.0											2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0		
Lead/Lag	Lag	Lag											Lead	
Lead-Lag Optimize?	Yes	Yes											Yes	
Vehicle Extension (s)	3.0	3.0											3.0	3.0
Recall Mode	None	None											C-Min	None
v/c Ratio		0.54						0.70			0.90			
Control Delay		49.4						6.4			14.1			
Queue Delay		0.0						0.1			4.9			
Total Delay		49.4						6.6			19.0			
Queue Length 50th (ft)		78						119			470			
Queue Length 95th (ft)		139						169			625			
Internal Link Dist (ft)		78			214			332			201			
Turn Bay Length (ft)														
Base Capacity (vph)		243						3817			2682			
Starvation Cap Reductn		0						261			0			
Spillback Cap Reductn		0						0			232			
Storage Cap Reductn		0						0			0			
Reduced v/c Ratio		0.54						0.75			0.98			

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 90 (90%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 12: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	105	7	8	0	0	0	0	2442	0	0	2213	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	16	16	16	12	12	12	12	12	12	12	12	12
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.95	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		2004						4893			3438	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		2004						4893			3438	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	114	8	9	0	0	0	0	2654	0	0	2405	0
RTOR Reduction (vph)	0	3	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	128	0	0	0	0	0	2654	0	0	2405	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	6%	6%	6%	5%	5%	5%
Turn Type	Split											
Protected Phases	1	1						2 3			2 3	
Permitted Phases												
Actuated Green, G (s)		12.0						78.0			78.0	
Effective Green, g (s)		12.0						78.0			78.0	
Actuated g/C Ratio		0.12						0.78			0.78	
Clearance Time (s)		5.0										
Vehicle Extension (s)		3.0										
Lane Grp Cap (vph)		240						3817			2682	
v/s Ratio Prot		c0.06						0.54			c0.70	
v/s Ratio Perm												
v/c Ratio		0.53						0.70			0.90	
Uniform Delay, d1		41.4						5.3			8.1	
Progression Factor		1.00						1.09			1.00	
Incremental Delay, d2		2.3						0.3			4.4	
Delay (s)		43.7						6.0			12.4	
Level of Service		D						A			B	
Approach Delay (s)		43.7			0.0			6.0			12.4	
Approach LOS		D			A			A			B	

Intersection Summary

HCM Average Control Delay	10.0	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.85				
Actuated Cycle Length (s)	100.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	77.8%	ICU Level of Service		D	
Analysis Period (min)	15				

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	290	5	0	0	0	157	0	2721	120	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		300	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red	Yes		Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		105			600			1113			116	
Travel Time (s)		2.4			13.6			25.3			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	2%	2%
Shared Lane Traffic (%)	49%											
Lane Group Flow (vph)	161	159	0	0	0	171	0	3088	0	0	0	0
Turn Type	Perm					Free						
Protected Phases		4						2				
Permitted Phases	4					Free						
Detector Phase	4	4						2				
Switch Phase												
Minimum Initial (s)	6.0	6.0						10.0				
Minimum Split (s)	11.0	11.0						20.0				
Total Split (s)	25.0	25.0	0.0	0.0	0.0	0.0	0.0	75.0	0.0	0.0	0.0	0.0
Total Split (%)	25.0%	25.0%	0.0%	0.0%	0.0%	0.0%	0.0%	75.0%	0.0%	0.0%	0.0%	0.0%
Maximum Green (s)	20.0	20.0						70.0				
Yellow Time (s)	3.0	3.0						3.0				
All-Red Time (s)	2.0	2.0						2.0				
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0						3.0				
Recall Mode	None	None						C-Min				
Walk Time (s)	7.0	7.0										
Flash Dont Walk (s)	13.0	13.0										
Pedestrian Calls (#/hr)	5	5										
v/c Ratio	0.65	0.61				0.11		0.83				
Control Delay	51.6	48.9				0.1		11.7				
Queue Delay	0.0	0.0				0.0		2.4				
Total Delay	51.6	48.9				0.1		14.1				
Queue Length 50th (ft)	102	100				0		393				
Queue Length 95th (ft)	163	160				0		595				
Internal Link Dist (ft)		25			520			1033			36	
Turn Bay Length (ft)												
Base Capacity (vph)	338	356				1611		3710				
Starvation Cap Reductn	0	0				0		0				
Spillback Cap Reductn	0	0				157		480				
Storage Cap Reductn	0	0				0		0				
Reduced v/c Ratio	0.48	0.45				0.12		0.96				

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 89 (89%), Referenced to phase 2:NBT, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	

Splits and Phases: 20: Waldemar Avenue & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	290	5	0	0	0	157	0	2721	120	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0				4.0		5.0				
Lane Util. Factor	0.95	0.95				1.00		0.91				
Frt	1.00	1.00				0.86		0.99				
Flt Protected	0.95	1.00				1.00		1.00				
Satd. Flow (prot)	1681	1770				1611		4915				
Flt Permitted	0.95	1.00				1.00		1.00				
Satd. Flow (perm)	1681	1770				1611		4915				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	315	5	0	0	0	171	0	2958	130	0	0	0
RTOR Reduction (vph)	2	2	0	0	0	0	0	4	0	0	0	0
Lane Group Flow (vph)	159	157	0	0	0	171	0	3084	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	2%	2%
Turn Type	Perm					Free						
Protected Phases		4						2				
Permitted Phases	4					Free						
Actuated Green, G (s)	14.6	14.6				100.0		75.4				
Effective Green, g (s)	14.6	14.6				100.0		75.4				
Actuated g/C Ratio	0.15	0.15				1.00		0.75				
Clearance Time (s)	5.0	5.0						5.0				
Vehicle Extension (s)	3.0	3.0						3.0				
Lane Grp Cap (vph)	245	258				1611		3706				
v/s Ratio Prot								c0.63				
v/s Ratio Perm	c0.09	0.09				0.11						
v/c Ratio	0.65	0.61				0.11		0.83				
Uniform Delay, d1	40.3	40.0				0.0		8.1				
Progression Factor	1.00	1.00				1.00		1.00				
Incremental Delay, d2	6.0	4.0				0.1		2.3				
Delay (s)	46.3	44.1				0.1		10.5				
Level of Service	D	D				A		B				
Approach Delay (s)		45.2			0.1			10.5			0.0	
Approach LOS		D			A			B			A	

Intersection Summary					
HCM Average Control Delay	13.1	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.80				
Actuated Cycle Length (s)	100.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	71.7%	ICU Level of Service		C	
Analysis Period (min)	15				

c Critical Lane Group



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	122	2435	112	0	2334
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.79	0.79	0.94	0.94	0.96	0.96
Hourly flow rate (vph)	0	154	2590	119	0	2431
Pedestrians	3					
Lane Width (ft)	16.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	3869	1358			2713	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3869	1358			2713	
tC, single (s)	6.9	7.0			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.3	
p0 queue free %	100	0			100	
cM capacity (veh/h)	2	136			138	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	154	1727	983	1216	1216
Volume Left	0	0	0	0	0
Volume Right	154	0	119	0	0
cSH	136	1700	1700	1700	1700
Volume to Capacity	1.14	1.02	0.58	0.72	0.72
Queue Length 95th (ft)	222	0	0	0	0
Control Delay (s)	182.8	0.0	0.0	0.0	0.0
Lane LOS	F				
Approach Delay (s)	182.8	0.0		0.0	
Approach LOS	F				

Intersection Summary			
Average Delay	5.3		
Intersection Capacity Utilization	85.1%	ICU Level of Service	E
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	66	168	794	0	0	466
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.83	0.83	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	80	202	882	0	0	518
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						233
pX, platoon unblocked						
vC, conflicting volume	1141	441			882	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1141	441			882	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	59	64			100	
cM capacity (veh/h)	196	567			775	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	80	202	441	441	259	259
Volume Left	80	0	0	0	0	0
Volume Right	0	202	0	0	0	0
cSH	196	567	1700	1700	1700	1700
Volume to Capacity	0.41	0.36	0.26	0.26	0.15	0.15
Queue Length 95th (ft)	46	40	0	0	0	0
Control Delay (s)	35.4	14.8	0.0	0.0	0.0	0.0
Lane LOS	E	B				
Approach Delay (s)	20.7		0.0		0.0	
Approach LOS	C					

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	39.0%	ICU Level of Service	A
Analysis Period (min)	15		

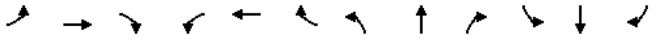


Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	431	0	0	2540	138
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.97	0.97
Hourly flow rate (vph)	0	468	0	0	2619	142
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2690	944	2761			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2690	944	2761			
tC, single (s)	7.0	7.1	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.2			
p0 queue free %	100	0	100			
cM capacity (veh/h)	15	247	141			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3
Volume Total	468	1047	1047	666
Volume Left	0	0	0	0
Volume Right	468	0	0	142
cSH	247	1700	1700	1700
Volume to Capacity	1.90	0.62	0.62	0.39
Queue Length 95th (ft)	825	0	0	0
Control Delay (s)	452.2	0.0	0.0	0.0
Lane LOS	F			
Approach Delay (s)	452.2	0.0		
Approach LOS	F			

Intersection Summary				
Average Delay	65.6			
Intersection Capacity Utilization	85.5%	ICU Level of Service	E	
Analysis Period (min)	15			

Intersection Sign configuration not allowed in HCM analysis.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	19	84	6	8	408	22	5	180	52
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.84	0.84	0.84	0.88	0.88	0.88	0.78	0.78	0.78
Hourly flow rate (vph)	0	0	0	23	100	7	9	464	25	6	231	67
Pedestrians		3			28			3			24	
Lane Width (ft)		0.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			2			0			2	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								119				
pX, platoon unblocked												
vC, conflicting volume	611	815	155	654	836	296	300			517		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	611	815	155	654	836	296	300			517		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	93	66	99	99			99		
cM capacity (veh/h)	263	299	861	337	294	676	1265			1007		

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	130	241	257	122	182
Volume Left	23	9	0	6	0
Volume Right	7	0	25	0	67
cSH	311	1265	1700	1007	1700
Volume to Capacity	0.42	0.01	0.15	0.01	0.11
Queue Length 95th (ft)	49	1	0	0	0
Control Delay (s)	24.6	0.4	0.0	0.5	0.0
Lane LOS	C	A		A	
Approach Delay (s)	24.6	0.2		0.2	
Approach LOS	C				

Intersection Summary				
Average Delay	3.6			
Intersection Capacity Utilization	34.5%	ICU Level of Service		A
Analysis Period (min)	15			

Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

Synchro 7 Capacity Analysis
2022 Build Condition
Saturday Afternoon Peak Hour

Signalized and Unsignalized Synchro Analysis

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1227	122	228	1299	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	9	11	12	12
Storage Length (ft)		0	130		0	0
Storage Lanes		0	1		0	0
Taper Length (ft)		25	25		25	25
Right Turn on Red		Yes				Yes
Link Speed (mph)	30			30	30	
Link Distance (ft)	572			1857	345	
Travel Time (s)	13.0			42.2	7.8	
Peak Hour Factor	0.95	0.95	0.91	0.91	0.95	0.95
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Bus Blockages (#/hr)	0	0	0	2	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1420	0	251	1427	0	0
Turn Type			Prot			
Protected Phases	2		1	1 2		
Permitted Phases						
Detector Phase	2		1	1 2		
Switch Phase						
Minimum Initial (s)	4.0		4.0			
Minimum Split (s)	20.0		20.0			
Total Split (s)	75.0	0.0	30.0	105.0	0.0	0.0
Total Split (%)	71.4%	0.0%	28.6%	100.0%	0.0%	0.0%
Yellow Time (s)	3.5		3.5			
All-Red Time (s)	0.5		0.5			
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	Max		None			
v/c Ratio	0.42		0.65	0.29		
Control Delay	7.7		44.5	0.1		
Queue Delay	0.0		0.0	0.0		
Total Delay	7.7		44.5	0.1		
Queue Length 50th (ft)	138		151	0		
Queue Length 95th (ft)	165		239	0		
Internal Link Dist (ft)	492			1777	265	
Turn Bay Length (ft)			130			
Base Capacity (vph)	3356		402	4951		
Starvation Cap Reductn	0		0	0		
Spillback Cap Reductn	0		0	0		
Storage Cap Reductn	0		0	0		
Reduced v/c Ratio	0.42		0.62	0.29		

Intersection Summary	
Area Type:	Other
Cycle Length: 105	
Actuated Cycle Length: 103.9	
Natural Cycle: 40	
Control Type: Semi Act-Uncoord	

Splits and Phases: 3: Route 145 & Route 1A on-ramp



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1227	122	228	1299	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	11	11	9	11	12	12
Total Lost time (s)	4.0		4.0	4.0		
Lane Util. Factor	0.91		1.00	0.91		
Frt	0.99		1.00	1.00		
Flt Protected	1.00		0.95	1.00		
Satd. Flow (prot)	4897		1608	4951		
Flt Permitted	1.00		0.95	1.00		
Satd. Flow (perm)	4897		1608	4951		
Peak-hour factor, PHF	0.95	0.95	0.91	0.91	0.95	0.95
Adj. Flow (vph)	1292	128	251	1427	0	0
RTOR Reduction (vph)	11	0	0	0	0	0
Lane Group Flow (vph)	1409	0	251	1427	0	0
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Bus Blockages (#/hr)	0	0	0	2	0	0
Turn Type			Prot			
Protected Phases	2		1	1 2		
Permitted Phases						
Actuated Green, G (s)	71.0		24.9	103.9		
Effective Green, g (s)	71.0		24.9	103.9		
Actuated g/C Ratio	0.68		0.24	1.00		
Clearance Time (s)	4.0		4.0			
Vehicle Extension (s)	3.0		3.0			
Lane Grp Cap (vph)	3346		385	4951		
v/s Ratio Prot	c0.29		c0.16	0.29		
v/s Ratio Perm						
v/c Ratio	0.42		0.65	0.29		
Uniform Delay, d1	7.3		35.6	0.0		
Progression Factor	1.00		1.00	1.00		
Incremental Delay, d2	0.4		3.9	0.0		
Delay (s)	7.7		39.5	0.0		
Level of Service	A		D	A		
Approach Delay (s)	7.7			5.9	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM Average Control Delay	6.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	103.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	45.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations													
Volume (vph)	88	294	255	0	0	0	330	182	85	56	153	138	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	10	12	12	12	10	11	12	12	12	12	
Storage Length (ft)	0		50	0		0	0		0	0		0	
Storage Lanes	0		1	0		0	1		0	0		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		988			531			233			338		
Travel Time (s)		22.5			12.1			5.3			7.7		
Peak Hour Factor	0.93	0.93	0.93	0.92	0.92	0.92	0.96	0.96	0.96	0.94	0.94	0.94	
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	1%	1%	1%	
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	2	
Parking (#/hr)									0				
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	411	274	0	0	0	344	279	0	0	370	0	
Turn Type	Split		Prot				D.P+P			Perm			
Protected Phases	4	4	4				2	2 6			6		9
Permitted Phases							6			6			
Detector Phase	4	4	4				2	2 6		6	6		
Switch Phase													
Minimum Initial (s)	1.0	1.0	1.0				1.0			1.0	1.0		1.0
Minimum Split (s)	7.0	7.0	7.0				6.0			7.0	7.0		5.0
Total Split (s)	29.0	29.0	29.0	0.0	0.0	0.0	13.0	31.0	0.0	18.0	18.0	0.0	22.0
Total Split (%)	35.4%	35.4%	35.4%	0.0%	0.0%	0.0%	15.9%	37.8%	0.0%	22.0%	22.0%	0.0%	27%
Yellow Time (s)	4.0	4.0	4.0				4.0			5.0	5.0		3.5
All-Red Time (s)	2.0	2.0	2.0				1.0			1.0	1.0		0.5
Lost Time Adjust (s)	-2.0	-2.0	-2.0	0.0	0.0	0.0	-1.0	-1.0	0.0	-2.0	-2.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lag	Lag	Lag				Lead			Lag	Lag		Lead
Lead-Lag Optimize?	Yes	Yes	Yes				Yes			Yes	Yes		Yes
Recall Mode	None	None	None				None			Max	Max		None
v/c Ratio		0.70	0.50				0.87	0.38			0.52		
Control Delay		27.2	13.4				42.7	15.0			17.2		
Queue Delay		0.0	0.0				0.0	0.0			0.0		
Total Delay		27.2	13.4				42.7	15.0			17.2		
Queue Length 50th (ft)		110	34				76	50			33		
Queue Length 95th (ft)		#365	146				#329	188			108		
Internal Link Dist (ft)		908			451			153			258		
Turn Bay Length (ft)			50										
Base Capacity (vph)		706	635				396	726			718		
Starvation Cap Reductn		0	0				0	0			0		
Spillback Cap Reductn		0	0				0	0			0		
Storage Cap Reductn		0	0				0	0			0		
Reduced v/c Ratio		0.58	0.43				0.87	0.38			0.52		

Intersection Summary

Area Type: CBD
Cycle Length: 82
Actuated Cycle Length: 61.4
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Winthrop Avenue & State Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	88	294	255	0	0	0	330	182	85	56	153	138
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	10	12	12	12	10	11	12	12	12	12
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	
Lane Util. Factor		1.00	1.00				1.00	1.00			0.95	
Frt		1.00	0.85				1.00	0.95			0.94	
Flt Protected		0.99	1.00				0.95	1.00			0.99	
Satd. Flow (prot)		1674	1332				1501	1558			3001	
Flt Permitted		0.99	1.00				0.45	1.00			0.85	
Satd. Flow (perm)		1674	1332				712	1558			2567	
Peak-hour factor, PHF	0.93	0.93	0.93	0.92	0.92	0.92	0.96	0.96	0.96	0.94	0.94	0.94
Adj. Flow (vph)	95	316	274	0	0	0	344	190	89	60	163	147
RTOR Reduction (vph)	0	0	84	0	0	0	0	18	0	0	114	0
Lane Group Flow (vph)	0	411	190	0	0	0	344	261	0	0	256	0
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	2
Parking (#/hr)									0			
Turn Type	Split		Prot				D.P+P			Perm		
Protected Phases	4	4	4				2	2 6			6	
Permitted Phases							6			6		
Actuated Green, G (s)		19.4	19.4				20.7	25.7			12.4	
Effective Green, g (s)		21.4	21.4				22.7	26.7			14.4	
Actuated g/C Ratio		0.33	0.33				0.35	0.42			0.22	
Clearance Time (s)		6.0	6.0				5.0				6.0	
Vehicle Extension (s)		3.0	3.0				3.0				3.0	
Lane Grp Cap (vph)		558	444				366	648			576	
v/s Ratio Prot		c0.25	0.14				c0.14	0.17				
v/s Ratio Perm							c0.20				0.10	
v/c Ratio		0.74	0.43				0.94	0.40			0.44	
Uniform Delay, d1		18.9	16.6				18.3	13.2			21.5	
Progression Factor		1.00	1.00				1.00	1.00			1.00	
Incremental Delay, d2		5.0	0.7				31.5	0.4			2.5	
Delay (s)		23.9	17.3				49.9	13.6			23.9	
Level of Service		C	B				D	B			C	
Approach Delay (s)		21.3			0.0			33.6			23.9	
Approach LOS		C			A			C			C	

Intersection Summary

HCM Average Control Delay	26.4	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.82				
Actuated Cycle Length (s)	64.2	Sum of lost time (s)		19.1	
Intersection Capacity Utilization	64.3%	ICU Level of Service		C	
Analysis Period (min)	15				

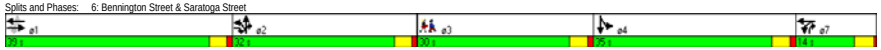
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø3
Lane Configurations													
Volume (vph)	316	291	165	39	323	3	136	271	75	37	200	364	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	10	12	12	10	12	12	10	16	12	12	12	
Storage Length (ft)	0		0	0		0	250		305	0		150	
Storage Lanes	0		1	0		0	1		1	0		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			No			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		3390			1736			677			1166		
Travel Time (s)		77.0			39.5			15.4			26.5		
Peak Hour Factor	0.95	0.95	0.95	0.86	0.86	0.86	0.93	0.93	0.93	0.90	0.90	0.90	
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	2%	2%	2%	1%	1%	1%	
Parking (#/hr)			1			1				1			
Shared Lane Traffic (%)							10%						
Lane Group Flow (vph)	0	639	174	0	424	0	131	306	81	0	667	0	
Turn Type	Perm		pm+ov	D.P+P			Split		pt+ov	Split			
Protected Phases		1	2	7	1 7		2	2	2 7	4	4		3
Permitted Phases	1		1	1									
Detector Phase	1	1	2	7	1 7		2	2	2 7	4	4		
Switch Phase													
Minimum Initial (s)	4.0	4.0	4.0	4.0			4.0	4.0		4.0	4.0		4.0
Minimum Split (s)	13.0	13.0	20.0	8.0			20.0	20.0		20.0	20.0		30.0
Total Split (s)	39.0	39.0	32.0	14.0	53.0	0.0	32.0	32.0	46.0	35.0	35.0	0.0	30.0
Total Split (%)	26.0%	26.0%	21.3%	9.3%	35.3%	0.0%	21.3%	21.3%	30.7%	23.3%	23.3%	0.0%	20%
Yellow Time (s)	3.0	3.0	3.0	3.5			3.0	3.0		3.0	3.0		3.0
All-Red Time (s)	1.0	1.0	1.0	0.5			1.0	1.0		1.0	1.0		1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lead	Lag				Lag	Lag		Lag	Lag		Lead
Lead-Lag Optimize?	Yes	Yes	Yes				Yes	Yes		Yes	Yes		Yes
Recall Mode	None	None	None	None			None	None		Max	Max		None
v/c Ratio		3.18	0.26		0.61		0.40	0.96	0.15		1.65		
Control Delay		1012.6	22.2		38.6		52.1	93.3	5.2		334.6		
Queue Delay		0.0	0.0		0.0		0.0	0.0	0.0		0.0		
Total Delay		1012.6	22.2		38.6		52.1	93.3	5.2		334.6		
Queue Length 50th (ft)		~854	66		117		90	243	0		~703		
Queue Length 95th (ft)		#1217	167		212		196	#563	26		#1210		
Internal Link Dist (ft)		3310			1656			597			1086		
Turn Bay Length (ft)							250		305				
Base Capacity (vph)		201	668		694		325	318	528		404		
Starvation Cap Reductn		0	0		0		0	0	0		0		
Spillback Cap Reductn		0	0		0		0	0	0		0		
Storage Cap Reductn		0	0		0		0	0	0		0		
Reduced v/c Ratio		3.18	0.26		0.61		0.40	0.96	0.15		1.65		

Intersection Summary	
Area Type:	CBD
Cycle Length: 150	
Actuated Cycle Length: 132	
Natural Cycle: 145	
Control Type: Actuated-Uncoordinated	

– Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Bennington Street & Saratoga Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	316	291	165	39	323	3	136	271	75	37	200	364
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	12	10	12	12	10	16	12	12	12
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00		0.95		0.95	0.95	1.00		1.00	
Frt		1.00	0.85		1.00		1.00	1.00	0.85		0.92	
Flt Protected		0.97	1.00		0.99		0.95	1.00	1.00		1.00	
Satd. Flow (prot)		1555	1301		2983		1513	1483	1615		1550	
Flt Permitted		0.47	1.00		0.58		0.95	1.00	1.00		1.00	
Satd. Flow (perm)		749	1301		1731		1513	1483	1615		1550	
Peak-hour factor, PHF	0.95	0.95	0.95	0.86	0.86	0.86	0.93	0.93	0.93	0.90	0.90	0.90
Adj. Flow (vph)	333	306	174	45	376	3	146	291	81	41	222	404
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	58	0	35	0
Lane Group Flow (vph)	0	639	174	0	424	0	131	306	23	0	632	0
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	2%	2%	2%	1%	1%	1%
Parking (#/hr)						1				1		
Turn Type	Perm		pm+ov	D.P+P			Split		pt+ov	Split		
Protected Phases		1	2	7	1 7		2	2	2 7	4	4	
Permitted Phases	1		1	1								
Actuated Green, G (s)		35.4	63.7		45.5		28.3	28.3	38.4		31.4	
Effective Green, g (s)		35.4	63.7		45.5		28.3	28.3	38.4		31.4	
Actuated g/C Ratio		0.26	0.47		0.34		0.21	0.21	0.29		0.23	
Clearance Time (s)		4.0	4.0				4.0	4.0			4.0	
Vehicle Extension (s)		3.0	3.0				3.0	3.0			3.0	
Lane Grp Cap (vph)		197	655		680		319	312	461		362	
v/s Ratio Prot			0.06		c0.05		0.09	c0.21	0.01		c0.41	
v/s Ratio Perm		c0.85	0.08		0.16							
v/c Ratio		3.24	0.27		0.62		0.41	0.98	0.05		1.75	
Uniform Delay, d1		49.5	21.3		37.3		45.8	52.8	34.8		51.5	
Progression Factor		1.00	1.00		1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2		1022.7	0.2		1.8		0.9	45.5	0.0		346.6	
Delay (s)		1072.2	21.5		39.1		46.7	98.3	34.8		398.1	
Level of Service		F	C		D		D	F	C		F	
Approach Delay (s)		847.3			39.1			75.3			398.1	
Approach LOS		F			D			E			F	

Intersection Summary					
HCM Average Control Delay		417.0	HCM Level of Service		F
HCM Volume to Capacity ratio		1.93			
Actuated Cycle Length (s)		134.4	Sum of lost time (s)		29.2
Intersection Capacity Utilization		115.7%	ICU Level of Service		H
Analysis Period (min)		15			

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBT	NBR	SBT	SBR	SEL2	SEL	SER	SER2
Lane Configurations															
Volume (vph)	7	205	8	910	281	33	75	611	1054	487	33	20	89	7	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	10	16	12	12	12	12	12	14	16	12	12	12	12	12
Storage Length (ft)	50		0	0		0			0		0		0	0	
Storage Lanes	1		1	2		0			1		0		1	0	
Taper Length (ft)	25		25	25		25			25		25		25	25	
Right Turn on Red			Yes				No		Yes						Yes
Link Speed (mph)		30			30			30		30			30		
Link Distance (ft)		485			572			480		673			302		
Travel Time (s)		11.0			13.0			10.9		15.3			6.9		
Peak Hour Factor	0.75	0.75	0.75	0.92	0.92	0.92	0.92	0.97	0.97	0.81	0.81	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	0%	1%	1%	1%	1%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	282	11	989	423	0	0	630	1087	642	0	0	142	0	0
Turn Type	Split		Prot	Split					custom			Split			
Protected Phases	4	4	4	8	8			2	2	6		12	12		
Permitted Phases									4 8 12						
Detector Phase	4	4	4	8	8			2	2	6		12	12		
Switch Phase															
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0	4.0		4.0	4.0		
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0			21.0	21.0	21.0		21.0	21.0		
Total Split (s)	35.0	35.0	35.0	80.0	80.0	0.0	0.0	70.0	70.0	70.0	0.0	30.0	30.0	0.0	0.0
Total Split (%)	16.3%	16.3%	16.3%	37.2%	37.2%	0.0%	0.0%	32.6%	32.6%	32.6%	0.0%	14.0%	14.0%	0.0%	0.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0	4.0		4.0	4.0		
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0			1.0	1.0	1.0		1.0	1.0		
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	0.0	0.0	-1.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag															
Lead-Lag Optimize?															
Recall Mode	None	None	None	None	None			Max	Max	Max		None	None		
v/c Ratio		0.71	0.05	0.86	0.70			0.50	0.64	0.45			0.72		
Control Delay		91.4	32.2	67.6	62.7			52.1	1.8	50.6			103.3		
Queue Delay		0.0	0.0	4.0	2.6			0.0	0.0	0.0			0.0		
Total Delay		91.4	32.2	71.5	65.3			52.1	1.8	50.6			103.3		
Queue Length 50th (ft)		181	0	593	460			328	0	328			172		
Queue Length 95th (ft)		211	17	738	642			466	0	408			269		
Internal Link Dist (ft)		405			492			400		593			222		
Turn Bay Length (ft)															
Base Capacity (vph)		554	309	1430	743			1267	1706	1422			252		
Starvation Cap Reductn		0	0	350	204			0	0	0			0		
Spillback Cap Reductn		0	0	0	0			0	0	0			0		
Storage Cap Reductn		0	0	0	0			0	0	0			0		
Reduced v/c Ratio		0.51	0.04	0.92	0.78			0.50	0.64	0.45			0.56		

Intersection Summary

Area Type: Other
Cycle Length: 215
Actuated Cycle Length: 188.4
Natural Cycle: 85
Control Type: Semi Act-Uncoord

Splits and Phases: 8: Winthrop Avenue & Route 16



Movement	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBT	NBR	SBT	SBR	SEL2	SEL	SER	SER2
Lane Configurations															
Volume (vph)	7	205	8	910	281	33	75	611	1054	487	33	20	89	7	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	16	12	12	12	12	12	14	16	12	12	12	12	12
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0	4.0	4.0			4.0		
Lane Util. Factor		0.95	1.00	0.97	1.00			0.95	1.00	0.95			1.00		
Frt		1.00	0.85	1.00	0.96			1.00	0.85	0.99			0.98		
Flt Protected		1.00	1.00	0.95	1.00			1.00	1.00	1.00			0.96		
Satd. Flow (prot)		3331	1798	3502	1820			3574	1706	4012			1792		
Flt Permitted		1.00	1.00	0.95	1.00			1.00	1.00	1.00			0.96		
Satd. Flow (perm)		3331	1798	3502	1820			3574	1706	4012			1792		
Peak-hour factor, PHF	0.75	0.75	0.75	0.92	0.92	0.92	0.92	0.97	0.97	0.81	0.81	0.86	0.86	0.86	0.86
Adj. Flow (vph)	9	273	11	989	305	36	82	630	1087	601	41	23	103	8	8
RTOR Reduction (vph)	0	0	10	0	0	0	0	0	0	0	0	0	1	0	0
Lane Group Flow (vph)	0	282	1	989	423	0	0	630	1087	642	0	0	141	0	0
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	0%	1%	1%	1%	1%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Turn Type	Split		Prot	Split					custom			Split			
Protected Phases	4	4	4	8	8			2	2	6		12	12		
Permitted Phases									4 8 12						
Actuated Green, G (s)		21.6	21.6	61.1	61.1			65.8	178.2	65.8			19.7		
Effective Green, g (s)		22.6	22.6	62.1	62.1			66.8	180.2	66.8			20.7		
Actuated g/C Ratio		0.12	0.12	0.33	0.33			0.35	0.96	0.35			0.11		
Clearance Time (s)		5.0	5.0	5.0	5.0			5.0	5.0	5.0			5.0		
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0	3.0	3.0			3.0		
Lane Grp Cap (vph)		400	216	1156	601			1269	1706	1424			197		
v/s Ratio Prot		0.08	0.00	c0.28	0.23			0.18	c0.23	0.16			0.08		
v/s Ratio Perm									0.41						
v/c Ratio		0.70	0.01	0.86	0.70			0.50	0.64	0.45			0.72		
Uniform Delay, d1		79.6	72.9	58.9	55.0			47.5	0.4	46.6			80.9		
Progression Factor		1.00	1.00	1.00	1.00			1.00	1.00	1.00			1.00		
Incremental Delay, d2		5.6	0.0	6.4	3.7			1.4	0.8	1.0			11.7		
Delay (s)		85.2	72.9	65.2	58.8			48.9	1.2	47.6			92.6		
Level of Service		F	E	E	E			D	A	D			F		
Approach Delay (s)		84.7			63.3			18.7		47.6			92.6		
Approach LOS		F			E			B		D			F		

Intersection Summary

HCM Average Control Delay	45.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	188.2	Sum of lost time (s)	4.0
Intersection Capacity Utilization	77.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations											
Volume (vph)	209	32	67	0	161	698	282	177	217	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	16	12	12	12	12	12	12	12	12
Storage Length (ft)		0	0	0		0	115		200	0	0
Storage Lanes		1	1	0		2	1		1	0	0
Taper Length (ft)		25	25	25		25	25		25	25	25
Right Turn on Red			Yes			Yes			Yes		
Link Speed (mph)		30			30			30		30	
Link Distance (ft)		335			262			919		278	
Travel Time (s)		7.6			6.0			20.9		6.3	
Peak Hour Factor	0.97	0.97	0.97	0.96	0.96	0.96	0.90	0.90	0.90	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	0%	0%
Shared Lane Traffic (%)	50%										
Lane Group Flow (vph)	107	141	69	0	168	727	313	197	241	0	0
Turn Type	Split		Prot			Free	Prot		Prot		
Protected Phases	8	8	8		6		1	1 6	1 6		
Permitted Phases						Free					
Detector Phase	8	8	8		6		1	1 6	1 6		
Switch Phase											
Minimum Initial (s)	4.0	4.0	4.0		4.0		4.0				
Minimum Split (s)	20.0	20.0	20.0		20.0		8.0				
Total Split (s)	20.0	20.0	20.0	0.0	45.0	0.0	20.0	65.0	65.0	0.0	0.0
Total Split (%)	23.5%	23.5%	23.5%	0.0%	52.9%	0.0%	23.5%	76.5%	76.5%	0.0%	0.0%
Yellow Time (s)	3.0	3.0	3.0		3.0		3.0				
All-Red Time (s)	1.0	1.0	1.0		1.0		1.0				
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lag	Lag		Lead						
Lead-Lag Optimize?	Yes	Yes	Yes		Yes						
Recall Mode	None	None	None		Max		None				
v/c Ratio	0.50	0.33	0.23		0.09	0.45	0.87	0.07	0.19		
Control Delay	40.0	33.0	10.3		10.5	0.9	58.3	2.7	0.8		
Queue Delay	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		
Total Delay	40.0	33.0	10.3		10.5	0.9	58.3	2.7	0.8		
Queue Length 50th (ft)	54	35	0		21	0	151	9	0		
Queue Length 95th (ft)	106	62	33		40	0	#316	21	16		
Internal Link Dist (ft)		255			182			839		198	
Turn Bay Length (ft)							115		200		
Base Capacity (vph)	331	663	424		1867	1615	360	2711	1271		
Starvation Cap Reductn	0	0	0		0	0	0	0	0		
Spillback Cap Reductn	0	0	0		0	0	0	0	0		
Storage Cap Reductn	0	0	0		0	0	0	0	0		
Reduced v/c Ratio	0.32	0.21	0.16		0.09	0.45	0.87	0.07	0.19		

Intersection Summary

Area Type: Other
Cycle Length: 85
Actuated Cycle Length: 79.4
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 10: State Road & Ocean Avenue



Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations											
Volume (vph)	209	32	67	0	161	698	282	177	217	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	16	12	12	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0		
Lane Util. Factor	0.91	0.91	1.00		0.95	1.00	1.00	0.95	1.00		
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85		
Flt Protected	0.95	0.95	1.00		1.00	1.00	0.95	1.00	1.00		
Satd. Flow (prot)	1643	3285	1830		3610	1615	1787	3574	1599		
Flt Permitted	0.95	0.95	1.00		1.00	1.00	0.95	1.00	1.00		
Satd. Flow (perm)	1643	3285	1830		3610	1615	1787	3574	1599		
Peak-hour factor, PHF	0.97	0.97	0.97	0.96	0.96	0.96	0.90	0.90	0.90	0.92	0.92
Adj. Flow (vph)	215	33	69	0	168	727	313	197	241	0	0
RTOR Reduction (vph)	0	0	60	0	0	0	0	0	56	0	0
Lane Group Flow (vph)	107	141	9	0	168	727	313	197	185	0	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	0%	0%
Turn Type	Split		Prot			Free	Prot		Prot		
Protected Phases	8	8	8		6		1	1 6	1 6		
Permitted Phases						Free					
Actuated Green, G (s)	10.4	10.4	10.4		41.1	79.4	15.9	61.0	61.0		
Effective Green, g (s)	10.4	10.4	10.4		41.1	79.4	15.9	61.0	61.0		
Actuated g/C Ratio	0.13	0.13	0.13		0.52	1.00	0.20	0.77	0.77		
Clearance Time (s)	4.0	4.0	4.0		4.0		4.0				
Vehicle Extension (s)	3.0	3.0	3.0		3.0		3.0				
Lane Grp Cap (vph)	215	430	240		1869	1615	358	2746	1228		
v/s Ratio Prot	0.07	0.04	0.00		0.05		c0.18	0.06	0.12		
v/s Ratio Perm						c0.45					
v/c Ratio	0.50	0.33	0.04		0.09	0.45	0.87	0.07	0.15		
Uniform Delay, d1	32.1	31.3	30.1		9.7	0.0	30.8	2.3	2.4		
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00		
Incremental Delay, d2	1.8	0.4	0.1		0.1	0.9	20.4	0.0	0.1		
Delay (s)	33.9	31.8	30.2		9.8	0.9	51.1	2.3	2.5		
Level of Service	C	C	C		A	A	D	A	A		
Approach Delay (s)		32.1			2.6			22.7		0.0	
Approach LOS		C			A			C		A	

Intersection Summary

HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	79.4	Sum of lost time (s)	4.0
Intersection Capacity Utilization	35.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Volume (vph)	40	268	81	89	177	70	15	122	1211	87	28	424	1352	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	50		0		150		0		800		0
Storage Lanes	1		0	1		0		1		0		1		0
Taper Length (ft)	25		25	25		25		25		25		25		25
Right Turn on Red			Yes			Yes				Yes				Yes
Link Speed (mph)		30			30				30				30	
Link Distance (ft)		1202			2003				910				1421	
Travel Time (s)		27.3			45.5				20.7				32.3	
Confl. Peds. (#/hr)	8		18	18		8				1				4
Confl. Bikes (#/hr)														1
Peak Hour Factor	0.91	0.91	0.91	0.85	0.85	0.85	0.95	0.95	0.95	0.95	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	3%	3%	3%	3%	2%	2%	2%	2%
Shared Lane Traffic (%)														
Lane Group Flow (vph)	44	384	0	105	290	0	0	144	1367	0	0	481	1473	0
Turn Type	Perm			Perm				Prot				Prot		
Protected Phases		4			8			1	6			5	2	
Permitted Phases	4			8										
Detector Phase	4	4		8	8			1	6			5	2	
Switch Phase														
Minimum Initial (s)	4.0	4.0		4.0	4.0			4.0	4.0			4.0	4.0	
Minimum Split (s)	11.0	11.0		11.0	11.0			31.0	11.0			11.0	11.0	
Total Split (s)	36.0	36.0	0.0	36.0	36.0	0.0	0.0	36.0	56.0	0.0	0.0	36.0	56.0	0.0
Total Split (%)	28.1%	28.1%	0.0%	28.1%	28.1%	0.0%	0.0%	28.1%	43.8%	0.0%	0.0%	28.1%	43.8%	0.0%
Yellow Time (s)	4.0	4.0		4.0	4.0			4.0	4.0			4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0			2.0	2.0			2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	4.0	6.0	6.0	4.0	4.0	6.0	6.0	4.0	4.0	6.0	6.0	4.0
Lead/Lag								Lead	Lag			Lead	Lag	
Lead-Lag Optimize?								Yes	Yes			Yes	Yes	
Recall Mode	None	None		None	None			None	Max			None	Max	
v/c Ratio	0.30	0.90		1.46	0.69			no cap	1.01			no cap	1.07	
Control Delay	47.3	71.4		303.8	52.0				64.8				82.9	
Queue Delay	0.0	0.0		0.0	0.0				0.0				0.0	
Total Delay	47.3	71.4		303.8	52.0			Error	64.8			Error	82.9	
Queue Length 50th (ft)	30	303		~119	211			~248	~598			~829	~712	
Queue Length 95th (ft)	69	#489		#222	291			#386	#764			#1042	#853	
Internal Link Dist (ft)		1122			1923				830				1341	
Turn Bay Length (ft)	50			50				150				800		
Base Capacity (vph)	145	426		72	422			1	1358			1	1377	
Starvation Cap Reductn	0	0		0	0			0	0			0	0	
Spillback Cap Reductn	0	0		0	0			0	0			0	0	
Storage Cap Reductn	0	0		0	0			0	0			0	0	
Reduced v/c Ratio	0.30	0.90		1.46	0.69			144.00	1.01			481.00	1.07	

Intersection Summary

Area Type: Other
Cycle Length: 128
Actuated Cycle Length: 128
Natural Cycle: 130
Control Type: Semi Act-Uncoord
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 15: Revere St & Route 60



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Volume (vph)	40	268	81	89	177	70	15	122	1211	87	28	424	1352	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	0.95			1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00	1.00			1.00	1.00	
Flpb, ped/bikes	0.99	1.00		0.99	1.00			1.00	1.00			1.00	1.00	
Frt	1.00	0.97		1.00	0.96			1.00	0.99			1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00			0.95	1.00	
Satd. Flow (prot)	1760	1784		1737	1755			1752	3465			1770	3524	
Flt Permitted	0.33	1.00		0.17	1.00			0.13	1.00			0.13	1.00	
Satd. Flow (perm)	618	1784		307	1755			246	3465			248	3524	
Peak-hour factor, PHF	0.91	0.91	0.91	0.85	0.85	0.85	0.95	0.95	0.95	0.95	0.94	0.94	0.94	0.94
Adj. Flow (vph)	44	295	89	105	208	82	16	128	1275	92	30	451	1438	35
RTOR Reduction (vph)	0	8	0	0	11	0	0	0	4	0	0	0	1	0
Lane Group Flow (vph)	44	376	0	105	279	0	0	144	1363	0	0	481	1472	0
Confl. Peds. (#/hr)	8		18	18		8				1				4
Confl. Bikes (#/hr)														1
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	3%	3%	3%	3%	2%	2%	2%	2%
Turn Type	Perm			Perm				Prot				Prot		
Protected Phases		4			8			1	6			5	2	
Permitted Phases	4			8										
Actuated Green, G (s)	30.0	30.0		30.0	30.0			30.0	50.0			30.0	50.0	
Effective Green, g (s)	30.0	30.0		30.0	30.0			30.0	50.0			30.0	50.0	
Actuated g/C Ratio	0.23	0.23		0.23	0.23			0.23	0.39			0.23	0.39	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0			6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			3.0	3.0	
Lane Grp Cap (vph)	145	418		72	411			58	1354			58	1377	
v/s Ratio Prot		0.21			0.16				0.39				c0.42	
v/s Ratio Perm	0.07			c0.34				0.59				c1.94		
v/c Ratio	0.30	0.90		1.46	0.68			2.48	1.01			8.29	1.07	
Uniform Delay, d1	40.4	47.5		49.0	44.6			49.0	39.0			49.0	39.0	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00			1.00	1.00	
Incremental Delay, d2	1.2	21.4		267.6	4.4			715.7	26.0			3316.8	45.0	
Delay (s)	41.6	68.9		316.6	49.1			764.7	65.0			3365.8	84.0	
Level of Service	D	E		F	D			F	E			F	F	
Approach Delay (s)		66.1			120.2				131.7				891.8	
Approach LOS		E			F				F				F	

Intersection Summary

HCM Average Control Delay	470.5	HCM Level of Service	F
HCM Volume to Capacity ratio	3.14		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	105.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø3
Lane Configurations													
Volume (vph)	0	1219	115	463	1557	6	213	251	149	179	176	110	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	10	10	10	11	11	12	12	12	12	
Storage Length (ft)	0		0	200		0	300		50	0		80	
Storage Lanes	0		0	1		0	1		1	1		1	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			No			No	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		2232			2756			1675			1148		
Travel Time (s)		50.7			62.6			38.1			26.1		
Confl. Peds. (#/hr)	5					5	3		18	18		3	
Peak Hour Factor	0.95	0.95	0.95	0.97	0.97	0.97	0.89	0.89	0.89	0.93	0.93	0.93	
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	1404	0	477	1611	0	239	282	167	192	189	118	
Turn Type				Prot			D.P+P		Perm	Perm		Perm	
Protected Phases		2		1	1 2		4	4 9			9		3
Permitted Phases							9		4 9	9		9	
Detector Phase		2		1	1 2		4	4 9	4 9	9	9	9	
Switch Phase													
Minimum Initial (s)		4.0		4.0			4.0			4.0	4.0	4.0	4.0
Minimum Split (s)		55.0		13.0			13.0			15.0	15.0	15.0	29.0
Total Split (s)	0.0	55.0	0.0	40.0	95.0	0.0	17.0	52.0	52.0	35.0	35.0	35.0	29.0
Total Split (%)	0.0%	31.3%	0.0%	22.7%	54.0%	0.0%	9.7%	29.5%	29.5%	19.9%	19.9%	19.9%	16%
Yellow Time (s)		5.0		4.0			4.0			6.0	6.0	6.0	4.0
All-Red Time (s)		1.0		1.0			1.0			1.0	1.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.0	6.0	4.0	5.0	5.0	4.0	5.0	5.0	5.0	7.0	7.0	7.0	
Lead/Lag		Lag		Lead			Lag						Lead
Lead-Lag Optimize?													
Recall Mode		Max		None			None			None	None	None	None
v/c Ratio		0.87		1.22	0.56		0.78	0.49	0.34	0.95	0.54	0.40	
Control Delay		53.8		166.8	19.0		61.9	45.6	42.4	109.8	61.8	58.7	
Queue Delay		0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		53.8		166.8	19.0		61.9	45.6	42.4	109.8	61.8	58.7	
Queue Length 50th (ft)		457		~553	315		181	218	122	183	165	100	
Queue Length 95th (ft)		#585		#856	431		#328	338	207	#377	269	179	
Internal Link Dist (ft)		2152			2676			1595			1068		
Turn Bay Length (ft)				200			300		50			80	
Base Capacity (vph)		1615		391	2889		307	573	488	203	353	295	
Starvation Cap Reductn		0		0	0		0	0	0	0	0	0	
Spillback Cap Reductn		0		0	0		0	0	0	0	0	0	
Storage Cap Reductn		0		0	0		0	0	0	0	0	0	
Reduced v/c Ratio		0.87		1.22	0.56		0.78	0.49	0.34	0.95	0.54	0.40	

Intersection Summary

Area Type: Other
Cycle Length: 176
Actuated Cycle Length: 149.3
Natural Cycle: 145
Control Type: Semi Act-Uncoord
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 19: Route 16 (Revere Beach Pkwy) & Garfield Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1219	115	463	1557	6	213	251	149	179	176	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	10	10	10	11	11	12	12	12	12
Total Lost time (s)		6.0		5.0	5.0		5.0	5.0	5.0	7.0	7.0	7.0
Lane Util. Factor		0.91		1.00	0.91		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes		1.00		1.00	1.00		1.00	1.00	0.97	1.00	1.00	0.98
Flpb, ped/bikes		1.00		1.00	1.00		1.00	1.00	1.00	0.98	1.00	1.00
Frt		0.99		1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		4900		1668	4790		1726	1818	1551	1751	1881	1572
Flt Permitted		1.00		0.95	1.00		0.46	1.00	1.00	0.59	1.00	1.00
Satd. Flow (perm)		4900		1668	4790		838	1818	1551	1081	1881	1572
Peak-hour factor, PHF	0.95	0.95	0.95	0.97	0.97	0.97	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	0	1283	121	477	1605	6	239	282	167	192	189	118
RTOR Reduction (vph)	0	6	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1398	0	477	1611	0	239	282	167	192	189	118
Confl. Peds. (#/hr)	5					5	3		18	18		3
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type				Prot			D.P+P		Perm	Perm		Perm
Protected Phases		2		1	1 2		4	4 9			9	
Permitted Phases							9		4 9	9		9
Actuated Green, G (s)		49.0		35.0	89.0		40.0	45.0	45.0	28.0	28.0	28.0
Effective Green, g (s)		49.0		35.0	89.0		40.0	45.0	45.0	28.0	28.0	28.0
Actuated g/C Ratio		0.32		0.23	0.58		0.26	0.29	0.29	0.18	0.18	0.18
Clearance Time (s)		6.0		5.0			5.0			7.0	7.0	7.0
Vehicle Extension (s)		3.0		3.0			3.0			3.0	3.0	3.0
Lane Grp Cap (vph)		1559		379	2768		287	531	453	197	342	286
v/s Ratio Prot		c0.29		c0.29	0.34		c0.06	0.16			0.10	
v/s Ratio Perm							0.15		0.11	c0.18		0.08
v/c Ratio		0.90		1.26	0.58		0.83	0.53	0.37	0.97	0.55	0.41
Uniform Delay, d1		50.1		59.5	20.7		52.2	45.7	43.2	62.6	57.3	55.7
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		8.5		136.1	0.3		18.3	1.0	0.5	56.3	1.9	1.0
Delay (s)		58.6		195.6	21.0		70.5	46.7	43.7	119.0	59.2	56.7
Level of Service		E		F	C		E	D	D	F	E	E
Approach Delay (s)		58.6			60.9			54.2			81.6	
Approach LOS		E			E			D			F	

Intersection Summary

HCM Average Control Delay	61.4	HCM Level of Service	E
HCM Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	154.0	Sum of lost time (s)	30.0
Intersection Capacity Utilization	94.1%	ICU Level of Service	F
Analysis Period (min)	15		

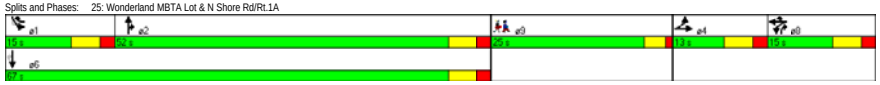
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR	ø9
Lane Configurations														
Volume (vph)	0	0	0	15	0	60	0	1351	18	1	44	1260	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		0	0		0	0		175		370		50	
Storage Lanes	1		0	1		1	0		1		1		1	
Taper Length (ft)	25		25	25		25	25		25		25		25	
Right Turn on Red			Yes			Yes			Yes				Yes	
Link Speed (mph)		30			30			30				30		
Link Distance (ft)		452			461			392				1885		
Travel Time (s)		10.3			10.5			8.9				42.8		
Peak Hour Factor	0.92	0.92	0.92	0.81	0.81	0.81	0.90	0.90	0.90	0.89	0.89	0.89	0.89	
Heavy Vehicles (%)	2%	2%	2%	16%	16%	16%	1%	1%	1%	1%	1%	1%	1%	
Shared Lane Traffic (%)	0%			10%		49%								
Lane Group Flow (vph)	0	0	0	17	38	38	0	1501	20	0	50	1416	0	
Turn Type	Split			Split		pt+ov			pt+ov	custom	Prot		Perm	
Protected Phases	4	4		8	8	1 8!		2	2 8		1	6		9
Permitted Phases										1!			6	
Detector Phase	4	4		8	8	1 8		2	2 8	1	1	6	6	
Switch Phase														
Minimum Initial (s)	5.0	5.0		5.0	5.0			10.0		6.0	6.0	10.0	10.0	5.0
Minimum Split (s)	11.0	11.0		11.0	11.0			16.0		12.0	12.0	16.0	16.0	25.0
Total Split (s)	13.0	13.0	0.0	15.0	15.0	30.0	0.0	52.0	67.0	15.0	15.0	67.0	67.0	25.0
Total Split (%)	10.8%	10.8%	0.0%	12.5%	12.5%	25.0%	0.0%	43.3%	55.8%	12.5%	12.5%	55.8%	55.8%	21%
Yellow Time (s)	4.0	4.0		4.0	4.0			4.0		4.0	4.0	4.0	4.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0			2.0		2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0	4.0	6.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lead/Lag								Lag		Lead	Lead			
Lead-Lag Optimize?														
Recall Mode	None	None		None	None			C-Min		None	None	C-Min	C-Min	None
v/c Ratio				0.22	0.38	0.13		0.72	0.02		0.70	0.54		
Control Delay				60.4	28.9	11.1		26.8	4.6		41.8	28.3		
Queue Delay				0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Total Delay				60.4	28.9	11.1		26.8	4.6		41.8	28.3		
Queue Length 50th (ft)				13	2	0		513	1		41	565		
Queue Length 95th (ft)				34	32	23		#755	8		m37	m463		
Internal Link Dist (ft)		372			381			312				1805		
Turn Bay Length (ft)									175		370			
Base Capacity (vph)				111	129	268		2094	1036		72	2607		
Starvation Cap Reductn				0	0	0		0	0		0	0		
Spillback Cap Reductn				0	0	0		0	0		0	0		
Storage Cap Reductn				0	0	0		0	0		0	0		
Reduced v/c Ratio				0.15	0.29	0.14		0.72	0.02		0.69	0.54		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 110
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.
! Phase conflict between lane groups.

Splits and Phases: 25: Wonderland MBTA Lot & N Shore Rd/Rt.1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	0	0	0	15	0	60	0	1351	18	1	44	1260	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor				0.95	0.91	0.95		0.95	1.00		1.00	0.95	
Frt				1.00	0.86	0.85		1.00	0.85		1.00	1.00	
Flt Protected				0.95	1.00	1.00		1.00	1.00		0.95	1.00	
Satd. Flow (prot)				1478	1275	1323		3574	1599		1787	3574	
Flt Permitted				0.95	1.00	1.00		1.00	1.00		0.32	1.00	
Satd. Flow (perm)				1478	1275	1323		3574	1599		607	3574	
Peak-hour factor, PHF	0.92	0.92	0.92	0.81	0.81	0.81	0.90	0.90	0.90	0.89	0.89	0.89	0.89
Adj. Flow (vph)	0	0	0	19	0	74	0	1501	20	1	49	1416	0
RTOR Reduction (vph)	0	0	0	0	34	30	0	0	4	0	0	0	0
Lane Group Flow (vph)	0	0	0	17	4	8	0	1501	16	0	50	1416	0
Heavy Vehicles (%)	2%	2%	2%	16%	16%	16%	1%	1%	1%	1%	1%	1%	1%
Turn Type	Split			Split		pt+ov			pt+ov	custom	Prot		Perm
Protected Phases	4	4		8	8	1 8!		2	2 8		1	6	
Permitted Phases										1!			6
Actuated Green, G (s)				5.3	5.3	23.7		65.9	71.2		12.4	84.3	
Effective Green, g (s)				5.3	5.3	23.7		65.9	71.2		12.4	84.3	
Actuated g/C Ratio				0.04	0.04	0.20		0.55	0.59		0.10	0.70	
Clearance Time (s)				6.0	6.0			6.0			6.0	6.0	
Vehicle Extension (s)				2.0	2.0			3.0			3.0	3.0	
Lane Grp Cap (vph)				65	56	261		1963	949		63	2511	
v/s Ratio Prot				c0.01	0.00	0.01		c0.42	0.01			0.40	
v/s Ratio Perm											c0.08		
v/c Ratio				0.26	0.06	0.03		0.76	0.02		0.79	0.56	
Uniform Delay, d1				55.5	55.0	38.9		21.0	10.0		52.6	8.8	
Progression Factor				1.00	1.00	1.00		1.00	1.00		0.72	2.81	
Incremental Delay, d2				0.8	0.2	0.0		2.9	0.0		6.2	0.1	
Delay (s)				56.2	55.1	38.9		23.9	10.0		43.9	24.8	
Level of Service				E	E	D		C	B		D	C	
Approach Delay (s)		0.0			48.7			23.7				25.5	
Approach LOS		A			D			C				C	

Intersection Summary

HCM Average Control Delay	25.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	36.4
Intersection Capacity Utilization	52.4%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations														
Volume (vph)	258	235	81	113	356	58	4	151	1214	115	118	1107	303	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		0	80		0		200		0	75		0	
Storage Lanes	1		0	1		0		1		0	1		0	
Taper Length (ft)	25		25	25		25		25		25	25		25	
Right Turn on Red			Yes			Yes				Yes			Yes	
Link Speed (mph)		30			30				30			30		
Link Distance (ft)		2000			713				1885			1623		
Travel Time (s)		45.5			16.2				42.8			36.9		
Confl. Bikes (#/hr)			2			1								
Peak Hour Factor	0.80	0.80	0.80	0.86	0.86	0.86	0.88	0.88	0.88	0.88	0.92	0.92	0.92	
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	2%	2%	2%	2%	1%	1%	1%	
Bus Blockages (#/hr)	0	10	0	0	0	0	0	0	0	0	0	0	0	
Shared Lane Traffic (%)														
Lane Group Flow (vph)	322	395	0	131	481	0	0	177	1511	0	128	1532	0	
Turn Type	pm+pt			pm+pt			pm+pt	pm+pt			pm+pt			
Protected Phases	7	4		3	8		5	5	2		1	6		9
Permitted Phases	4			8			2	2			6			
Detector Phase	7	4		3	8		5	5	2		1	6		
Switch Phase														
Minimum Initial (s)	6.0	10.0		6.0	10.0		6.0	6.0	30.0		6.0	30.0		4.0
Minimum Split (s)	11.0	15.0		11.0	15.0		12.0	12.0	36.0		12.0	36.0		24.0
Total Split (s)	13.0	32.0	0.0	13.0	32.0	0.0	17.0	17.0	47.0	0.0	17.0	47.0	0.0	11.0
Total Split (%)	10.8%	26.7%	0.0%	10.8%	26.7%	0.0%	14.2%	14.2%	39.2%	0.0%	14.2%	39.2%	0.0%	9%
Yellow Time (s)	3.0	3.0		3.0	3.0		4.0	4.0	4.0		4.0	4.0		3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0		2.0	2.0		3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lead	Lag		Lead	Lag		
Lead-Lag Optimize?														
Recall Mode	None	None		None	None		None	None	C-Min		None	C-Min		None
v/c Ratio	1.52	0.91		0.68	1.14			0.80	1.22		0.61	1.26		
Control Delay	284.9	69.5		48.3	129.7			63.4	145.6		33.5	159.4		
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0		
Total Delay	284.9	69.5		48.3	129.7			63.4	145.6		33.5	159.4		
Queue Length 50th (ft)	~333	298		73	~433			121	~737		54	~785		
Queue Length 95th (ft)	#439	#411		#121	#601			m#209	#858		107	#927		
Internal Link Dist (ft)		1920			633				1805			1543		
Turn Bay Length (ft)				80				200			75			
Base Capacity (vph)	212	435		195	422			226	1238		229	1212		
Starvation Cap Reductn	0	0		0	0			0	0		0	0		
Spillback Cap Reductn	0	0		0	0			0	0		0	0		
Storage Cap Reductn	0	0		0	0			0	0		0	0		
Reduced v/c Ratio	1.52	0.91		0.67	1.14			0.78	1.22		0.56	1.26		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 26: Revere St & N Shore Rd/Rt.1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	258	235	81	113	356	58	4	151	1214	115	118	1107	303
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.98			1.00	0.99		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1787	1731		1805	1857			1770	3493		1787	3459	
Flt Permitted	0.14	1.00		0.17	1.00			0.10	1.00		0.10	1.00	
Satd. Flow (perm)	256	1731		332	1857			181	3493		188	3459	
Peak-hour factor, PHF	0.80	0.80	0.80	0.86	0.86	0.86	0.88	0.88	0.88	0.88	0.92	0.92	0.92
Adj. Flow (vph)	322	294	101	131	414	67	5	172	1380	131	128	1203	329
RTOR Reduction (vph)	0	10	0	0	5	0	0	0	6	0	0	21	0
Lane Group Flow (vph)	322	385	0	131	476	0	0	177	1505	0	128	1511	0
Confl. Bikes (#/hr)			2			1							
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	2%	2%	2%	2%	1%	1%	1%
Bus Blockages (#/hr)	0	10	0	0	0	0	0	0	0	0	0	0	0
Turn Type	pm+pt			pm+pt			pm+pt	pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	5	2		1	6	
Permitted Phases	4			8			2	2			6		
Actuated Green, G (s)	39.6	29.4		34.8	27.0			51.8	41.1		49.8	40.1	
Effective Green, g (s)	39.6	29.4		34.8	27.0			51.8	41.1		49.8	40.1	
Actuated g/C Ratio	0.33	0.24		0.29	0.22			0.43	0.34		0.41	0.33	
Clearance Time (s)	5.0	5.0		5.0	5.0			6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	215	424		192	418			220	1196		207	1156	
v/s Ratio Prot	c0.13	0.22		0.04	0.26			c0.07	0.43		0.05	c0.44	
v/s Ratio Perm	c0.37			0.15				0.28			0.21		
v/c Ratio	1.50	0.91		0.68	1.14			0.80	1.26		0.62	1.31	
Uniform Delay, d1	35.0	44.0		34.2	46.5			27.9	39.5		27.9	40.0	
Progression Factor	1.00	1.00		1.00	1.00			1.71	1.23		1.00	1.00	
Incremental Delay, d2	246.8	22.4		7.7	87.9			14.9	121.6		5.4	144.7	
Delay (s)	281.9	66.4		41.9	134.4			62.6	170.3		33.4	184.6	
Level of Service	F	E		D	F			E	F		C	F	
Approach Delay (s)		163.1			114.6				159.0			173.0	
Approach LOS		F			F				F			F	

Intersection Summary

HCM Average Control Delay	158.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.30		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	27.0
Intersection Capacity Utilization	103.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

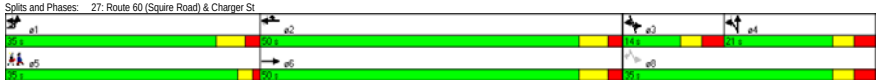
Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø5	ø8
Lane Configurations															
Volume (vph)	3	182	1695	0	0	1805	317	35	67	32	316	0	189		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)		400		0	0		50	0		0	0		125		
Storage Lanes		1		0	0		1	1		0	1		1		
Taper Length (ft)		25		25	25		25	25		25	25		25		
Right Turn on Red				Yes			Yes			Yes			Yes		
Link Speed (mph)			30			30			30			30			
Link Distance (ft)			930			2104			1965			1139			
Travel Time (s)			21.1			47.8			44.7			25.9			
Confl. Peds. (#/hr)													7		
Confl. Bikes (#/hr)													2		
Peak Hour Factor	0.98	0.98	0.98	0.98	0.90	0.90	0.90	0.96	0.96	0.96	0.92	0.92	0.92		
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%	1%	0%	0%	0%	0%	0%	0%		
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	189	1730	0	0	2006	352	36	103	0	343	0	205		
Turn Type	Prot	Prot					Prot	Prot			custom		custom		
Protected Phases	1	1	6			2	2	3 4	4		3			5	8
Permitted Phases											8		1 2 4 8		
Detector Phase	1	1	6			2	2	3 4	4		3		1 2 4 8		
Switch Phase															
Minimum Initial (s)	6.0	6.0	20.0			20.0	20.0		6.0		6.0			4.0	6.0
Minimum Split (s)	12.0	12.0	26.0			26.0	26.0		12.0		12.0			30.0	20.0
Total Split (s)	35.0	35.0	50.0	0.0	0.0	50.0	50.0	35.0	21.0	0.0	14.0	0.0	141.0	35.0	35.0
Total Split (%)	29.2%	29.2%	41.7%	0.0%	0.0%	41.7%	41.7%	29.2%	17.5%	0.0%	11.7%	0.0%	117.5%	29%	29%
Yellow Time (s)	4.0	4.0	4.0			4.0	4.0		3.0		3.0			2.0	3.0
All-Red Time (s)	2.0	2.0	2.0			2.0	2.0		3.0		3.0			1.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	6.0	6.0	6.0	4.0	4.0	6.0	6.0	6.0	6.0	4.0	6.0	4.0	6.0		
Lead/Lag	Lead	Lead	Lag			Lag	Lag		Lag		Lead			Lead	
Lead-Lag Optimize?															
Recall Mode	None	None	C-Min			C-Min	C-Min		None		None			None	None
v/c Ratio		0.71	0.63			0.79	0.43	0.10	0.57		1.47		0.13		
Control Delay		48.3	34.6			29.8	19.1	37.6	56.0		266.0		0.2		
Queue Delay		0.0	0.0			0.0	0.0	0.0	0.0		0.0		0.0		
Total Delay		48.3	34.6			29.8	19.1	37.6	56.0		266.0		0.2		
Queue Length 50th (ft)		149	256			462	136	23	65		~364		0		
Queue Length 95th (ft)		m170	567			#667	254	50	120		#530		0		
Internal Link Dist (ft)			850			2024			1885			1059			
Turn Bay Length (ft)		400					50						125		
Base Capacity (vph)		428	2756			2524	820	436	240		234		1571		
Starvation Cap Reductn		0	0			0	0	0	0		0		0		
Spillback Cap Reductn		0	0			0	0	0	0		0		0		
Storage Cap Reductn		0	0			0	0	0	0		0		0		
Reduced v/c Ratio		0.44	0.63			0.79	0.43	0.08	0.43		1.47		0.13		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 100
Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 27: Route 60 (Squire Road) & Charger St



Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	3	182	1695	0	0	1805	317	35	67	32	316	0	189
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0			6.0	6.0	6.0	6.0		6.0		6.0
Lane Util. Factor		1.00	0.91			0.91	1.00	1.00	1.00		1.00		1.00
Frpb, ped/bikes		1.00	1.00			1.00	1.00	1.00	1.00		1.00		0.99
Flpb, ped/bikes		1.00	1.00			1.00	1.00	1.00	1.00		1.00		1.00
Frt		1.00	1.00			1.00	0.85	1.00	0.95		1.00		0.85
Flt Protected		0.95	1.00			1.00	1.00	0.95	1.00		0.95		1.00
Satd. Flow (prot)		1770	5085			5136	1599	1805	1809		1805		1592
Flt Permitted		0.95	1.00			1.00	1.00	0.95	1.00		0.42		1.00
Satd. Flow (perm)		1770	5085			5136	1599	1805	1809		801		1592
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.90	0.90	0.90	0.96	0.96	0.96	0.92	0.92	0.92
Adj. Flow (vph)	3	186	1730	0	0	2006	352	36	70	33	343	0	205
RTOR Reduction (vph)	0	0	0	0	0	0	35	0	15	0	0	0	0
Lane Group Flow (vph)	0	189	1730	0	0	2006	317	36	88	0	343	0	205
Confl. Peds. (#/hr)													7
Confl. Bikes (#/hr)													2
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	Prot					Prot	Prot			custom		custom
Protected Phases	1	1	6			2	2	3 4	4		3		
Permitted Phases											8		1 2 4 8
Actuated Green, G (s)		18.1	63.8			58.9	58.9	25.0	11.0		25.0		120.0
Effective Green, g (s)		18.1	63.8			58.9	58.9	25.0	11.0		25.0		120.0
Actuated g/C Ratio		0.15	0.53			0.49	0.49	0.21	0.09		0.21		1.00
Clearance Time (s)		6.0	6.0			6.0	6.0		6.0		6.0		
Vehicle Extension (s)		3.0	3.0			3.0	3.0		3.0		3.0		
Lane Grp Cap (vph)		267	2704			2521	785	376	166		234		1592
v/s Ratio Prot		c0.11	c0.34			c0.39	0.20	0.02	0.05		c0.10		
v/s Ratio Perm											c0.21		0.13
v/c Ratio		0.71	0.64			0.80	0.40	0.10	0.53		1.47		0.13
Uniform Delay, d1		48.4	19.9			25.5	19.4	38.4	52.0		46.7		0.0
Progression Factor		0.85	1.49			1.00	1.00	1.00	1.00		1.00		1.00
Incremental Delay, d2		4.2	0.6			2.7	1.5	0.1	3.3		231.5		0.0
Delay (s)		45.5	30.2			28.2	21.0	38.5	55.3		278.2		0.0
Level of Service		D	C			C	C	D	E		F		A
Approach Delay (s)			31.7			27.1			51.0			174.2	
Approach LOS			C			C			D			F	

Intersection Summary

HCM Average Control Delay	45.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		

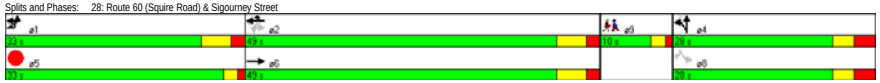
c Critical Lane Group

Lane Group	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø5	ø9
Lane Configurations																
Volume (vph)	4	318	1582	0	12	0	1841	179	102	52	36	256	0	216		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)		325		0		0		0	0		0	0		0		
Storage Lanes		1		0		0		1	1		0	1		1		
Taper Length (ft)		25		25		25		25	25		25	25		25		
Right Turn on Red				No				Yes			Yes			Yes		
Link Speed (mph)			30				30			30			30			
Link Distance (ft)			924				930			1560			1008			
Travel Time (s)			21.0				21.1			35.5			22.9			
Confl. Peds. (#/hr)														2		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.93	0.93	0.93	0.93	0.88	0.88	0.88	0.88	0.88	0.88		
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%		
Shared Lane Traffic (%)																
Lane Group Flow (vph)	0	332	1631	0	0	0	1993	192	116	100	0	291	0	245		
Turn Type	Prot	Prot			Perm	Perm		Prot	Split			custom		custom		
Protected Phases	1	1	6				2	2	4	4					5	9
Permitted Phases					2	2						8		1 2 4 8		
Detector Phase	1	1	6		2	2	2	2	4	4		8		1 2 4 8		
Switch Phase																
Minimum Initial (s)	10.0	10.0	20.0		20.0	20.0	20.0	20.0	6.0	6.0		12.0			4.0	4.0
Minimum Split (s)	16.0	16.0	26.0		26.0	26.0	26.0	26.0	12.0	12.0		18.0			33.0	21.0
Total Split (s)	33.0	33.0	49.0	0.0	49.0	49.0	49.0	49.0	28.0	28.0	0.0	28.0	0.0	138.0	33.0	10.0
Total Split (%)	27.5%	27.5%	40.8%	0.0%	40.8%	40.8%	40.8%	40.8%	23.3%	23.3%	0.0%	23.3%	0.0%	115.0%	28%	8%
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0	3.0	3.0		3.0			2.0	2.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0	2.0	3.0	3.0		3.0			1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	6.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	4.0	6.0	4.0	6.0		
Lead/Lag	Lead	Lead	Lag		Lag	Lag	Lag	Lag							Lead	
Lead-Lag Optimize?																
Recall Mode	None	None	C-Min		C-Min	C-Min	C-Min	C-Min	None	None		None			None	None
v/c Ratio		0.89	0.87				1.92	0.29	0.26	0.22		0.90		0.16		
Control Delay		71.2	33.8				436.6	2.6	39.3	28.9		73.7		0.3		
Queue Delay		0.0	0.0				0.0	0.0	0.0	0.0		0.0		0.0		
Total Delay		71.2	33.8				436.6	2.6	39.3	28.9		73.7		0.3		
Queue Length 50th (ft)		247	416				~1284	32	71	44		214		0		
Queue Length 95th (ft)		#395	#980				#1382	m1	133	98		#439		7		
Internal Link Dist (ft)			844				850			1480			928			
Turn Bay Length (ft)		325														
Base Capacity (vph)		402	1871				1037	651	447	461		325		1535		
Starvation Cap Reductn		0	0				0	0	0	0		0		0		
Spillback Cap Reductn		0	0				0	0	0	0		0		0		
Storage Cap Reductn		0	0				0	0	0	0		0		0		
Reduced v/c Ratio		0.83	0.87				1.92	0.29	0.26	0.22		0.90		0.16		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 21 (18%), Referenced to phase 2:WBTL and 6:EBT, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 28: Route 60 (Squire Road) & Sigourney Street



Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Volume (vph)	4	318	1582	0	12	0	1841	179	102	52	36	256	0	216
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0				6.0	6.0	6.0	6.0		6.0		6.0
Lane Util. Factor		1.00	0.95				0.95	1.00	1.00	1.00		1.00		1.00
Frpb, ped/bikes		1.00	1.00				1.00	1.00	1.00	1.00		1.00		0.99
Flpb, ped/bikes		1.00	1.00				1.00	1.00	1.00	1.00		1.00		1.00
Frt		1.00	1.00				1.00	0.85	1.00	0.94		1.00		0.85
Flt Protected		0.95	1.00				1.00	1.00	0.95	1.00		0.95		1.00
Satd. Flow (prot)		1787	3574				3538	1583	1787	1765		1787		1579
Flt Permitted		0.95	1.00				0.78	1.00	0.95	1.00		0.69		1.00
Satd. Flow (perm)		1787	3574				2774	1583	1787	1765		1302		1579
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.93	0.93	0.93	0.93	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	4	328	1631	0	13	0	1980	192	116	59	41	291	0	245
RTOR Reduction (vph)	0	0	0	0	0	0	0	61	0	20	0	0	0	21
Lane Group Flow (vph)	0	332	1631	0	0	0	1993	131	116	81	0	291	0	224
Confl. Peds. (#/hr)														2
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Turn Type	Prot	Prot			Perm	Perm		Prot	Split			custom		custom
Protected Phases	1	1	6				2	2	4	4				
Permitted Phases					2	2						8		1 2 4 8
Actuated Green, G (s)		25.2	58.6				42.4	42.4	30.0	30.0		30.0		109.6
Effective Green, g (s)		25.2	58.6				42.4	42.4	30.0	30.0		30.0		109.6
Actuated g/C Ratio		0.21	0.49				0.35	0.35	0.25	0.25		0.25		0.91
Clearance Time (s)		6.0	6.0				6.0	6.0	6.0	6.0		6.0		
Vehicle Extension (s)		3.0	3.0				3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		375	1745				980	559	447	441		326		1442
v/s Ratio Prot		c0.19	c0.46					0.08	0.06	0.05				
v/s Ratio Perm							c0.72					c0.22		0.14
v/c Ratio		0.89	0.93				2.03	0.23	0.26	0.18		0.89		0.16
Uniform Delay, d1		46.0	28.9				38.8	27.4	36.1	35.4		43.4		0.5
Progression Factor		1.00	1.00				0.41	0.13	1.00	1.00		1.00		1.00
Incremental Delay, d2		21.2	10.8				467.6	0.7	0.3	0.2		24.9		0.1
Delay (s)		67.2	39.7				483.6	4.2	36.4	35.6		68.4		0.6
Level of Service		E	D				F	A	D	D		E		A
Approach Delay (s)			44.3				441.5			36.0			37.4	
Approach LOS			D				F			D			D	

Intersection Summary

HCM Average Control Delay	220.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.49		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	28.4
Intersection Capacity Utilization	134.2%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	ø2	ø3	ø9
Lane Configurations									
Volume (vph)	248	922	1126	202	166	209			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	11	11	11	12	15	12			
Storage Length (ft)	120			0	0	150			
Storage Lanes	1			0	1	1			
Taper Length (ft)	25			25	25	25			
Right Turn on Red				Yes		Yes			
Link Speed (mph)		30	30		30				
Link Distance (ft)		1857	236		865				
Travel Time (s)		42.2	5.4		19.7				
Peak Hour Factor	0.92	0.92	0.90	0.90	0.88	0.88			
Heavy Vehicles (%)	0%	0%	1%	1%	1%	1%			
Bus Blockages (#/hr)	0	2	0	0	0	0			
Shared Lane Traffic (%)									
Lane Group Flow (vph)	270	1002	1475	0	189	238			
Turn Type	Prot					custom			
Protected Phases	5	2 3 5	2 3		7	7	2	3	9
Permitted Phases						2 3 5			
Detector Phase	5	2 3 5	2 3		7	7			
Switch Phase									
Minimum Initial (s)	3.0				2.0	2.0	3.0	3.0	1.0
Minimum Split (s)	8.0				8.0	8.0	12.0	8.0	7.0
Total Split (s)	30.0	95.0	65.0	0.0	25.0	25.0	30.0	35.0	20.0
Total Split (%)	21.4%	67.9%	46.4%	0.0%	17.9%	17.9%	21%	25%	14%
Yellow Time (s)	4.0				4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0				1.0	1.0	2.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-2.0	-2.0	0.0	-1.0	-1.0			
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lag				Lead	Lead	Lag	Lead	
Lead-Lag Optimize?	Yes				Yes	Yes	Yes	Yes	
Recall Mode	None				C-Max	C-Max	Max	None	None
v/c Ratio	0.83	0.31	0.69		0.33	0.15			
Control Delay	76.8	11.0	30.8		40.7	0.2			
Queue Delay	0.0	0.0	61.1		0.4	0.0			
Total Delay	76.8	11.0	91.8		41.1	0.2			
Queue Length 50th (ft)	240	136	291		135	0			
Queue Length 95th (ft)	#385	161	m308		201	0			
Internal Link Dist (ft)		1777	156		785				
Turn Bay Length (ft)	120					150			
Base Capacity (vph)	324	3251	2131		576	1599			
Starvation Cap Reductn	0	0	825		0	0			
Spillback Cap Reductn	0	315	0		115	0			
Storage Cap Reductn	0	0	0		0	0			
Reduced v/c Ratio	0.83	0.34	1.13		0.41	0.15			

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 116 (83%), Referenced to phase 7:SBL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 41: Route 145 & N Shore Rd



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	248	922	1126	202	166	209
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	15	12
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.91	0.91		1.00	1.00
Frt	1.00	1.00	0.98		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1745	5001	4851		1966	1599
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1745	5001	4851		1966	1599
Peak-hour factor, PHF	0.92	0.92	0.90	0.90	0.88	0.88
Adj. Flow (vph)	270	1002	1251	224	189	238
RTOR Reduction (vph)	0	0	18	0	0	22
Lane Group Flow (vph)	270	1002	1457	0	189	216
Heavy Vehicles (%)	0%	0%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	2	0	0	0	0
Turn Type	Prot					custom
Protected Phases	5	2 3 5	2 3		7	7
Permitted Phases						2 3 5
Actuated Green, G (s)	25.0	90.0	60.0		40.0	130.0
Effective Green, g (s)	26.0	89.0	62.0		41.0	127.0
Actuated g/C Ratio	0.19	0.64	0.44		0.29	0.91
Clearance Time (s)	5.0				5.0	5.0
Vehicle Extension (s)	3.0				3.0	3.0
Lane Grp Cap (vph)	324	3179	2148		576	1542
v/s Ratio Prot	c0.15	0.20	c0.30		c0.10	0.04
v/s Ratio Perm						0.09
v/c Ratio	0.83	0.32	0.68		0.33	0.14
Uniform Delay, d1	54.9	11.6	31.1		38.7	0.7
Progression Factor	1.00	1.00	0.93		1.00	1.00
Incremental Delay, d2	16.6	0.1	0.7		1.5	0.0
Delay (s)	71.5	11.7	29.6		40.2	0.7
Level of Service	E	B	C		D	A
Approach Delay (s)		24.4	29.6		18.2	
Approach LOS		C	C		B	

Intersection Summary

HCM Average Control Delay	26.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2	ø7	ø9
Lane Configurations															
Volume (vph)	0	696	392	153	679	0	650	0	420	0	0	0			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	12	11	11	9	11	12	10	12	12	12	12	16			
Storage Length (ft)	0		0	100		0	0		100	0		0			
Storage Lanes	0		0	1		0	1		1	0		1			
Taper Length (ft)	25		25	25		25	25		25	25		25			
Right Turn on Red			No			Yes			No			No			
Link Speed (mph)		30			30			30			30				
Link Distance (ft)		236			635			5227			589				
Travel Time (s)		5.4			14.4			118.8			13.4				
Peak Hour Factor	0.92	0.92	0.92	0.80	0.80	0.80	0.90	0.90	0.90	0.65	0.65	0.65			
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	0%	0%	0%			
Bus Blockages (#/hr)	0	0	0	0	2	0	0	0	0	0	0	0			
Shared Lane Traffic (%)															
Lane Group Flow (vph)	0	1183	0	191	849	0	722	0	467	0	0	0			
Turn Type				Prot			Prot		custom			custom			
Protected Phases		2 7		5	2 5 7		3		3				2	7	9
Permitted Phases									2 5 7			3			
Detector Phase		2 7		5	2 5 7		3		3			3			
Switch Phase															
Minimum Initial (s)				3.0			3.0		3.0			3.0	3.0	2.0	1.0
Minimum Split (s)				8.0			8.0		8.0			8.0	12.0	8.0	7.0
Total Split (s)	0.0	55.0	0.0	30.0	85.0	0.0	35.0	0.0	35.0	0.0	0.0	35.0	30.0	25.0	20.0
Total Split (%)	0.0%	39.3%	0.0%	21.4%	60.7%	0.0%	25.0%	0.0%	25.0%	0.0%	0.0%	25.0%	21%	18%	14%
Yellow Time (s)				4.0			4.0		4.0			4.0	4.0	4.0	2.0
All-Red Time (s)				1.0			1.0		1.0			1.0	2.0	1.0	1.0
Lost Time Adjust (s)	0.0	-2.0	0.0	-1.0	-2.0	0.0	-1.0	0.0	-1.0	0.0	0.0	-1.0			
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			
Lead/Lag				Lag			Lead		Lead			Lead	Lag	Lead	
Lead-Lag Optimize?				Yes			Yes		Yes			Yes	Yes	Yes	
Recall Mode				None			None		None			None	Max	C-Max	None
v/c Ratio		0.49		0.64	0.24		1.01		0.29						
Control Delay		19.1		63.5	6.7		89.1		0.5						
Queue Delay		12.2		0.0	0.6		0.0		0.0						
Total Delay		31.3		63.5	7.3		89.1		0.5						
Queue Length 50th (ft)		206		163	86		~346		0						
Queue Length 95th (ft)		227		217	89		#479		0						
Internal Link Dist (ft)		156			555			5147			509				
Turn Bay Length (ft)				100					100						
Base Capacity (vph)		2405		299	3572		717		1599						
Starvation Cap Reductn		1212		0	0		0		0						
Spillback Cap Reductn		0		0	2198		0		0						
Storage Cap Reductn		0		0	0		0		0						
Reduced v/c Ratio		0.99		0.64	0.62		1.01		0.29						

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 116 (83%), Referenced to phase 7:SBL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 42: Winthrop Ave & Suffolk Downs



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	696	392	153	679	0	650	0	420	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	9	11	12	10	12	12	12	12	16
Total Lost time (s)		4.0		4.0	4.0		4.0		4.0			
Lane Util. Factor		0.91		1.00	0.91		0.97		1.00			
Frt		0.95		1.00	1.00		1.00		0.85			
Flt Protected		1.00		0.95	1.00		0.95		1.00			
Satd. Flow (prot)		4743		1608	4951		3236		1599			
Flt Permitted		1.00		0.95	1.00		0.95		1.00			
Satd. Flow (perm)		4743		1608	4951		3236		1599			
Peak-hour factor, PHF	0.92	0.92	0.92	0.80	0.80	0.80	0.90	0.90	0.90	0.65	0.65	0.65
Adj. Flow (vph)	0	757	426	191	849	0	722	0	467	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1183	0	191	849	0	722	0	467	0	0	0
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	2	0	0	0	0	0	0	0
Turn Type				Prot			Prot		custom			custom
Protected Phases		2 7		5	2 5 7		3		3			
Permitted Phases									2 5 7			3
Actuated Green, G (s)		69.0		25.0	99.0		30.0		129.0			
Effective Green, g (s)		68.0		26.0	95.0		31.0		131.0			
Actuated g/C Ratio		0.49		0.19	0.68		0.22		0.94			
Clearance Time (s)				5.0			5.0		5.0			
Vehicle Extension (s)				3.0			3.0		3.0			
Lane Grp Cap (vph)		2304		299	3360		717		1542			
v/s Ratio Prot		c0.25		c0.12	0.17		c0.22		0.07			
v/s Ratio Perm									0.22			
v/c Ratio		0.51		0.64	0.25		1.01		0.30			
Uniform Delay, d1		24.7		52.7	8.7		54.5		0.4			
Progression Factor		0.81		1.00	1.00		1.00		1.00			
Incremental Delay, d2		0.8		4.4	0.0		35.3		0.1			
Delay (s)		20.7		57.1	8.8		89.8		0.5			
Level of Service		C		E	A		F		A			
Approach Delay (s)		20.7			17.6			54.8			0.0	
Approach LOS		C			B			D			A	

Intersection Summary

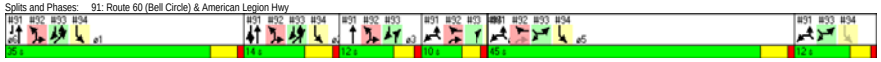
HCM Average Control Delay	31.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NWL	NWR	NEL	NER	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations																
Volume (vph)	0	1014	0	0	979	562	1425	419	0	0						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900						
Lane Width (ft)	12	13	12	12	13	16	16	16	12	12						
Storage Length (ft)	0		0	0		130	0	0	0	0						
Storage Lanes	0		0	0		1	2	1	0	0						
Taper Length (ft)	25		25	25		25	25	25	25	25						
Right Turn on Red			No			Yes		Yes								
Link Speed (mph)		30			30		30		30							
Link Distance (ft)		324			508		202		252							
Travel Time (s)		7.4			11.5		4.6		5.7							
Peak Hour Factor	0.92	0.87	0.92	0.92	0.87	0.68	0.97	0.64	0.92	0.92						
Heavy Vehicles (%)	2%	4%	2%	2%	2%	0%	2%	10%	2%	2%						
Shared Lane Traffic (%)																
Lane Group Flow (vph)	0	1166	0	0	1125	826	1469	655	0	0						
Turn Type						Prot		Prot								
Protected Phases		1 2 3			1 2	1 2	4 5 6	4 5 6			1	2	3	4	5	6
Permitted Phases																
Minimum Split (s)											35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	0.0	61.0	0.0	0.0	49.0	49.0	67.0	67.0	0.0	0.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	0.0%	47.7%	0.0%	0.0%	38.3%	38.3%	52.3%	52.3%	0.0%	0.0%	27%	11%	9%	8%	35%	9%
Yellow Time (s)											4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)											1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	-1.0	0.0	0.0	-1.0	-1.0	-1.0	-1.0	0.0	0.0						
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	4.0	4.0						
Lead/Lag											Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?											Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio		0.73			0.87	1.11	0.75	0.66								
Control Delay		1.0			47.8	98.4	20.0	17.2								
Queue Delay		2.3			0.0	0.0	65.2	38.8								
Total Delay		3.2			47.8	98.4	85.2	56.0								
Queue Length 50th (ft)		0			457	~692	446	264								
Queue Length 95th (ft)		m0			524	500	468	167								
Internal Link Dist (ft)		244			428		122		172							
Turn Bay Length (ft)						130										
Base Capacity (vph)		1597			1286	746	1946	995								
Starvation Cap Reductn		289			0	0	657	380								
Spillback Cap Reductn		0			0	0	0	0								
Storage Cap Reductn		0			0	0	0	0								
Reduced v/c Ratio		0.89			0.87	1.11	1.14	1.07								

Intersection Summary	
Area Type:	Other
Cycle Length: 128	
Actuated Cycle Length: 128	
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green	
Natural Cycle: 150	
Control Type: Pretimed	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 91: Route 60 (Bell Circle) & American Legion Hwy



Movement	NBL	NBT	NBR	SBL	SBT	SBR	NWL	NWR	NEL	NER
Lane Configurations										
Volume (vph)	0	1014	0	0	979	562	1425	419	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	13	12	12	13	16	16	16	12	12
Total Lost time (s)		4.0			4.0	4.0	3.0	3.0		
Lane Util. Factor		0.95			0.95	1.00	0.97	1.00		
Frt		1.00			1.00	0.85	1.00	1.00		
Flt Protected		1.00			1.00	1.00	0.95	1.00		
Satd. Flow (prot)		3587			3657	1830	3891	1958		
Flt Permitted		1.00			1.00	1.00	1.00	1.00		
Satd. Flow (perm)		3587			3657	1830	4096	1958		
Peak-hour factor, PHF	0.92	0.87	0.92	0.92	0.87	0.68	0.97	0.64	0.92	0.92
Adj. Flow (vph)	0	1166	0	0	1125	826	1469	655	0	0
RTOR Reduction (vph)	0	0	0	0	0	102	0	17	0	0
Lane Group Flow (vph)	0	1166	0	0	1125	724	1469	638	0	0
Heavy Vehicles (%)	2%	4%	2%	2%	2%	0%	2%	10%	2%	2%
Turn Type						Prot		Prot		
Protected Phases		1 2 3			1 2	1 2	4 5 6	4 5 6		
Permitted Phases										
Actuated Green, G (s)		57.0			44.0	44.0	63.0	63.0		
Effective Green, g (s)		58.0			45.0	45.0	60.0	60.0		
Actuated g/C Ratio		0.45			0.35	0.35	0.47	0.47		
Clearance Time (s)										
Lane Grp Cap (vph)		1625			1286	643	1824	918		
v/s Ratio Prot		c0.33			0.31	c0.40	c0.38	0.33		
v/s Ratio Perm										
v/c Ratio		0.72			0.87	1.13	0.81	0.69		
Uniform Delay, d1		28.4			38.9	41.5	29.0	26.8		
Progression Factor		0.02			1.00	1.00	0.69	0.64		
Incremental Delay, d2		0.3			8.5	75.2	2.8	3.1		
Delay (s)		0.9			47.4	116.7	22.8	20.3		
Level of Service		A			D	F	C	C		
Approach Delay (s)		0.9			76.7		22.0		0.0	
Approach LOS		A			E		C		A	

Intersection Summary					
HCM Average Control Delay		37.7	HCM Level of Service		D
HCM Volume to Capacity ratio		0.91			
Actuated Cycle Length (s)		128.0	Sum of lost time (s)		10.0
Intersection Capacity Utilization		75.3%	ICU Level of Service		D
Analysis Period (min)		15			

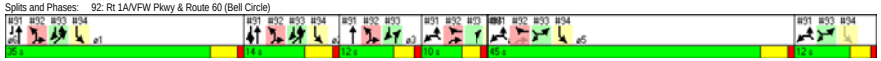
c Critical Lane Group

Lane Group	WBL	WBR	SEL	SER	NEL	NER	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations												
Volume (vph)	0	1351	0	0	482	1705						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900						
Lane Width (ft)	16	16	12	12	16	14						
Right Turn on Red		Yes		Yes	Yes	Yes						
Link Speed (mph)	30		30		30							
Link Distance (ft)	646		202		216							
Travel Time (s)	14.7		4.6		4.9							
Peak Hour Factor	0.92	0.86	0.92	0.92	0.79	0.86						
Heavy Vehicles (%)	2%	0%	2%	2%	6%	2%						
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1571	0	0	610	1983						
Turn Type		custom				custom						
Protected Phases		4 5			1 2 3	1 2 3 4	1	2	3	4	5	6
Permitted Phases						5						
Minimum Split (s)							35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	0.0	55.0	0.0	0.0	61.0	71.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	0.0%	43.0%	0.0%	0.0%	47.7%	55.5%	27%	11%	9%	8%	35%	9%
Yellow Time (s)							4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)							1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	-1.0	0.0	0.0	-1.0	0.0						
Total Lost Time (s)	4.0	3.0	4.0	4.0	4.0	5.0						
Lead/Lag							Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio		0.84			0.32	0.60						
Control Delay		26.6			10.9	0.2						
Queue Delay		2.6			7.0	1.3						
Total Delay		29.2			17.9	1.6						
Queue Length 50th (ft)		459			63	0						
Queue Length 95th (ft)		514			m51	m0						
Internal Link Dist (ft)	566		122		136							
Turn Bay Length (ft)												
Base Capacity (vph)		1867			1934	3288						
Starvation Cap Reductn		0			1265	1015						
Spillback Cap Reductn		188			882	0						
Storage Cap Reductn		0			0	0						
Reduced v/c Ratio		0.94			0.91	0.87						

Intersection Summary

Area Type: Other
Cycle Length: 128
Actuated Cycle Length: 128
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green
Natural Cycle: 150
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 92: Rt 1A/VFW Pkwy & Route 60 (Bell Circle)



Movement	WBL	WBR	SEL	SER	NEL	NER
Lane Configurations						
Volume (vph)	0	1351	0	0	482	1705
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	16	16	12	12	16	14
Total Lost time (s)		3.0			4.0	5.0
Lane Util. Factor		0.88			0.97	0.88
Frt		1.00			1.00	1.00
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		3790			3941	3497
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		3790			3941	3497
Peak-hour factor, PHF	0.92	0.86	0.92	0.92	0.79	0.86
Adj. Flow (vph)	0	1571	0	0	610	1983
RTOR Reduction (vph)	0	331	0	0	176	375
Lane Group Flow (vph)	0	1240	0	0	434	1608
Heavy Vehicles (%)	2%	0%	2%	2%	6%	2%
Turn Type		custom				custom
Protected Phases		4 5			1 2 3	1 2 3 4
Permitted Phases						5
Actuated Green, G (s)		50.0			57.0	107.0
Effective Green, g (s)		51.0			58.0	103.0
Actuated g/C Ratio		0.40			0.45	0.80
Clearance Time (s)						
Lane Grp Cap (vph)		1510			1786	2814
v/s Ratio Prot		c0.33			0.11	c0.28
v/s Ratio Perm						0.18
v/c Ratio		0.82			0.24	0.57
Uniform Delay, d1		34.4			21.5	4.5
Progression Factor		1.00			1.05	0.00
Incremental Delay, d2		5.1			0.1	0.2
Delay (s)		39.6			22.8	0.2
Level of Service		D			C	A
Approach Delay (s)	39.6		0.0		5.5	
Approach LOS	D		A		A	

Intersection Summary

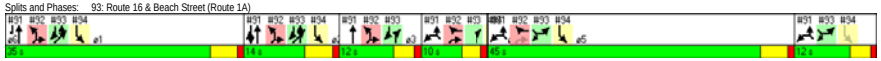
HCM Average Control Delay	18.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	63.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	NBR	SBR	SEL	SER2	NEL	NET	ø2	ø3	ø4	ø5	ø6
Lane Configurations											
Volume (vph)	710	979	737	1249	1014	739					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900					
Lane Width (ft)	12	13	12	14	12	16					
Storage Length (ft)	0	0	100		0						
Storage Lanes	2	2	0		2						
Taper Length (ft)	25	25	25		25						
Right Turn on Red	No			Yes							
Link Speed (mph)			30			30					
Link Distance (ft)			189			610					
Travel Time (s)			4.3			13.9					
Peak Hour Factor	0.94	0.94	0.79	0.93	0.73	0.94					
Heavy Vehicles (%)	3%	4%	2%	2%	4%	3%					
Shared Lane Traffic (%)											
Lane Group Flow (vph)	755	1041	933	1343	1389	786					
Turn Type	custom	custom		Prot	Prot						
Protected Phases	2 3 4	1 2 3	5 6	5 6	1 2	1	2	3	4	5	6
Permitted Phases											
Minimum Split (s)						35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	36.0	61.0	57.0	57.0	49.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	28.1%	47.7%	44.5%	44.5%	38.3%	27.3%	11%	9%	8%	35%	9%
Yellow Time (s)						4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)						1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0					
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0					
Lead/Lag						Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio	0.93	0.83	0.62	0.83	1.11	1.55					
Control Delay	65.7	9.8	24.4	23.1	102.0	292.5					
Queue Delay	0.0	1.9	22.9	8.5	0.0	0.0					
Total Delay	65.7	11.7	47.3	31.6	102.0	292.5					
Queue Length 50th (ft)	349	91	251	379	~680	~918					
Queue Length 95th (ft)	#479	99	256	481	#536	#1163					
Internal Link Dist (ft)			109			530					
Turn Bay Length (ft)			100	100							
Base Capacity (vph)	812	1258	1496	1618	1246	506					
Starvation Cap Reductn	0	101	587	253	0	0					
Spillback Cap Reductn	0	0	0	0	0	0					
Storage Cap Reductn	0	0	0	0	0	0					
Reduced v/c Ratio	0.93	0.90	1.03	0.98	1.11	1.55					

Intersection Summary	
Area Type:	Other
Cycle Length: 128	
Actuated Cycle Length: 128	
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green	
Natural Cycle: 150	
Control Type: Pretimed	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 93: Route 16 & Beach Street (Route 1A)



Movement	NBR	SBR	SEL	SER2	NEL	NET
Lane Configurations						
Volume (vph)	710	979	737	1249	1014	739
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	13	12	14	12	16
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.88	0.88	0.97	0.88	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	1.00
Flt Protected	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	3247	2824	3614	3497	3544	2091
Flt Permitted	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	3247	2824	3614	3497	3544	2091
Peak-hour factor, PHF	0.94	0.94	0.79	0.93	0.73	0.94
Adj. Flow (vph)	755	1041	933	1343	1389	786
RTOR Reduction (vph)	0	0	0	168	0	0
Lane Group Flow (vph)	755	1041	933	1175	1389	786
Heavy Vehicles (%)	3%	4%	2%	2%	4%	3%
Turn Type	custom	custom		Prot	Prot	
Protected Phases	2 3 4	1 2 3	5 6	5 6	1 2	1
Permitted Phases						
Actuated Green, G (s)	32.0	57.0	53.0	53.0	44.0	30.0
Effective Green, g (s)	30.0	58.0	54.0	54.0	45.0	31.0
Actuated g/C Ratio	0.23	0.45	0.42	0.42	0.35	0.24
Clearance Time (s)						5.0
Lane Grp Cap (vph)	761	1280	1525	1475	1246	506
v/s Ratio Prot	c0.23	0.37	0.26	c0.34	c0.39	c0.38
v/s Ratio Perm						
v/c Ratio	0.99	0.81	0.61	0.80	1.11	1.55
Uniform Delay, d1	48.9	30.3	28.8	32.2	41.5	48.5
Progression Factor	1.00	0.21	0.75	0.70	1.00	1.00
Incremental Delay, d2	30.8	2.7	1.7	4.2	63.1	258.6
Delay (s)	79.7	9.2	23.4	26.9	104.6	307.1
Level of Service	E	A	C	C	F	F
Approach Delay (s)			25.5			177.8
Approach LOS			C			F

Intersection Summary			
HCM Average Control Delay	82.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	Err%	ICU Level of Service	H
Analysis Period (min)	15		

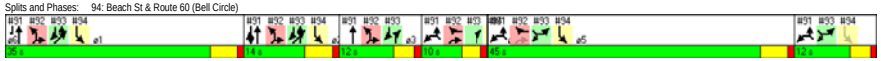
c Critical Lane Group

Lane Group	EBL	EBR	SBL	SBR	NWL	NWR	ø1	ø2	ø3	ø4	ø5	ø6
Lane Configurations												
Volume (vph)	0	493	1474	493	0	0						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900						
Lane Width (ft)	12	16	16	16	12	12						
Right Turn on Red		Yes	Yes	Yes		Yes						
Link Speed (mph)	30		30		30							
Link Distance (ft)	1028		252		189							
Travel Time (s)	23.4		5.7		4.3							
Confl. Peds. (#/hr)		100			100							
Peak Hour Factor	0.92	0.89	0.92	0.92	0.92	0.92						
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	554	1602	536	0	0						
Turn Type		Free		Free								
Protected Phases			1 2 4 5				1	2	3	4	5	6
Permitted Phases		Free	6	Free								
Minimum Split (s)							35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	0.0	0.0	104.0	0.0	0.0	0.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	0.0%	0.0%	81.3%	0.0%	0.0%	0.0%	27%	11%	9%	8%	35%	9%
Yellow Time (s)							4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)							1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	-1.0	0.0	0.0	0.0						
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0						
Lead/Lag							Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio		0.32	0.48	0.30								
Control Delay		0.5	0.3	0.2								
Queue Delay		0.3	0.4	0.0								
Total Delay		0.8	0.7	0.2								
Queue Length 50th (ft)		0	0	0								
Queue Length 95th (ft)		0	m0	m0								
Internal Link Dist (ft)	948		172		109							
Turn Bay Length (ft)												
Base Capacity (vph)		1751	3369	1794								
Starvation Cap Reductn		0	1107	0								
Spillback Cap Reductn		636	1057	0								
Storage Cap Reductn		0	0	0								
Reduced v/c Ratio		0.50	0.71	0.30								

Intersection Summary	
Area Type:	Other
Cycle Length: 128	
Actuated Cycle Length: 128	
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green	
Natural Cycle: 150	
Control Type: Pretimed	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 94: Beach St & Route 60 (Bell Circle)



Movement	EBL	EBR	SBL	SBR	NWL	NWR
Lane Configurations						
Volume (vph)	0	493	1474	493	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	16	16	16	12	12
Total Lost time (s)		4.0	4.0	4.0		
Lane Util. Factor		1.00	0.97	1.00		
Frpb, ped/bikes		0.96	1.00	1.00		
Flpb, ped/bikes		1.00	1.00	1.00		
Frt		0.86	1.00	0.85		
Flt Protected		1.00	0.95	1.00		
Satd. Flow (prot)		1751	3891	1794		
Flt Permitted		1.00	1.00	1.00		
Satd. Flow (perm)		1751	4096	1794		
Peak-hour factor, PHF	0.92	0.89	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	554	1602	536	0	0
RTOR Reduction (vph)	0	0	211	0	0	0
Lane Group Flow (vph)	0	554	1391	536	0	0
Confl. Peds. (#/hr)		100			100	
Turn Type		Free		Free		
Protected Phases			1 2 4 5			
Permitted Phases		Free	6	Free		
Actuated Green, G (s)		128.0	102.0	128.0		
Effective Green, g (s)		128.0	102.0	128.0		
Actuated g/C Ratio		1.00	0.80	1.00		
Clearance Time (s)						
Lane Grp Cap (vph)		1751	3115	1794		
v/s Ratio Prot			c0.32			
v/s Ratio Perm		c0.32	c0.03	0.30		
v/c Ratio		0.32	0.45	0.30		
Uniform Delay, d1		0.0	4.1	0.0		
Progression Factor		1.00	0.18	1.00		
Incremental Delay, d2		0.5	0.2	0.2		
Delay (s)		0.5	0.9	0.2		
Level of Service		A	A	A		
Approach Delay (s)	0.5		0.7		0.0	
Approach LOS	A		A		A	

Intersection Summary			
HCM Average Control Delay	0.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	61.7%	ICU Level of Service	B
Analysis Period (min)	15		

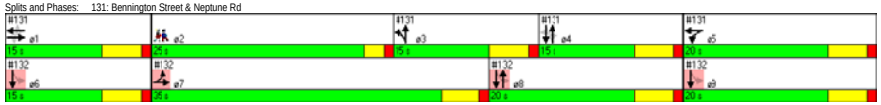
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2	ø6	ø7	ø8	ø9
Lane Configurations																	
Volume (vph)	15	371	103	323	261	63	119	231	3	16	91	122					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900					
Lane Width (ft)	12	12	10	10	12	10	11	11	11	11	11	11					
Right Turn on Red			Yes			Yes			Yes			Yes					
Link Speed (mph)		30			30			30			30						
Link Distance (ft)		669			3390			95			119						
Travel Time (s)		15.2			77.0			2.2			2.7						
Confl. Peds. (#/hr)										23		101					
Confl. Bikes (#/hr)									112								
Peak Hour Factor	0.81	0.81	0.81	0.90	0.90	0.90	0.93	0.93	0.93	0.78	0.78	0.78					
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	3%	3%	3%	8%	8%	8%					
Bus Blockages (#/hr)	0	0	0	0	0	8	0	0	0	0	0	0					
Parking (#/hr)					0	0					10	10					
Shared Lane Traffic (%)																	
Lane Group Flow (vph)	0	604	0	359	360	0	0	379	0	0	294	0					
Turn Type	Perm			D.P+P			D.P+P			Perm							
Protected Phases		1		5	1 5		3	3 4			4		2	6	7	8	9
Permitted Phases	1			1			4			4							
Detector Phase	1	1		5	1 5		3	3 4		4	4						
Switch Phase																	
Minimum Initial (s)	4.0	4.0		4.0			4.0			4.0	4.0		6.0	4.0	4.0	4.0	4.0
Minimum Split (s)	13.0	13.0		13.0			11.0			11.0	11.0		25.0	13.0	19.0	17.0	9.0
Total Split (s)	15.0	15.0	0.0	20.0	35.0	0.0	15.0	30.0	0.0	15.0	15.0	0.0	25.0	15.0	35.0	20.0	20.0
Total Split (%)	16.7%	16.7%	0.0%	22.2%	38.9%	0.0%	16.7%	33.3%	0.0%	16.7%	16.7%	0.0%	28%	17%	39%	22%	22%
Yellow Time (s)	4.0	4.0		4.0			4.0			4.0	4.0		2.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0			1.0			1.0	1.0		1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0					
Lead/Lag							Lag						Lead		Lead	Lag	
Lead-Lag Optimize?							Yes						Yes		Yes	Yes	
Recall Mode	C-Max	C-Max		None			None			None	None		None	None	None	None	None
v/c Ratio		1.61		0.74	0.46			0.44			0.63						
Control Delay		312.4		32.1	20.4			8.5			23.3						
Queue Delay		0.0		0.0	0.0			0.5			0.0						
Total Delay		312.4		32.1	20.4			9.0			23.3						
Queue Length 50th (ft)		~285		132	127			11			34						
Queue Length 95th (ft)		#359		#361	262			137			#77						
Internal Link Dist (ft)		589			3310			15			39						
Turn Bay Length (ft)																	
Base Capacity (vph)		376		486	783			858			464						
Starvation Cap Reductn		0		0	0			180			0						
Spillback Cap Reductn		0		0	0			0			0						
Storage Cap Reductn		0		0	0			0			0						
Reduced v/c Ratio		1.61		0.74	0.46			0.56			0.63						

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 131: Bennington Street & Neptune Rd



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	371	103	323	261	63	119	231	3	16	91	122
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	10	10	12	10	11	11	11	11	11	11
Total Lost time (s)		5.0		5.0	5.0			5.0			5.0	
Lane Util. Factor		0.95		1.00	1.00			0.95			0.95	
Frpb, ped/bikes		1.00		1.00	1.00			1.00			0.84	
Flpb, ped/bikes		1.00		1.00	1.00			1.00			1.00	
Frt		0.97		1.00	0.97			1.00			0.92	
Flt Protected		1.00		0.95	1.00			0.98			1.00	
Satd. Flow (prot)		3422		1668	1644			3325			2308	
Flt Permitted		0.57		0.29	1.00			0.71			0.90	
Satd. Flow (perm)		1960		509	1644			2402			2092	
Peak-hour factor, PHF	0.81	0.81	0.81	0.90	0.90	0.90	0.93	0.93	0.93	0.78	0.78	0.78
Adj. Flow (vph)	19	458	127	359	290	70	128	248	3	21	117	156
RTOR Reduction (vph)	0	25	0	0	8	0	0	1	0	0	128	0
Lane Group Flow (vph)	0	579	0	359	352	0	0	378	0	0	166	0
Confl. Peds. (#/hr)										23		101
Confl. Bikes (#/hr)									112			
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	3%	3%	3%	8%	8%	8%
Bus Blockages (#/hr)	0	0	0	0	0	8	0	0	0	0	0	0
Parking (#/hr)					0	0					10	10
Turn Type	Perm			D.P+P			D.P+P			Perm		
Protected Phases		1		5	1 5		3	3 4			4	
Permitted Phases	1			1			4			4		
Actuated Green, G (s)		13.8		35.1	40.1			27.7			16.2	
Effective Green, g (s)		13.8		35.1	40.1			27.7			16.2	
Actuated g/C Ratio		0.15		0.39	0.45			0.31			0.18	
Clearance Time (s)		5.0		5.0							5.0	
Vehicle Extension (s)		3.0		3.0							3.0	
Lane Grp Cap (vph)		301		473	732			857			377	
v/s Ratio Prot				c0.18	0.21			c0.06				
v/s Ratio Perm		c0.30		0.12				c0.08			0.08	
v/c Ratio		1.92		0.76	0.48			0.44			0.44	
Uniform Delay, d1		38.1		22.0	17.6			25.0			32.9	
Progression Factor		1.00		1.00	1.00			0.34			1.00	
Incremental Delay, d2		427.1		6.9	0.5			0.3			0.8	
Delay (s)		465.2		28.9	18.1			8.7			33.7	
Level of Service		F		C	B			A			C	
Approach Delay (s)		465.2			23.5			8.7			33.7	
Approach LOS		F			C			A			C	

Intersection Summary

HCM Average Control Delay	155.9	HCM Level of Service	F
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	27.2
Intersection Capacity Utilization	71.7%	ICU Level of Service	C
Analysis Period (min)	15		

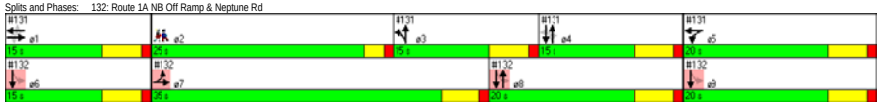
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø2	ø3	ø4	ø5	ø6	ø9
Lane Configurations																			
Volume (vph)	292	187	7	0	0	0	0	92	173	6	56	0							
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900							
Lane Width (ft)	10	11	12	12	12	12	11	11	11	11	11	11							
Right Turn on Red			Yes			Yes			Yes			Yes							
Link Speed (mph)		30			30			30			30								
Link Distance (ft)		106			312			647			107								
Travel Time (s)		2.4			7.1			14.7			2.4								
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.89	0.89	0.89	0.82	0.82	0.82							
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	7%	7%	7%	10%	10%	10%							
Shared Lane Traffic (%)																			
Lane Group Flow (vph)	317	211	0	0	0	0	0	297	0	0	75	0							
Turn Type	Split									Perm									
Protected Phases	7	7						8			6 8 9		1	2	3	4	5	6	9
Permitted Phases										6 8 9									
Detector Phase	7	7						8		6 8 9	6 8 9								
Switch Phase																			
Minimum Initial (s)	4.0	4.0						4.0					4.0	6.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	19.0	19.0						17.0					13.0	25.0	11.0	11.0	13.0	13.0	9.0
Total Split (s)	35.0	35.0	0.0	0.0	0.0	0.0	0.0	20.0	0.0	55.0	55.0	0.0	15.0	25.0	15.0	15.0	20.0	15.0	20.0
Total Split (%)	38.9%	38.9%	0.0%	0.0%	0.0%	0.0%	0.0%	22.2%	0.0%	61.1%	61.1%	0.0%	17%	28%	17%	17%	22%	17%	22%
Yellow Time (s)	4.0	4.0						4.0					4.0	2.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0						1.0					1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0							
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	5.0	5.0	4.0							
Lead/Lag	Lead	Lead						Lag						Lead	Lag				
Lead-Lag Optimize?	Yes	Yes						Yes						Yes	Yes				
Recall Mode	None	None						None					C-Max	None	None	None	None	None	None
v/c Ratio	0.76	0.46						0.62			0.04								
Control Delay	42.3	30.1						19.4			5.5								
Queue Delay	0.8	0.0						0.0			0.0								
Total Delay	43.1	30.1						19.4			5.5								
Queue Length 50th (ft)	165	99						29			4								
Queue Length 95th (ft)	235	149						63			m6								
Internal Link Dist (ft)		26			232			567			27								
Turn Bay Length (ft)																			
Base Capacity (vph)	540	586						652			1793								
Starvation Cap Reductn	0	0						0			0								
Spillback Cap Reductn	64	0						7			0								
Storage Cap Reductn	0	0						0			0								
Reduced v/c Ratio	0.67	0.36						0.46			0.04								

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 132: Route 1A NB Off Ramp & Neptune Rd



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	292	187	7	0	0	0	0	92	173	6	56	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)	5.0	5.0						5.0			5.0	
Lane Util. Factor	1.00	1.00						0.95			0.95	
Frt	1.00	0.99						0.90			1.00	
Flt Protected	0.95	1.00						1.00			1.00	
Satd. Flow (prot)	1620	1756						2942			3158	
Flt Permitted	0.95	1.00						1.00			0.93	
Satd. Flow (perm)	1620	1756						2942			2956	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.89	0.89	0.89	0.82	0.82	0.82
Adj. Flow (vph)	317	203	8	0	0	0	0	103	194	7	68	0
RTOR Reduction (vph)	0	1	0	0	0	0	0	169	0	0	0	0
Lane Group Flow (vph)	317	210	0	0	0	0	0	128	0	0	75	0
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	7%	7%	7%	10%	10%	10%
Turn Type	Split									Perm		
Protected Phases	7	7						8			6 8 9	
Permitted Phases										6 8 9		
Actuated Green, G (s)	23.2	23.2						11.7			56.8	
Effective Green, g (s)	23.2	23.2						11.7			56.8	
Actuated g/C Ratio	0.26	0.26						0.13			0.63	
Clearance Time (s)	5.0	5.0						5.0				
Vehicle Extension (s)	3.0	3.0						3.0				
Lane Grp Cap (vph)	418	453						382			1866	
v/s Ratio Prot	c0.20	0.12						c0.04				
v/s Ratio Perm											c0.03	
v/c Ratio	0.76	0.46						0.34			0.04	
Uniform Delay, d1	30.8	28.1						35.6			6.3	
Progression Factor	1.00	1.00						1.00			0.70	
Incremental Delay, d2	7.7	0.7						0.5			0.0	
Delay (s)	38.5	28.9						36.1			4.4	
Level of Service	D	C						D			A	
Approach Delay (s)		34.7			0.0			36.1			4.4	
Approach LOS		C			A			D			A	

Intersection Summary					
HCM Average Control Delay	32.6	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.29				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		14.5	
Intersection Capacity Utilization	32.6%	ICU Level of Service		A	
Analysis Period (min)	15				

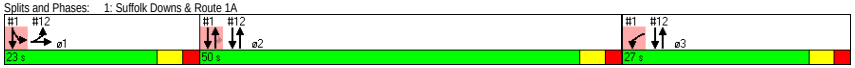
c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	526	193	1958	873	208	1850
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	300		300	0	
Storage Lanes	3	1		1	2	
Taper Length (ft)	25	25		25	25	
Right Turn on Red		Yes		Yes		
Link Speed (mph)	30		30			30
Link Distance (ft)	1248		333			412
Travel Time (s)	28.4		7.6			9.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	572	210	2128	949	226	2011
Turn Type		Free		Perm	Prot	
Protected Phases	3		2		1	1 2
Permitted Phases		Free		2		
Detector Phase	3		2	2	1	1 2
Switch Phase						
Minimum Initial (s)	6.0		6.0	6.0	10.0	
Minimum Split (s)	11.0		11.0	11.0	15.0	
Total Split (s)	27.0	0.0	50.0	50.0	23.0	73.0
Total Split (%)	27.0%	0.0%	50.0%	50.0%	23.0%	73.0%
Yellow Time (s)	3.0		3.0	3.0	3.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None		C-Min	C-Min	None	
v/c Ratio	0.52	0.13	0.93	0.87	0.37	0.84
Control Delay	36.4	0.2	29.2	11.1	38.4	14.3
Queue Delay	0.0	0.0	21.6	1.8	0.0	5.2
Total Delay	36.4	0.2	50.8	12.9	38.4	19.6
Queue Length 50th (ft)	114	0	473	19	77	323
Queue Length 95th (ft)	151	0	#500	#136	m87	408
Internal Link Dist (ft)	1168		253			332
Turn Bay Length (ft)		300		300		
Base Capacity (vph)	1098	1583	2288	1095	612	2383
Starvation Cap Reductn	0	0	248	55	0	320
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.13	1.04	0.91	0.37	0.97

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 68 (68%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Suffolk Downs & Route 1A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	526	193	1958	873	208	1850
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.94	1.00	0.91	1.00	0.97	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	4990	1583	5085	1583	3400	3505
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	4990	1583	5085	1583	3400	3505
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	572	210	2128	949	226	2011
RTOR Reduction (vph)	0	0	0	382	0	0
Lane Group Flow (vph)	572	210	2128	567	226	2011
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%
Turn Type		Free		Perm	Prot	
Protected Phases	3		2		1	1 2
Permitted Phases		Free		2		
Actuated Green, G (s)	22.0	100.0	45.0	45.0	18.0	68.0
Effective Green, g (s)	22.0	100.0	45.0	45.0	18.0	68.0
Actuated g/C Ratio	0.22	1.00	0.45	0.45	0.18	0.68
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1098	1583	2288	712	612	2383
v/s Ratio Prot	c0.11		c0.42		0.07	c0.57
v/s Ratio Perm		0.13		0.36		
v/c Ratio	0.52	0.13	0.93	0.80	0.37	0.84
Uniform Delay, d1	34.4	0.0	26.0	23.6	36.0	12.0
Progression Factor	1.00	1.00	0.85	0.45	1.04	1.00
Incremental Delay, d2	0.4	0.2	6.6	7.0	0.2	1.3
Delay (s)	34.8	0.2	28.6	17.6	37.5	13.3
Level of Service	C	A	C	B	D	B
Approach Delay (s)	25.5		25.2			15.8
Approach LOS	C		C			B

Intersection Summary

HCM Average Control Delay	21.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	70.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	36	10	35	242	12	316	31	10	323	173	2197	27	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		100	200		200	200		200	475		0	
Storage Lanes	0		1	1		1	1		1	1		0	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		246			531			536			818		
Travel Time (s)		5.6			12.1			12.2			18.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	1%	1%	1%	3%	3%	3%	
Shared Lane Traffic (%)				48%									
Lane Group Flow (vph)	0	50	38	137	139	343	34	11	351	188	2417	0	
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot			
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2		2
Permitted Phases									Free				
Detector Phase	5	5	3 5	4	4	4	3	3		1	1 2		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		10.0			4.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0		17.0			13.0
Total Split (s)	14.0	14.0	26.0	20.0	20.0	20.0	12.0	12.0	0.0	41.0	54.0	0.0	13.0
Total Split (%)	14.0%	14.0%	26.0%	20.0%	20.0%	20.0%	12.0%	12.0%	0.0%	41.0%	54.0%	0.0%	13%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0			3.0
All-Red Time (s)	2.0	2.0		4.0	4.0	4.0	2.0	2.0		2.0			2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	4.0	
Lead/Lag				Lag	Lag	Lag	Lead	Lead		Lead			Lag
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes		Yes			Yes
Recall Mode	None	None		None	None	None	None	None		C-Max			None
v/c Ratio		0.36	0.16	0.68	0.69	0.70	0.29	0.09	0.22	0.25	0.86		
Control Delay		51.0	15.0	59.5	59.9	12.9	50.7	45.2	0.3	20.4	24.6		
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay		51.0	15.0	59.5	59.9	12.9	50.7	45.2	0.3	20.4	24.6		
Queue Length 50th (ft)		31	8	88	89	0	21	7	0	85	553		
Queue Length 95th (ft)		68	27	#166	#168	84	53	25	0	m101	#691		
Internal Link Dist (ft)		166			451			456			738		
Turn Bay Length (ft)			100	200		200	200		200	475			
Base Capacity (vph)		157	261	219	220	504	125	132	1599	753	2813		
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio		0.32	0.15	0.63	0.63	0.68	0.27	0.08	0.22	0.25	0.86		

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 1:SBTL, Start of Green, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Boardman Street & Route 1A Southbound



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	10	35	242	12	316	31	10	323	173	2197	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	7.0	7.0	7.0	5.0	5.0	4.0	5.0	5.0	
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.91	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1742	1538	1681	1693	1583	1787	1881	1599	1752	5027	
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1742	1538	1681	1693	1583	1787	1881	1599	1752	5027	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	11	38	263	13	343	34	11	351	188	2388	29
RTOR Reduction (vph)	0	0	16	0	0	302	0	0	0	0	1	0
Lane Group Flow (vph)	0	50	22	137	139	41	34	11	351	188	2416	0
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	1%	1%	1%	3%	3%	3%
Turn Type	Split		pt+ov	Split		Prot	Split		Free	Prot		
Protected Phases	5	5	3 5	4	4	4	3	3		1	1 2	
Permitted Phases									Free			
Actuated Green, G (s)		6.6	12.1	12.0	12.0	12.0	5.5	5.5	100.0	40.9	53.9	
Effective Green, g (s)		6.6	12.1	12.0	12.0	12.0	5.5	5.5	100.0	40.9	53.9	
Actuated g/C Ratio		0.07	0.12	0.12	0.12	0.12	0.06	0.06	1.00	0.41	0.54	
Clearance Time (s)		5.0		7.0	7.0	7.0	5.0	5.0		5.0		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)		115	186	202	203	190	98	103	1599	717	2710	
v/s Ratio Prot		c0.03	0.01	0.08	c0.08	0.03	0.02	0.01		0.11	c0.48	
v/s Ratio Perm									c0.22			
v/c Ratio		0.43	0.12	0.68	0.68	0.22	0.35	0.11	0.22	0.26	0.89	
Uniform Delay, d1		44.9	39.2	42.2	42.2	39.8	45.5	44.9	0.0	19.6	20.5	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.92	1.02	
Incremental Delay, d2		2.6	0.3	8.7	9.2	0.6	2.1	0.5	0.3	0.6	2.6	
Delay (s)		47.5	39.5	50.9	51.4	40.3	47.7	45.4	0.3	18.6	23.5	
Level of Service		D	D	D	D	D	D	D	A	B	C	
Approach Delay (s)		44.1			45.1			5.6			23.1	
Approach LOS		D			D			A			C	

Intersection Summary

HCM Average Control Delay	25.4	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.74				
Actuated Cycle Length (s)	100.0	Sum of lost time (s)		17.0	
Intersection Capacity Utilization	69.2%	ICU Level of Service		C	
Analysis Period (min)	15				

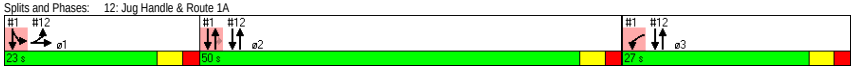
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2	ø3
Lane Configurations														
Volume (vph)	52	8	7	0	0	0	0	2137	2	0	2050	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Right Turn on Red			Yes			Yes			Yes			Yes		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		158			294			412			281			
Travel Time (s)		3.6			6.7			9.4			6.4			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92		
Heavy Vehicles (%)	14%	14%	14%	0%	0%	0%	2%	2%	2%	3%	3%	3%		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	74	0	0	0	0	0	2325	0	0	2228	0		
Turn Type	Split													
Protected Phases	1	1						2 3			2 3		2	3
Permitted Phases														
Detector Phase	1	1						2 3			2 3			
Switch Phase														
Minimum Initial (s)	10.0	10.0											6.0	6.0
Minimum Split (s)	15.0	15.0											11.0	11.0
Total Split (s)	23.0	23.0	0.0	0.0	0.0	0.0	0.0	77.0	0.0	0.0	77.0	0.0	50.0	27.0
Total Split (%)	23.0%	23.0%	0.0%	0.0%	0.0%	0.0%	0.0%	77.0%	0.0%	0.0%	77.0%	0.0%	50%	27%
Yellow Time (s)	3.0	3.0											3.0	3.0
All-Red Time (s)	2.0	2.0											2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0		
Lead/Lag	Lead	Lead											Lag	
Lead-Lag Optimize?	Yes	Yes											Yes	
Recall Mode	None	None											C-Min	None
v/c Ratio		0.26						0.64			0.88			
Control Delay		35.6						1.9			16.4			
Queue Delay		0.0						0.6			0.3			
Total Delay		35.6						2.5			16.7			
Queue Length 50th (ft)		38						16			492			
Queue Length 95th (ft)		80						m21			634			
Internal Link Dist (ft)		78			214			332			201			
Turn Bay Length (ft)														
Base Capacity (vph)		289						3661			2524			
Starvation Cap Reductn		0						827			0			
Spillback Cap Reductn		0						0			45			
Storage Cap Reductn		0						0			0			
Reduced v/c Ratio		0.26						0.82			0.90			

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 68 (68%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 12: Jug Handle & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	52	8	7	0	0	0	0	2137	2	0	2050	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0			5.0	
Lane Util. Factor		1.00						0.91			0.95	
Frt		0.99						1.00			1.00	
Flt Protected		0.96						1.00			1.00	
Satd. Flow (prot)		1581						5085			3505	
Flt Permitted		0.96						1.00			1.00	
Satd. Flow (perm)		1581						5085			3505	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	57	9	8	0	0	0	0	2323	2	0	2228	0
RTOR Reduction (vph)	0	4	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	70	0	0	0	0	0	2325	0	0	2228	0
Heavy Vehicles (%)	14%	14%	14%	0%	0%	0%	2%	2%	2%	3%	3%	3%
Turn Type	Split											
Protected Phases	1	1						2 3			2 3	
Permitted Phases												
Actuated Green, G (s)		18.0						72.0			72.0	
Effective Green, g (s)		18.0						72.0			72.0	
Actuated g/C Ratio		0.18						0.72			0.72	
Clearance Time (s)		5.0										
Vehicle Extension (s)		3.0										
Lane Grp Cap (vph)		285						3661			2524	
v/s Ratio Prot		c0.04						0.46			c0.64	
v/s Ratio Perm												
v/c Ratio		0.25						0.64			0.88	
Uniform Delay, d1		35.2						7.2			10.8	
Progression Factor		1.00						0.20			1.00	
Incremental Delay, d2		0.5						0.2			4.0	
Delay (s)		35.6						1.6			14.8	
Level of Service		D						A			B	
Approach Delay (s)		35.6			0.0			1.6			14.8	
Approach LOS		D			A			A			B	

Intersection Summary

HCM Average Control Delay	8.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	390	5	0	0	0	117	0	2326	120	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		300	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red	Yes		Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		105			600			1113			116	
Travel Time (s)		2.4			13.6			25.3			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)	49%											
Lane Group Flow (vph)	216	213	0	0	0	127	0	2658	0	0	0	0
Turn Type	Perm					Free						
Protected Phases		4						2				
Permitted Phases	4					Free						
Detector Phase	4	4						2				
Switch Phase												
Minimum Initial (s)	6.0	6.0						10.0				
Minimum Split (s)	11.0	11.0						20.0				
Total Split (s)	35.0	35.0	0.0	0.0	0.0	0.0	0.0	65.0	0.0	0.0	0.0	0.0
Total Split (%)	35.0%	35.0%	0.0%	0.0%	0.0%	0.0%	0.0%	65.0%	0.0%	0.0%	0.0%	0.0%
Yellow Time (s)	3.0	3.0						3.0				
All-Red Time (s)	2.0	2.0						2.0				
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None						C-Min				
v/c Ratio	0.69	0.65				0.08		0.74				
Control Delay	47.5	45.0				0.1		11.0				
Queue Delay	0.0	0.0				0.0		0.9				
Total Delay	47.5	45.0				0.1		11.9				
Queue Length 50th (ft)	138	134				0		312				
Queue Length 95th (ft)	m208	m203				0		500				
Internal Link Dist (ft)		25			520			1033			36	
Turn Bay Length (ft)												
Base Capacity (vph)	506	533				1611		3616				
Starvation Cap Reductn	0	0				0		0				
Spillback Cap Reductn	0	0				192		604				
Storage Cap Reductn	0	0				0		0				
Reduced v/c Ratio	0.43	0.40				0.09		0.88				

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 65 (65%), Referenced to phase 2:NBT, Start of Green
Natural Cycle: 50
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 20: Waldemar Avenue & Route 1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	390	5	0	0	0	117	0	2326	120	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0				4.0		5.0				
Lane Util. Factor	0.95	0.95				1.00		0.91				
Frt	1.00	1.00				0.86		0.99				
Flt Protected	0.95	1.00				1.00		1.00				
Satd. Flow (prot)	1681	1770				1611		5048				
Flt Permitted	0.95	1.00				1.00		1.00				
Satd. Flow (perm)	1681	1770				1611		5048				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	424	5	0	0	0	127	0	2528	130	0	0	0
RTOR Reduction (vph)	2	2	0	0	0	0	0	4	0	0	0	0
Lane Group Flow (vph)	214	211	0	0	0	127	0	2654	0	0	0	0
Turn Type	Perm					Free						
Protected Phases		4						2				
Permitted Phases	4					Free						
Actuated Green, G (s)	18.5	18.5				100.0		71.5				
Effective Green, g (s)	18.5	18.5				100.0		71.5				
Actuated g/C Ratio	0.18	0.18				1.00		0.72				
Clearance Time (s)	5.0	5.0						5.0				
Vehicle Extension (s)	3.0	3.0						3.0				
Lane Grp Cap (vph)	311	327				1611		3609				
v/s Ratio Prot								c0.53				
v/s Ratio Perm	c0.13	0.12				0.08						
v/c Ratio	0.69	0.64				0.08		0.74				
Uniform Delay, d1	38.0	37.7				0.0		8.6				
Progression Factor	1.03	1.03				1.00		1.00				
Incremental Delay, d2	5.1	3.6				0.1		1.4				
Delay (s)	44.4	42.4				0.1		9.9				
Level of Service	D	D				A		A				
Approach Delay (s)		43.4			0.1			9.9			0.0	
Approach LOS		D			A			A			A	

Intersection Summary

HCM Average Control Delay	14.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	66.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	142	2035	153	0	2119
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.91	0.91	0.89	0.89	0.94	0.94
Hourly flow rate (vph)	0	156	2287	172	0	2254
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	3500	1229			2458	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3500	1229			2458	
tC, single (s)	6.9	7.0			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	6			100	
cM capacity (veh/h)	5	167			184	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	156	1524	934	1127	1127
Volume Left	0	0	0	0	0
Volume Right	156	0	172	0	0
cSH	167	1700	1700	1700	1700
Volume to Capacity	0.94	0.90	0.55	0.66	0.66
Queue Length 95th (ft)	175	0	0	0	0
Control Delay (s)	108.7	0.0	0.0	0.0	0.0
Lane LOS	F				
Approach Delay (s)	108.7	0.0		0.0	
Approach LOS	F				

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	76.6%	ICU Level of Service	D
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	61	183	415	0	0	407
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.84	0.84	0.82	0.82	0.86	0.86
Hourly flow rate (vph)	73	218	506	0	0	473
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						233
pX, platoon unblocked						
vC, conflicting volume	743	253			506	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	743	253			506	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	80	71			100	
cM capacity (veh/h)	355	753			1062	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	73	218	253	253	237	237
Volume Left	73	0	0	0	0	0
Volume Right	0	218	0	0	0	0
cSH	355	753	1700	1700	1700	1700
Volume to Capacity	0.20	0.29	0.15	0.15	0.14	0.14
Queue Length 95th (ft)	19	30	0	0	0	0
Control Delay (s)	17.7	11.7	0.0	0.0	0.0	0.0
Lane LOS	C	B				
Approach Delay (s)	13.2		0.0		0.0	
Approach LOS	B					

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	29.5%	ICU Level of Service	A
Analysis Period (min)	15		

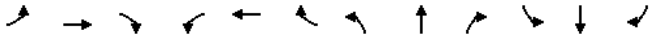


Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	243	0	0	2917	124
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.89	0.89	0.92	0.92	0.91	0.91
Hourly flow rate (vph)	0	273	0	0	3205	136
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	3274	1137	3342			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3274	1137	3342			
tC, single (s)	6.9	7.0	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.2			
p0 queue free %	100	0	100			
cM capacity (veh/h)	6	189	82			

Direction, Lane #	EB 1	SB 1	SB 2	SB 3
Volume Total	273	1282	1282	777
Volume Left	0	0	0	0
Volume Right	273	0	0	136
cSH	189	1700	1700	1700
Volume to Capacity	1.44	0.75	0.75	0.46
Queue Length 95th (ft)	415	0	0	0
Control Delay (s)	272.1	0.0	0.0	0.0
Lane LOS	F			
Approach Delay (s)	272.1	0.0		
Approach LOS	F			

Intersection Summary			
Average Delay	20.6		
Intersection Capacity Utilization	80.8%	ICU Level of Service	D
Analysis Period (min)	15		

Intersection Sign configuration not allowed in HCM analysis.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	34	76	13	4	289	13	6	193	33
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.91	0.91	0.91	0.74	0.74	0.74	0.81	0.81	0.81
Hourly flow rate (vph)	0	0	0	37	84	14	5	391	18	7	238	41
Pedestrians		10			20			4			13	
Lane Width (ft)		0.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			2			0			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								119				
pX, platoon unblocked	0.95	0.95		0.95	0.95	0.95				0.95		
vC, conflicting volume	559	722	154	568	734	237	289			428		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	422	595	154	432	607	82	289			284		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	92	78	98	100			99		
cM capacity (veh/h)	387	383	862	466	381	891	1270			1187		

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	135	201	213	127	160
Volume Left	37	5	0	7	0
Volume Right	14	0	18	0	41
cSH	428	1270	1700	1187	1700
Volume to Capacity	0.32	0.00	0.13	0.01	0.09
Queue Length 95th (ft)	33	0	0	0	0
Control Delay (s)	17.2	0.2	0.0	0.5	0.0
Lane LOS	C	A		A	
Approach Delay (s)	17.2	0.1		0.2	
Approach LOS	C				

Intersection Summary				
Average Delay	2.9			
Intersection Capacity Utilization	28.1%	ICU Level of Service		A
Analysis Period (min)	15			

Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

Sidra 5.1 Capacity Analysis

Roundabout Capacity Analysis

MOVEMENT SUMMARY

Site: Brown Circle Existing PM

Brown Circle
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Route 107 (Broadway)											
3	L	345	0.9	1.739	369.7	LOS F	89.3	2247.9	1.00	6.75	3.1
8	T	248	0.9	1.739	369.7	LOS F	89.3	2247.9	1.00	6.75	2.9
18	R	28	0.9	1.739	369.7	LOS F	89.3	2247.9	1.00	6.75	2.9
Approach		621	0.9	1.739	369.7	LOS F	89.3	2247.9	1.00	6.75	3.0
East: Route 60 (American Legion Hwy)											
1	L	68	2.2	1.411	214.0	LOS F	88.5	2252.5	1.00	6.29	4.9
6	T	1108	2.2	1.411	213.8	LOS F	91.5	2328.8	1.00	6.35	4.6
16	R	589	2.2	1.411	213.1	LOS F	91.5	2328.8	1.00	6.49	4.6
Approach		1765	2.2	1.411	213.6	LOS F	91.5	2328.8	1.00	6.39	4.6
North: Route 107 (Salem Turnpike)											
7	L	700	3.3	1.920	441.5	LOS F	147.0	3771.5	1.00	8.98	2.7
4	T	224	3.3	1.920	441.5	LOS F	147.0	3771.5	1.00	8.98	2.4
14	R	224	3.3	0.494	17.9	LOS C	1.8	44.9	0.73	0.88	17.8
Approach		1148	3.3	1.920	358.8	LOS F	147.0	3771.5	0.95	7.40	3.1
West: Route 60 (Squire Road)											
5	L	483	1.8	1.132	97.7	LOS F	43.9	1113.1	1.00	3.42	8.6
2	T	913	1.8	1.132	97.2	LOS F	44.4	1126.6	1.00	3.44	8.2
12	R	296	1.8	1.132	97.0	LOS F	44.4	1126.6	1.00	3.46	8.3
Approach		1691	1.8	1.132	97.3	LOS F	44.4	1126.6	1.00	3.44	8.3
All Vehicles		5226	2.2	1.920	226.4	LOS F	147.0	3771.5	0.99	5.70	4.5

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Brown Circle
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Route 107 (Broadway)											
3	L	420	0.9	1.989	479.4	LOS F	117.7	2964.4	1.00	7.69	2.5
8	T	261	0.9	1.989	479.4	LOS F	117.7	2964.4	1.00	7.69	2.3
18	R	29	0.9	1.989	479.4	LOS F	117.7	2964.4	1.00	7.69	2.3
Approach		710	0.9	1.989	479.4	LOS F	117.7	2964.4	1.00	7.69	2.4
East: Route 60 (American Legion Hwy)											
1	L	71	2.2	1.581	286.8	LOS F	124.0	3155.6	1.00	7.63	3.9
6	T	1313	2.2	1.581	286.6	LOS F	128.3	3263.6	1.00	7.71	3.6
16	R	632	2.2	1.581	286.1	LOS F	128.3	3263.6	1.00	7.88	3.6
Approach		2016	2.2	1.581	286.5	LOS F	128.3	3263.6	1.00	7.76	3.6
North: Route 107 (Salem Turnpike)											
7	L	760	3.3	2.162	549.6	LOS F	178.2	4573.4	1.00	9.76	2.2
4	T	247	3.3	2.162	549.6	LOS F	178.2	4573.4	1.00	9.76	2.0
14	R	234	3.3	0.535	20.0	LOS C	2.0	50.2	0.76	0.92	17.2
Approach		1241	3.3	2.162	449.6	LOS F	178.2	4573.4	0.95	8.09	2.5
West: Route 60 (Squire Road)											
5	L	507	1.8	1.275	152.9	LOS F	77.2	1956.9	1.00	5.05	6.4
2	T	1083	1.8	1.275	152.5	LOS F	78.6	1994.3	1.00	5.10	5.9
12	R	341	1.8	1.275	152.3	LOS F	78.6	1994.3	1.00	5.14	6.0
Approach		1932	1.8	1.275	152.6	LOS F	78.6	1994.3	1.00	5.09	6.1
All Vehicles		5899	2.1	2.162	300.2	LOS F	178.2	4573.4	0.99	6.95	3.5

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Brown Circle Build PM

Brown Circle
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Route 107 (Broadway)											
3	L	420	0.9	2.020	493.6	LOS F	119.5	3008.5	1.00	7.72	2.4
8	T	261	0.9	2.020	493.6	LOS F	119.5	3008.5	1.00	7.72	2.2
18	R	29	0.9	2.020	493.6	LOS F	119.5	3008.5	1.00	7.72	2.2
Approach		710	0.9	2.020	493.6	LOS F	119.5	3008.5	1.00	7.72	2.3
East: Route 60 (American Legion Hwy)											
1	L	71	2.2	1.656	319.3	LOS F	142.3	3619.2	1.00	8.17	3.5
6	T	1434	2.2	1.656	319.1	LOS F	147.0	3739.3	1.00	8.25	3.3
16	R	653	2.2	1.656	318.6	LOS F	147.0	3739.3	1.00	8.42	3.3
Approach		2158	2.2	1.656	319.0	LOS F	147.0	3739.3	1.00	8.30	3.3
North: Route 107 (Salem Turnpike)											
7	L	786	3.3	2.250	589.2	LOS F	188.1	4826.8	1.00	9.97	2.0
4	T	247	3.3	2.250	581.7	LOS F	188.1	4826.8	1.00	9.85	1.9
14	R	234	3.3	0.553	21.0	LOS C	2.0	52.5	0.77	0.93	17.0
Approach		1268	3.3	2.250	482.6	LOS F	188.1	4826.8	0.96	8.27	2.4
West: Route 60 (Squire Road)											
5	L	507	1.8	1.357	187.1	LOS F	97.1	2461.3	1.00	5.86	5.5
2	T	1218	1.8	1.357	186.8	LOS F	99.0	2511.8	1.00	5.93	5.1
12	R	341	1.8	1.357	186.6	LOS F	99.0	2511.8	1.00	5.98	5.1
Approach		2067	1.8	1.357	186.8	LOS F	99.0	2511.8	1.00	5.92	5.2
All Vehicles		6203	2.1	2.250	328.4	LOS F	188.1	4826.8	0.99	7.43	3.3

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: Brown Circle Existing SAT

Brown Circle
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Route 107 (Broadway)											
3	L	282	0.2	1.319	190.9	LOS F	43.4	1087.2	1.00	4.49	5.3
8	T	104	0.2	1.319	190.9	LOS F	43.4	1087.2	1.00	4.49	5.0
18	R	104	0.2	1.319	190.9	LOS F	43.4	1087.2	1.00	4.49	5.0
Approach		491	0.2	1.319	190.9	LOS F	43.4	1087.2	1.00	4.49	5.2
East: Route 60 (American Legion Hwy)											
1	L	42	1.6	1.365	196.9	LOS F	73.1	1850.1	1.00	5.74	5.2
6	T	951	1.6	1.365	196.7	LOS F	75.9	1922.2	1.00	5.78	4.9
16	R	578	1.6	1.365	195.8	LOS F	75.9	1922.2	1.00	5.94	4.9
Approach		1570	1.6	1.365	196.3	LOS F	75.9	1922.2	1.00	5.84	4.9
North: Route 107 (Salem Turnpike)											
7	L	482	1.4	1.533	270.2	LOS F	94.7	2394.5	1.00	7.00	4.0
4	T	317	1.4	1.533	268.9	LOS F	94.7	2394.5	1.00	6.96	3.8
14	R	184	1.4	0.376	13.5	LOS B	1.2	31.2	0.67	0.79	19.0
Approach		983	1.4	1.533	221.7	LOS F	94.7	2394.5	0.94	5.82	4.6
West: Route 60 (Squire Road)											
5	L	597	1.8	0.997	56.3	LOS F	18.6	472.8	1.00	1.90	11.6
2	T	645	1.8	0.997	55.7	LOS F	18.6	472.8	1.00	1.88	11.5
12	R	233	1.8	0.997	55.5	LOS F	18.3	465.3	1.00	1.87	11.5
Approach		1475	1.8	0.997	55.9	LOS F	18.6	472.8	1.00	1.88	11.5
All Vehicles		4519	1.5	1.533	155.5	LOS F	94.7	2394.5	0.99	4.40	6.0

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: Brown Circle No-Build SAT

Brown Circle
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Route 107 (Broadway)											
3	L	349	0.2	1.526	276.5	LOS F	67.8	1697.6	1.00	5.82	4.0
8	T	110	0.2	1.526	276.5	LOS F	67.8	1697.6	1.00	5.82	3.7
18	R	110	0.2	1.526	276.5	LOS F	67.8	1697.6	1.00	5.82	3.7
Approach		569	0.2	1.526	276.5	LOS F	67.8	1697.6	1.00	5.82	3.9
East: Route 60 (American Legion Hwy)											
1	L	44	1.6	1.507	256.7	LOS F	101.3	2564.3	1.00	6.94	4.2
6	T	1129	1.6	1.507	256.5	LOS F	105.2	2664.3	1.00	7.00	3.9
16	R	612	1.6	1.507	255.8	LOS F	105.2	2664.3	1.00	7.19	3.9
Approach		1785	1.6	1.507	256.2	LOS F	105.2	2664.3	1.00	7.07	3.9
North: Route 107 (Salem Turnpike)											
7	L	539	1.4	1.733	358.3	LOS F	123.1	3110.8	1.00	8.10	3.2
4	T	337	1.4	1.733	350.5	LOS F	123.1	3110.8	0.99	7.93	3.0
14	R	194	1.4	0.426	15.3	LOS C	1.5	36.7	0.70	0.83	18.5
Approach		1069	1.4	1.733	293.7	LOS F	123.1	3110.8	0.94	6.73	3.6
West: Route 60 (Squire Road)											
5	L	626	1.8	1.144	102.1	LOS F	46.6	1182.0	1.00	3.57	8.3
2	T	796	1.8	1.144	101.6	LOS F	47.2	1197.7	1.00	3.60	8.0
12	R	289	1.8	1.144	101.4	LOS F	47.2	1197.7	1.00	3.61	8.0
Approach		1712	1.8	1.144	101.8	LOS F	47.2	1197.7	1.00	3.59	8.1
All Vehicles		5134	1.5	1.733	214.8	LOS F	123.1	3110.8	0.99	5.70	4.7

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: Brown Circle Build SAT

Brown Circle
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Route 107 (Broadway)											
3	L	349	0.2	1.555	289.6	LOS F	70.0	1752.1	1.00	5.92	3.8
8	T	110	0.2	1.555	289.6	LOS F	70.0	1752.1	1.00	5.92	3.5
18	R	110	0.2	1.555	289.6	LOS F	70.0	1752.1	1.00	5.92	3.5
Approach		569	0.2	1.555	289.6	LOS F	70.0	1752.1	1.00	5.92	3.7
East: Route 60 (American Legion Hwy)											
1	L	44	1.6	1.566	281.3	LOS F	116.0	2937.9	1.00	7.43	3.9
6	T	1241	1.6	1.566	281.1	LOS F	120.4	3047.3	1.00	7.50	3.6
16	R	633	1.6	1.566	280.5	LOS F	120.4	3047.3	1.00	7.69	3.6
Approach		1917	1.6	1.566	280.9	LOS F	120.4	3047.3	1.00	7.56	3.6
North: Route 107 (Salem Turnpike)											
7	L	569	1.4	1.820	397.2	LOS F	134.1	3391.0	1.00	8.47	2.9
4	T	337	1.4	1.820	382.3	LOS F	134.1	3391.0	0.99	8.17	2.8
14	R	194	1.4	0.447	16.2	LOS C	1.5	39.1	0.72	0.85	18.3
Approach		1099	1.4	1.820	325.5	LOS F	134.1	3391.0	0.95	7.03	3.3
West: Route 60 (Squire Road)											
5	L	626	1.8	1.233	136.1	LOS F	66.8	1693.8	1.00	4.60	6.9
2	T	937	1.8	1.233	135.7	LOS F	68.0	1724.8	1.00	4.66	6.5
12	R	289	1.8	1.233	135.5	LOS F	68.0	1724.8	1.00	4.68	6.5
Approach		1853	1.8	1.233	135.8	LOS F	68.0	1724.8	1.00	4.64	6.6
All Vehicles		5438	1.5	1.820	241.4	LOS F	134.1	3391.0	0.99	6.29	4.2

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: Butler Circle Existing PM

Butler Circle
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: North Shore Road											
3	L	18	3.6	0.935	55.6	LOS F	7.7	199.2	0.93	1.52	12.9
8	T	430	3.6	0.935	55.6	LOS F	7.7	199.2	0.93	1.46	12.6
Approach		448	3.6	0.935	55.6	LOS F	7.7	199.2	0.93	1.46	12.6
North: Route 1A (North Shore Road)											
4	T	285	3.3	0.521	9.6	LOS A	3.3	85.2	0.19	0.30	23.4
14	R	820	3.3	0.521	9.6	LOS A	3.3	85.2	0.19	0.25	23.5
Approach		1105	3.3	0.521	9.6	LOS A	3.3	85.2	0.19	0.26	23.5
South West: Route 1A (VFW Parkway)											
5X	L	1114	2.1	0.707	17.8	LOS C	6.1	154.8	0.74	0.94	19.2
12X	R	43	2.1	0.707	17.8	LOS C	6.1	154.8	0.74	0.89	19.6
Approach		1157	2.1	0.707	17.8	LOS C	6.1	154.8	0.74	0.94	19.2
All Vehicles		2711	2.8	0.935	20.7	LOS C	7.7	199.2	0.55	0.75	19.0

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: Butler Circle No-Build PM

Butler Circle
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: North Shore Road											
3	L	60	3.6	1.297	179.3	LOS F	43.9	1128.6	1.00	4.12	6.0
8	T	462	3.6	1.297	179.3	LOS F	43.9	1128.6	1.00	4.12	5.6
Approach		523	3.6	1.297	179.3	LOS F	43.9	1128.6	1.00	4.12	5.7
North: Route 1A (North Shore Road)											
4	T	305	3.3	0.653	13.1	LOS B	5.2	134.5	0.37	0.36	22.0
14	R	1039	3.3	0.653	13.1	LOS B	5.2	134.5	0.37	0.32	22.1
Approach		1345	3.3	0.653	13.1	LOS B	5.2	134.5	0.37	0.33	22.1
South West: Route 1A (VFW Parkway)											
5X	L	1356	2.1	0.897	34.2	LOS D	14.1	358.2	1.00	1.29	15.5
12X	R	85	2.1	0.897	34.2	LOS D	14.1	358.2	1.00	1.29	15.5
Approach		1441	2.1	0.897	34.2	LOS D	14.1	358.2	1.00	1.29	15.5
All Vehicles		3308	2.8	1.297	48.5	LOS E	43.9	1128.6	0.74	1.35	13.5

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: Butler Circle Build PM

Butler Circle
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: North Shore Road											
3	L	60	3.6	1.356	203.0	LOS F	51.3	1318.8	1.00	4.52	5.5
8	T	486	3.6	1.356	203.0	LOS F	51.3	1318.8	1.00	4.52	5.1
Approach		546	3.6	1.356	203.0	LOS F	51.3	1318.8	1.00	4.52	5.1
North: Route 1A (North Shore Road)											
4	T	333	3.3	0.665	13.4	LOS B	5.5	141.2	0.37	0.36	21.9
14	R	1039	3.3	0.665	13.4	LOS B	5.5	141.2	0.37	0.32	21.9
Approach		1372	3.3	0.665	13.4	LOS B	5.5	141.2	0.37	0.33	21.9
South West: Route 1A (VFW Parkway)											
5X	L	1356	2.1	0.923	38.9	LOS E	15.8	400.7	1.00	1.40	14.7
12X	R	85	2.1	0.923	38.9	LOS E	15.8	400.7	1.00	1.40	14.7
Approach		1441	2.1	0.923	38.9	LOS E	15.8	400.7	1.00	1.40	14.7
All Vehicles		3359	2.8	1.356	55.2	LOS F	51.3	1318.8	0.74	1.47	12.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: Butler Circle Existing SAT

Butler Circle
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: North Shore Road											
3	L	28	1.9	0.593	18.4	LOS C	2.4	62.1	0.70	1.12	19.3
8	T	302	1.9	0.593	18.4	LOS C	2.4	62.1	0.70	0.86	20.1
Approach		330	1.9	0.593	18.4	LOS C	2.4	62.1	0.70	0.88	20.1
North: Route 1A (North Shore Road)											
4	T	238	3.0	0.563	10.5	LOS B	3.9	98.9	0.25	0.32	23.0
14	R	948	3.0	0.563	10.5	LOS B	3.9	98.9	0.25	0.27	23.1
Approach		1185	3.0	0.563	10.5	LOS B	3.9	98.9	0.25	0.28	23.1
South West: Route 1A (VFW Parkway)											
5X	L	934	1.9	0.556	12.0	LOS B	3.4	86.8	0.57	0.76	20.9
12X	R	29	1.9	0.556	12.0	LOS B	3.4	86.8	0.57	0.68	21.5
Approach		963	1.9	0.556	12.0	LOS B	3.4	86.8	0.57	0.76	21.0
All Vehicles		2478	2.4	0.593	12.2	LOS B	3.9	98.9	0.44	0.55	21.8

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: Butler Circle No-Build SAT

Butler Circle
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: North Shore Road											
3	L	74	1.9	0.832	38.9	LOS E	4.8	122.5	0.88	1.27	15.1
8	T	326	1.9	0.832	38.9	LOS E	4.8	122.5	0.88	1.17	15.1
Approach		400	1.9	0.832	38.9	LOS E	4.8	122.5	0.88	1.19	15.1
North: Route 1A (North Shore Road)											
4	T	256	3.0	0.704	15.2	LOS C	6.1	156.4	0.50	0.44	21.3
14	R	1157	3.0	0.704	15.2	LOS C	6.1	156.4	0.50	0.41	21.3
Approach		1413	3.0	0.704	15.2	LOS C	6.1	156.4	0.50	0.41	21.3
South West: Route 1A (VFW Parkway)											
5X	L	1139	1.9	0.711	17.5	LOS C	6.4	161.8	0.73	0.89	19.3
12X	R	70	1.9	0.711	17.5	LOS C	6.4	161.8	0.73	0.84	19.7
Approach		1210	1.9	0.711	17.5	LOS C	6.4	161.8	0.73	0.89	19.3
All Vehicles		3022	2.4	0.832	19.2	LOS C	6.4	161.8	0.64	0.71	19.4

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: Butler Circle Build SAT

Butler Circle
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: North Shore Road											
3	L	74	1.9	0.885	46.5	LOS E	6.0	153.1	0.91	1.36	14.0
8	T	351	1.9	0.885	46.5	LOS E	6.0	153.1	0.91	1.29	13.8
Approach		426	1.9	0.885	46.5	LOS E	6.0	153.1	0.91	1.30	13.9
North: Route 1A (North Shore Road)											
4	T	291	3.0	0.722	15.9	LOS C	6.5	167.3	0.52	0.44	21.0
14	R	1157	3.0	0.722	15.9	LOS C	6.5	167.3	0.52	0.41	21.0
Approach		1448	3.0	0.722	15.9	LOS C	6.5	167.3	0.52	0.42	21.0
South West: Route 1A (VFW Parkway)											
5X	L	1139	1.9	0.738	19.4	LOS C	6.9	175.6	0.78	0.97	18.8
12X	R	70	1.9	0.738	19.4	LOS C	6.9	175.6	0.78	0.93	19.1
Approach		1210	1.9	0.738	19.4	LOS C	6.9	175.6	0.78	0.97	18.8
All Vehicles		3083	2.4	0.885	21.5	LOS C	6.9	175.6	0.68	0.76	18.8

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: Eliot Circle Existing PM

Eliot Circle
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Winthrop Parkway NB (Route 145)											
3	L	313	1.2	0.937	48.1	LOS E	9.6	242.5	0.91	1.54	12.6
8	T	260	1.2	0.937	48.1	LOS E	9.6	242.5	0.91	1.47	12.3
Approach		573	1.2	0.937	48.1	LOS E	9.6	242.5	0.91	1.51	12.4
South West: Revere Beach Parkway NEB (Route 145)											
5X	L	842	1.1	0.673	13.2	LOS B	4.6	116.8	0.03	0.50	18.5
12X	R	755	1.1	0.673	11.7	LOS B	4.3	109.1	0.05	0.32	19.3
Approach		1597	1.1	0.673	12.5	LOS B	4.6	116.8	0.04	0.42	18.8
All Vehicles		2170	1.1	0.937	21.9	LOS C	9.6	242.5	0.27	0.71	16.5

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: Eliot Circle No-Build PM

Eliot Circle
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Winthrop Parkway NB (Route 145)											
3	L	332	1.2	1.016	67.3	LOS F	16.6	419.6	1.00	2.13	10.7
8	T	273	1.2	1.016	67.3	LOS F	16.6	419.6	1.00	2.13	10.2
Approach		606	1.2	1.016	67.3	LOS F	16.6	419.6	1.00	2.13	10.5
South West: Revere Beach Parkway NEB (Route 145)											
5X	L	887	1.1	0.731	15.4	LOS C	6.0	150.9	0.03	0.50	17.9
12X	R	848	1.1	0.731	13.6	LOS B	5.6	140.9	0.06	0.32	18.7
Approach		1735	1.1	0.731	14.5	LOS B	6.0	150.9	0.05	0.41	18.3
All Vehicles		2340	1.1	1.016	28.2	LOS D	16.6	419.6	0.29	0.86	15.3

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: Eliot Circle Build PM

Eliot Circle
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Winthrop Parkway NB (Route 145)											
3	L	334	1.2	1.020	68.3	LOS F	17.1	431.1	1.00	2.17	10.6
8	T	273	1.2	1.020	68.3	LOS F	17.1	431.1	1.00	2.17	10.1
Approach		608	1.2	1.020	68.3	LOS F	17.1	431.1	1.00	2.17	10.4
South West: Revere Beach Parkway NEB (Route 145)											
5X	L	887	1.1	0.732	15.4	LOS C	6.0	151.6	0.03	0.50	17.9
12X	R	850	1.1	0.732	13.6	LOS B	5.6	141.5	0.06	0.32	18.7
Approach		1737	1.1	0.732	14.6	LOS B	6.0	151.6	0.05	0.41	18.3
All Vehicles		2345	1.1	1.020	28.5	LOS D	17.1	431.1	0.29	0.87	15.2

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: Eliot Circle Existing SAT

Eliot Circle
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Winthrop Parkway NB (Route 145)											
3	L	283	0.2	0.648	14.6	LOS B	3.8	94.6	0.59	0.98	18.2
8	T	283	0.2	0.648	14.6	LOS B	3.8	94.6	0.59	0.65	18.8
Approach		565	0.2	0.648	14.6	LOS B	3.8	94.6	0.59	0.82	18.5
South West: Revere Beach Parkway NEB (Route 145)											
5X	L	365	0.2	0.329	6.5	LOS A	1.2	30.2	0.02	0.51	20.4
12X	R	589	0.2	0.450	7.5	LOS A	1.9	46.8	0.04	0.33	20.6
Approach		954	0.2	0.450	7.1	LOS A	1.9	46.8	0.03	0.40	20.5
All Vehicles		1519	0.2	0.648	9.9	LOS A	3.8	94.6	0.24	0.55	19.7

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: Eliot Circle No-Build SAT

Eliot Circle
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Winthrop Parkway NB (Route 145)											
3	L	329	0.2	0.730	18.3	LOS C	5.1	128.4	0.68	1.04	17.4
8	T	298	0.2	0.730	18.3	LOS C	5.1	128.4	0.68	0.79	17.8
Approach		627	0.2	0.730	18.3	LOS C	5.1	128.4	0.68	0.92	17.5
South West: Revere Beach Parkway NEB (Route 145)											
5X	L	387	0.2	0.349	6.7	LOS A	1.3	33.1	0.02	0.51	20.3
12X	R	653	0.2	0.498	8.2	LOS A	2.3	56.8	0.04	0.33	20.4
Approach		1040	0.2	0.498	7.7	LOS A	2.3	56.8	0.03	0.39	20.4
All Vehicles		1667	0.2	0.730	11.6	LOS B	5.1	128.4	0.28	0.59	19.2

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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MOVEMENT SUMMARY

Site: Eliot Circle Build SAT

Eliot Circle
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Winthrop Parkway NB (Route 145)											
3	L	335	0.2	0.736	18.6	LOS C	5.3	131.9	0.69	1.04	17.3
8	T	298	0.2	0.736	18.6	LOS C	5.3	131.9	0.69	0.80	17.7
Approach		633	0.2	0.736	18.6	LOS C	5.3	131.9	0.69	0.93	17.4
South West: Revere Beach Parkway NEB (Route 145)											
5X	L	387	0.2	0.349	6.7	LOS A	1.3	33.1	0.02	0.51	20.3
12X	R	655	0.2	0.500	8.3	LOS A	2.3	57.1	0.04	0.33	20.4
Approach		1043	0.2	0.500	7.7	LOS A	2.3	57.1	0.03	0.39	20.4
All Vehicles		1675	0.2	0.736	11.8	LOS B	5.3	131.9	0.28	0.60	19.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used.

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Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

HCS+ Capacity Analysis

Weave and Merge Capacity Analysis

Suffolk Downs

FREEWAY WEAVING WORKSHEET

General Information

Analyst	Erica Guidoboni
Agency/Company	VHB, Inc.
Date Performed	7/9/13
Analysis Time Period	Friday Evening

Site Information

Freeway/Dir of Travel	Route 1 SB at Copeland Cir.
Weaving Segment Location	Weave Segment 1 (WB)
Analysis Year	2012 Existing Conditions

Project Description *Suffolk Downs*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	300ft	Freeway maximum capacity, C_{IFL}	2250
Freeway free-flow speed, FFS	35 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	54	0.74	0	0	1.5	1.2	1.000	1.00	73
V_{RF}	950	0.92	2	0	1.5	1.2	0.990	1.00	1043
V_{FR}	810	0.88	2	0	1.5	1.2	0.990	1.00	930
V_{RR}	276	0.91	1	0	1.5	1.2	0.995	1.00	305
V_{NW}	378							V =	2351
V_W	1973								
VR	0.839								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1973 lc/h
Interchange density, ID	0.0 int/mi	Weaving lane changes, LC_W	1973 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	0 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	1973 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	0

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	2351 pc/h	Weaving intensity factor, W	0.999
Weaving segment capacity, c_w	2702 veh/h	Weaving segment speed, S	22.6 mph
Weaving segment v/c ratio	0.870	Average weaving speed, S_W	25.0 mph
Weaving segment density, D	51.9 pc/mi/ln	Average non-weaving speed, S_{NW}	15.2 mph
Level of Service, LOS	E	Maximum weaving length, L_{MAX}	12053 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Suffolk Downs

FREEWAY WEAVING WORKSHEET

General Information

Analyst	Erica Guidoboni
Agency/Company	VHB, Inc.
Date Performed	7/9/13
Analysis Time Period	Friday Evening

Site Information

Freeway/Dir of Travel	Route 1 SB at Copeland Cir.
Weaving Segment Location	Weave Segment 1 (WB)
Analysis Year	2022 No-Build Conditions

Project Description *Suffolk Downs*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	300ft	Freeway maximum capacity, C_{IFL}	2250
Freeway free-flow speed, FFS	35 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	57	0.74	0	0	1.5	1.2	1.000	1.00	77
V_{RF}	1026	0.92	2	0	1.5	1.2	0.990	1.00	1126
V_{FR}	913	0.88	2	0	1.5	1.2	0.990	1.00	1048
V_{RR}	297	0.91	1	0	1.5	1.2	0.995	1.00	328
V_{NW}	405							V =	2579
V_W	2174								
VR	0.843								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	2174 lc/h
Interchange density, ID	0.0 int/mi	Weaving lane changes, LC_W	2174 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	0 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	2174 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	0

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	2579 pc/h	Weaving intensity factor, W	1.078
Weaving segment capacity, c_w	2694 veh/h	Weaving segment speed, S	21.7 mph
Weaving segment v/c ratio	0.957	Average weaving speed, S_W	24.6 mph
Weaving segment density, D	59.5 pc/mi/ln	Average non-weaving speed, S_{NW}	13.2 mph
Level of Service, LOS	E	Maximum weaving length, L_{MAX}	12103 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Suffolk Downs

FREEWAY WEAVING WORKSHEET

General Information

Analyst	Erica Guidoboni
Agency/Company	VHB, Inc.
Date Performed	7/9/13
Analysis Time Period	Friday Evening

Site Information

Freeway/Dir of Travel	Route 1 SB at Copeland Cir.
Weaving Segment Location	Weave Segment 1 (WB)
Analysis Year	2022 Build Conditions

Project Description *Suffolk Downs*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	300ft	Freeway maximum capacity, C_{IFL}	2250
Freeway free-flow speed, FFS	35 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	57	0.74	0	0	1.5	1.2	1.000	1.00	77
V_{RF}	1026	0.92	2	0	1.5	1.2	0.990	1.00	1126
V_{FR}	1040	0.88	2	0	1.5	1.2	0.990	1.00	1194
V_{RR}	297	0.91	1	0	1.5	1.2	0.995	1.00	328
V_{NW}	405							V =	2725
V_W	2320								
VR	0.851								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	lc/h
Interchange density, ID	0.0 int/mi	Weaving lane changes, LC_W	lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	2725 pc/h	Weaving intensity factor, W	
Weaving segment capacity, c_w	2678 veh/h	Weaving segment speed, S	mph
Weaving segment v/c ratio	1.018	Average weaving speed, S_W	mph
Weaving segment density, D	pc/mi/ln	Average non-weaving speed, S_{NW}	mph
Level of Service, LOS	F	Maximum weaving length, L_{MAX}	12214 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Suffolk Downs

FREEWAY WEAVING WORKSHEET

General Information

Analyst	Erica Guidoboni
Agency/Company	VHB, Inc.
Date Performed	7/9/13
Analysis Time Period	Friday Evening

Site Information

Freeway/Dir of Travel	Route 60 EB at Copeland Cir.
Weaving Segment Location	Weaving Segment 2 (SB)
Analysis Year	2012 Existing Conditions

Project Description *Suffolk Downs*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	300ft	Freeway maximum capacity, C_{IFL}	2250
Freeway free-flow speed, FFS	35 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	905	0.92	3	0	1.5	1.2	0.985	1.00	998
V_{RF}	731	0.95	2	0	1.5	1.2	0.990	1.00	777
V_{FR}	181	0.90	2	0	1.5	1.2	0.990	1.00	203
V_{RR}	87	0.93	2	0	1.5	1.2	0.990	1.00	94
V_{NW}	1092							V =	2072
V_W	980								
VR	0.473								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	980 lc/h
Interchange density, ID	0.0 int/mi	Weaving lane changes, LC_W	980 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	2 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	982 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	0

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	2072 pc/h	Weaving intensity factor, W	0.576
Weaving segment capacity, c_w	3346 veh/h	Weaving segment speed, S	25.0 mph
Weaving segment v/c ratio	0.610	Average weaving speed, S_W	27.7 mph
Weaving segment density, D	41.5 pc/mi/ln	Average non-weaving speed, S_{NW}	23.0 mph
Level of Service, LOS	E	Maximum weaving length, L_{MAX}	7512 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Suffolk Downs

FREEWAY WEAVING WORKSHEET

General Information

Analyst	Erica Guidoboni
Agency/Company	VHB, Inc.
Date Performed	7/9/13
Analysis Time Period	Friday Evening

Site Information

Freeway/Dir of Travel	Route 60 EB at Copeland Cir.
Weaving Segment Location	Weaving Segment 2 (SB)
Analysis Year	2022 No-Build Conditions

Project Description *Suffolk Downs*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	300ft	Freeway maximum capacity, C_{IFL}	2250
Freeway free-flow speed, FFS	35 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	1013	0.92	3	0	1.5	1.2	0.985	1.00	1118
V_{RF}	793	0.95	2	0	1.5	1.2	0.990	1.00	843
V_{FR}	197	0.90	2	0	1.5	1.2	0.990	1.00	221
V_{RR}	91	0.93	2	0	1.5	1.2	0.990	1.00	99
V_{NW}	1217							V =	2281
V_W	1064								
VR	0.466								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1064 lc/h
Interchange density, ID	0.0 int/mi	Weaving lane changes, LC_W	1064 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	28 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	1092 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	0

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	2281 pc/h	Weaving intensity factor, W	0.626
Weaving segment capacity, c_w	3358 veh/h	Weaving segment speed, S	24.1 mph
Weaving segment v/c ratio	0.669	Average weaving speed, S_W	27.3 mph
Weaving segment density, D	47.3 pc/mi/ln	Average non-weaving speed, S_{NW}	21.9 mph
Level of Service, LOS	E	Maximum weaving length, L_{MAX}	7437 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Suffolk Downs

FREEWAY WEAVING WORKSHEET

General Information

Analyst	Erica Guidoboni
Agency/Company	VHB, Inc.
Date Performed	7/9/13
Analysis Time Period	Friday Evening

Site Information

Freeway/Dir of Travel	Route 60 EB at Copeland Cir.
Weaving Segment Location	Weaving Segment 2 (SB)
Analysis Year	2022 Build Conditions

Project Description *Suffolk Downs*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	300ft	Freeway maximum capacity, C_{IFL}	2250
Freeway free-flow speed, FFS	35 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	1140	0.92	3	0	1.5	1.2	0.985	1.00	1258
V_{RF}	793	0.95	2	0	1.5	1.2	0.990	1.00	843
V_{FR}	197	0.90	2	0	1.5	1.2	0.990	1.00	221
V_{RR}	91	0.93	2	0	1.5	1.2	0.990	1.00	99
V_{NW}	1357							V =	2421
V_W	1064								
VR	0.439								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1064 lc/h
Interchange density, ID	0.0 int/mi	Weaving lane changes, LC_W	1064 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	57 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	1121 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	0

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	2421 pc/h	Weaving intensity factor, W	0.639
Weaving segment capacity, c_w	3405 veh/h	Weaving segment speed, S	23.7 mph
Weaving segment v/c ratio	0.701	Average weaving speed, S_W	27.2 mph
Weaving segment density, D	51.1 pc/mi/ln	Average non-weaving speed, S_{NW}	21.5 mph
Level of Service, LOS	E	Maximum weaving length, L_{MAX}	7128 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Suffolk Downs

FREEWAY WEAVING WORKSHEET

General Information

Analyst	Erica Guidoboni
Agency/Company	VHB, Inc.
Date Performed	7/9/13
Analysis Time Period	Friday Evening

Site Information

Freeway/Dir of Travel	Route 1 NB at Copeland Cir.
Weaving Segment Location	Weaving Segment 3 (EB)
Analysis Year	2012 Existing Conditions

Project Description *Suffolk Downs*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	300ft	Freeway maximum capacity, C_{IFL}	2250
Freeway free-flow speed, FFS	35 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	178	0.88	2	0	1.5	1.2	0.990	1.00	204
V_{RF}	169	0.97	0	0	1.5	1.2	1.000	1.00	174
V_{FR}	1458	0.95	3	0	1.5	1.2	0.985	1.00	1558
V_{RR}	273	0.91	2	0	1.5	1.2	0.990	1.00	303
V_{NW}	507							V =	2239
V_W	1732								
VR	0.774								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1732 lc/h
Interchange density, ID	0.0 int/mi	Weaving lane changes, LC_W	1732 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	0 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	1732 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	0

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	2239 pc/h	Weaving intensity factor, W	0.901
Weaving segment capacity, c_w	2806 veh/h	Weaving segment speed, S	23.0 mph
Weaving segment v/c ratio	0.790	Average weaving speed, S_W	25.5 mph
Weaving segment density, D	48.7 pc/mi/ln	Average non-weaving speed, S_{NW}	17.2 mph
Level of Service, LOS	E	Maximum weaving length, L_{MAX}	11195 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Suffolk Downs

FREEWAY WEAVING WORKSHEET

General Information

Analyst	Erica Guidoboni
Agency/Company	VHB, Inc.
Date Performed	7/9/13
Analysis Time Period	Friday Evening

Site Information

Freeway/Dir of Travel	Route 1 NB at Copeland Cir.
Weaving Segment Location	Weaving Segment 3 (EB)
Analysis Year	2022 No-Build Conditions

Project Description *Suffolk Downs*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	300ft	Freeway maximum capacity, C_{IFL}	2250
Freeway free-flow speed, FFS	35 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	187	0.88	2	0	1.5	1.2	0.990	1.00	215
V_{RF}	178	0.97	0	0	1.5	1.2	1.000	1.00	184
V_{FR}	1619	0.95	3	0	1.5	1.2	0.985	1.00	1730
V_{RR}	299	0.91	2	0	1.5	1.2	0.990	1.00	332
V_{NW}	547							V =	2461
V_W	1914								
VR	0.778								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1914 lc/h
Interchange density, ID	0.0 int/mi	Weaving lane changes, LC_W	1914 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	0 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	1914 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	0

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	2461 pc/h	Weaving intensity factor, W	0.975
Weaving segment capacity, c_w	2796 veh/h	Weaving segment speed, S	22.0 mph
Weaving segment v/c ratio	0.871	Average weaving speed, S_W	25.1 mph
Weaving segment density, D	55.9 pc/mi/ln	Average non-weaving speed, S_{NW}	15.3 mph
Level of Service, LOS	E	Maximum weaving length, L_{MAX}	11249 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Suffolk Downs

FREEWAY WEAVING WORKSHEET

General Information

Analyst	Erica Guidoboni
Agency/Company	VHB, Inc.
Date Performed	7/9/13
Analysis Time Period	Friday Evening

Site Information

Freeway/Dir of Travel	Route 1 NB at Copeland Cir.
Weaving Segment Location	Weaving Segment 3 (EB)
Analysis Year	2022 Build Conditions

Project Description *Suffolk Downs*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	300ft	Freeway maximum capacity, C_{IFL}	2250
Freeway free-flow speed, FFS	35 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	187	0.88	2	0	1.5	1.2	0.990	1.00	215
V_{RF}	178	0.97	0	0	1.5	1.2	1.000	1.00	184
V_{FR}	1746	0.95	3	0	1.5	1.2	0.985	1.00	1865
V_{RR}	299	0.91	2	0	1.5	1.2	0.990	1.00	332
V_{NW}	547							V =	2596
V_W	2049								
VR	0.789								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	2049 lc/h
Interchange density, ID	0.0 int/mi	Weaving lane changes, LC_W	2049 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	0 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	2049 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	0

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	2596 pc/h	Weaving intensity factor, W	1.029
Weaving segment capacity, c_w	2774 veh/h	Weaving segment speed, S	21.4 mph
Weaving segment v/c ratio	0.927	Average weaving speed, S_W	24.9 mph
Weaving segment density, D	60.7 pc/mi/ln	Average non-weaving speed, S_{NW}	14.0 mph
Level of Service, LOS	E	Maximum weaving length, L_{MAX}	11399 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Suffolk Downs

FREEWAY WEAVING WORKSHEET

General Information

Analyst	Erica Guidoboni
Agency/Company	VHB, Inc.
Date Performed	7/9/13
Analysis Time Period	Saturday Afternoon

Site Information

Freeway/Dir of Travel	Route 1 SB at Copeland Cir.
Weaving Segment Location	Weaving Segment 1 (WB)
Analysis Year	2012 Existing Conditions

Project Description *Suffolk Downs*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	300ft	Freeway maximum capacity, C_{IFL}	2250
Freeway free-flow speed, FFS	35 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	100	0.83	1	0	1.5	1.2	0.995	1.00	121
V_{RF}	776	0.88	1	0	1.5	1.2	0.995	1.00	886
V_{FR}	686	0.95	3	0	1.5	1.2	0.985	1.00	733
V_{RR}	232	0.78	1	0	1.5	1.2	0.995	1.00	299
V_{NW}	420							V =	2039
V_W	1619								
VR	0.794								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1619 lc/h
Interchange density, ID	0.0 int/mi	Weaving lane changes, LC_W	1619 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	0 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	1619 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	0

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	2039 pc/h	Weaving intensity factor, W	0.855
Weaving segment capacity, c_w	2778 veh/h	Weaving segment speed, S	23.8 mph
Weaving segment v/c ratio	0.730	Average weaving speed, S_W	25.8 mph
Weaving segment density, D	42.8 pc/mi/ln	Average non-weaving speed, S_{NW}	18.4 mph
Level of Service, LOS	E	Maximum weaving length, L_{MAX}	11460 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Suffolk Downs

FREEWAY WEAVING WORKSHEET

General Information

Analyst	Erica Guidoboni
Agency/Company	VHB, Inc.
Date Performed	7/9/13
Analysis Time Period	Saturday Afternoon

Site Information

Freeway/Dir of Travel	Route 1 SB at Copeland Cir.
Weaving Segment Location	Weaving Segment 1 (WB)
Analysis Year	2022 No-Build Conditions

Project Description *Suffolk Downs*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	300ft	Freeway maximum capacity, C_{IFL}	2250
Freeway free-flow speed, FFS	35 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	105	0.83	1	0	1.5	1.2	0.995	1.00	127
V_{RF}	842	0.88	1	0	1.5	1.2	0.995	1.00	962
V_{FR}	779	0.95	3	0	1.5	1.2	0.985	1.00	832
V_{RR}	251	0.78	1	0	1.5	1.2	0.995	1.00	323
V_{NW}	450							V =	2244
V_W	1794								
VR	0.799								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1794 lc/h
Interchange density, ID	0.0 int/mi	Weaving lane changes, LC_W	1794 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	0 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	1794 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	0

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	2244 pc/h	Weaving intensity factor, W	0.927
Weaving segment capacity, c_w	2768 veh/h	Weaving segment speed, S	23.0 mph
Weaving segment v/c ratio	0.807	Average weaving speed, S_W	25.4 mph
Weaving segment density, D	48.8 pc/mi/ln	Average non-weaving speed, S_{NW}	16.7 mph
Level of Service, LOS	E	Maximum weaving length, L_{MAX}	11531 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Suffolk Downs

FREEWAY WEAVING WORKSHEET

General Information

Analyst	Erica Guidoboni
Agency/Company	VHB, Inc.
Date Performed	7/9/13
Analysis Time Period	Saturday Afternoon

Site Information

Freeway/Dir of Travel	Route 1 SB at Copeland Cir.
Weaving Segment Location	Weaving Segment 1 (WB)
Analysis Year	2022 Build Conditions

Project Description *Suffolk Downs*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	300ft	Freeway maximum capacity, C_{IFL}	2250
Freeway free-flow speed, FFS	35 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	105	0.83	1	0	1.5	1.2	0.995	1.00	127
V_{RF}	842	0.88	1	0	1.5	1.2	0.995	1.00	962
V_{FR}	913	0.95	3	0	1.5	1.2	0.985	1.00	975
V_{RR}	251	0.78	1	0	1.5	1.2	0.995	1.00	323
V_{NW}	450							V =	2387
V_W	1937								
VR	0.811								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1937 lc/h
Interchange density, ID	0.0 int/mi	Weaving lane changes, LC_W	1937 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	0 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	1937 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	0

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	2387 pc/h	Weaving intensity factor, W	0.984
Weaving segment capacity, c_w	2744 veh/h	Weaving segment speed, S	22.4 mph
Weaving segment v/c ratio	0.866	Average weaving speed, S_W	25.1 mph
Weaving segment density, D	53.3 pc/mi/ln	Average non-weaving speed, S_{NW}	15.3 mph
Level of Service, LOS	E	Maximum weaving length, L_{MAX}	11688 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Suffolk Downs

FREEWAY WEAVING WORKSHEET

General Information

Analyst	Erica Guidoboni
Agency/Company	VHB, Inc.
Date Performed	7/9/13
Analysis Time Period	Saturday Afternoon

Site Information

Freeway/Dir of Travel	Route 60 EB at Copeland Cir.
Weaving Segment Location	Weaving Segment 2 (SB)
Analysis Year	2012 Existing Conditions

Project Description *Suffolk Downs*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	300ft	Freeway maximum capacity, C_{IFL}	2250
Freeway free-flow speed, FFS	35 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	718	0.93	3	0	1.5	1.2	0.985	1.00	784
V_{RF}	797	0.93	2	0	1.5	1.2	0.990	1.00	866
V_{FR}	200	0.95	1	0	1.5	1.2	0.995	1.00	212
V_{RR}	181	0.73	1	0	1.5	1.2	0.995	1.00	249
V_{NW}	1033							V =	2111
V_W	1078								
VR	0.511								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1078 lc/h
Interchange density, ID	0.0 int/mi	Weaving lane changes, LC_W	1078 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	0 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	1078 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	0

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	2111 pc/h	Weaving intensity factor, W	0.620
Weaving segment capacity, c_w	3281 veh/h	Weaving segment speed, S	24.5 mph
Weaving segment v/c ratio	0.634	Average weaving speed, S_W	27.3 mph
Weaving segment density, D	43.0 pc/mi/ln	Average non-weaving speed, S_{NW}	22.2 mph
Level of Service, LOS	E	Maximum weaving length, L_{MAX}	7951 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Suffolk Downs

FREEWAY WEAVING WORKSHEET

General Information

Analyst	Erica Guidoboni
Agency/Company	VHB, Inc.
Date Performed	7/9/13
Analysis Time Period	Saturday Afternoon

Site Information

Freeway/Dir of Travel	Route 60 EB at Copeland Cir.
Weaving Segment Location	Weaving Segment 2 (SB)
Analysis Year	2022 No-Build Conditions

Project Description *Suffolk Downs*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	300ft	Freeway maximum capacity, C_{IFL}	2250
Freeway free-flow speed, FFS	35 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	813	0.93	3	0	1.5	1.2	0.985	1.00	887
V_{RF}	866	0.93	2	0	1.5	1.2	0.990	1.00	940
V_{FR}	217	0.95	1	0	1.5	1.2	0.995	1.00	230
V_{RR}	190	0.73	1	0	1.5	1.2	0.995	1.00	262
V_{NW}	1149							V =	2319
V_W	1170								
VR	0.505								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1170 lc/h
Interchange density, ID	0.0 int/mi	Weaving lane changes, LC_W	1170 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	14 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	1184 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	0

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	2319 pc/h	Weaving intensity factor, W	0.668
Weaving segment capacity, c_w	3291 veh/h	Weaving segment speed, S	23.7 mph
Weaving segment v/c ratio	0.694	Average weaving speed, S_W	27.0 mph
Weaving segment density, D	49.0 pc/mi/ln	Average non-weaving speed, S_{NW}	21.0 mph
Level of Service, LOS	E	Maximum weaving length, L_{MAX}	7879 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Suffolk Downs

FREEWAY WEAVING WORKSHEET

General Information

Analyst	Erica Guidoboni
Agency/Company	VHB, Inc.
Date Performed	7/9/13
Analysis Time Period	Saturday Afternoon

Site Information

Freeway/Dir of Travel	Route 60 EB at Copeland Cir.
Weaving Segment Location	Weaving Segment 2 (SB)
Analysis Year	2022 Build Conditions

Project Description *Suffolk Downs*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	300ft	Freeway maximum capacity, C_{IFL}	2250
Freeway free-flow speed, FFS	35 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	947	0.93	3	0	1.5	1.2	0.985	1.00	1034
V_{RF}	866	0.93	2	0	1.5	1.2	0.990	1.00	940
V_{FR}	217	0.95	1	0	1.5	1.2	0.995	1.00	230
V_{RR}	190	0.73	1	0	1.5	1.2	0.995	1.00	262
V_{NW}	1296							V =	2466
V_W	1170								
VR	0.474								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1170 lc/h
Interchange density, ID	0.0 int/mi	Weaving lane changes, LC_W	1170 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	44 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	1214 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	0

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	2466 pc/h	Weaving intensity factor, W	0.681
Weaving segment capacity, c_w	3344 veh/h	Weaving segment speed, S	23.2 mph
Weaving segment v/c ratio	0.727	Average weaving speed, S_W	26.9 mph
Weaving segment density, D	53.1 pc/mi/ln	Average non-weaving speed, S_{NW}	20.7 mph
Level of Service, LOS	E	Maximum weaving length, L_{MAX}	7529 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Suffolk Downs

FREEWAY WEAVING WORKSHEET

General Information

Analyst	Erica Guidoboni
Agency/Company	VHB, Inc.
Date Performed	7/9/13
Analysis Time Period	Saturday Afternoon

Site Information

Freeway/Dir of Travel	Route 1 NB at Copeland Cir.
Weaving Segment Location	Weaving Segment 3 (EB)
Analysis Year	2012 Existing Conditions

Project Description *Suffolk Downs*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	300ft	Freeway maximum capacity, C_{IFL}	2250
Freeway free-flow speed, FFS	35 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	119	0.76	0	0	1.5	1.2	1.000	1.00	157
V_{RF}	167	0.90	1	0	1.5	1.2	0.995	1.00	186
V_{FR}	1396	0.97	2	0	1.5	1.2	0.990	1.00	1454
V_{RR}	275	0.92	1	0	1.5	1.2	0.995	1.00	300
V_{NW}	457							V =	2097
V_W	1640								
VR	0.782								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1640 lc/h
Interchange density, ID	0.0 int/mi	Weaving lane changes, LC_W	1640 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	0 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	1640 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	0

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	2097 pc/h	Weaving intensity factor, W	0.863
Weaving segment capacity, c_w	2816 veh/h	Weaving segment speed, S	23.6 mph
Weaving segment v/c ratio	0.745	Average weaving speed, S_W	25.7 mph
Weaving segment density, D	44.4 pc/mi/ln	Average non-weaving speed, S_{NW}	18.2 mph
Level of Service, LOS	E	Maximum weaving length, L_{MAX}	11305 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Suffolk Downs

FREEWAY WEAVING WORKSHEET

General Information

Analyst	Erica Guidoboni
Agency/Company	VHB, Inc.
Date Performed	7/9/13
Analysis Time Period	Saturday Afternoon

Site Information

Freeway/Dir of Travel	Route 1 NB at Copeland Cir.
Weaving Segment Location	Weaving Segment 3 (EB)
Analysis Year	2022 No-Build Conditions

Project Description *Suffolk Downs*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	300ft	Freeway maximum capacity, C_{IFL}	2250
Freeway free-flow speed, FFS	35 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	125	0.76	0	0	1.5	1.2	1.000	1.00	164
V_{RF}	176	0.90	1	0	1.5	1.2	0.995	1.00	197
V_{FR}	1553	0.97	2	0	1.5	1.2	0.990	1.00	1617
V_{RR}	296	0.92	1	0	1.5	1.2	0.995	1.00	323
V_{NW}	487							V =	2301
V_W	1814								
VR	0.788								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1814 lc/h
Interchange density, ID	0.0 int/mi	Weaving lane changes, LC_W	1814 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	0 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	1814 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	0

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	2301 pc/h	Weaving intensity factor, W	0.935
Weaving segment capacity, c_w	2804 veh/h	Weaving segment speed, S	22.7 mph
Weaving segment v/c ratio	0.821	Average weaving speed, S_W	25.3 mph
Weaving segment density, D	50.6 pc/mi/ln	Average non-weaving speed, S_{NW}	16.4 mph
Level of Service, LOS	E	Maximum weaving length, L_{MAX}	11387 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Suffolk Downs

FREEWAY WEAVING WORKSHEET

General Information

Analyst	Erica Guidoboni
Agency/Company	VHB, Inc.
Date Performed	7/9/13
Analysis Time Period	Saturday Afternoon

Site Information

Freeway/Dir of Travel	Route 1 NB at Copeland Cir.
Weaving Segment Location	Weaving Segment 3 (EB)
Analysis Year	2022 Build Conditions

Project Description *Suffolk Downs*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	300ft	Freeway maximum capacity, C_{IFL}	2250
Freeway free-flow speed, FFS	35 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	125	0.76	0	0	1.5	1.2	1.000	1.00	164
V_{RF}	176	0.90	1	0	1.5	1.2	0.995	1.00	197
V_{FR}	1687	0.97	2	0	1.5	1.2	0.990	1.00	1757
V_{RR}	296	0.92	1	0	1.5	1.2	0.995	1.00	323
V_{NW}	487							V =	2441
V_W	1954								
VR	0.800								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1954 lc/h
Interchange density, ID	0.0 int/mi	Weaving lane changes, LC_W	1954 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	0 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	1954 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	0

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	2441 pc/h	Weaving intensity factor, W	0.991
Weaving segment capacity, c_w	2780 veh/h	Weaving segment speed, S	22.1 mph
Weaving segment v/c ratio	0.878	Average weaving speed, S_W	25.0 mph
Weaving segment density, D	55.2 pc/mi/ln	Average non-weaving speed, S_{NW}	15.1 mph
Level of Service, LOS	E	Maximum weaving length, L_{MAX}	11545 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Eastbound
Agency or Company	VHB, Inc.	Junction	Squire Road NB at Copeland Cir
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Friday Evening	Analysis Year	2012 Existing Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Number of Lanes, N	2	Downstream Adj Ramp
☑ Yes ☐ On		Acceleration Lane Length, L_A	180	☐ Yes ☐ On
☐ No ☑ Off		Deceleration Lane Length L_D		☑ No ☐ Off
L_{up} =	370 ft	Freeway Volume, V_F	346	L_{down} = ft
V_u =	1731 veh/h	Ramp Volume, V_R	2114	V_D = veh/h
		Freeway Free-Flow Speed, S_{FF}	55.0	
		Ramp Free-Flow Speed, S_{FR}	35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	346	0.78	Level	2	0	0.990	1.00	448
Ramp	2114	0.89	Level	2	0	0.990	1.00	2399
UpStream	1731	0.93	Level	2	0	0.990	1.00	1880
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 448 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2847	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2847	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 23.8 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.357 (Exibit 13-11)

S_R = 50.4 mph (Exhibit 13-11)

S_0 = N/A mph (Exhibit 13-11)

S = 50.4 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Eastbound
Agency or Company	VHB, Inc.	Junction	Squire Road NB at Copeland Cir
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Friday Evening	Analysis Year	2022 No-Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Number of Lanes, N	2	Downstream Adj Ramp
☑ Yes ☐ On		Acceleration Lane Length, L_A	180	☐ Yes ☐ On
☐ No ☑ Off		Deceleration Lane Length L_D		☑ No ☐ Off
L_{up} =	370 ft	Freeway Volume, V_F	364	L_{down} = ft
V_u =	1919 veh/h	Ramp Volume, V_R	2309	V_D = veh/h
		Freeway Free-Flow Speed, S_{FF}	55.0	
		Ramp Free-Flow Speed, S_{FR}	35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	364	0.78	Level	2	0	0.990	1.00	471
Ramp	2309	0.89	Level	2	0	0.990	1.00	2620
UpStream	1919	0.93	Level	2	0	0.990	1.00	2084
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 471 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3091	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3091	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 25.6 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.375 (Exibit 13-11)

S_R = 50.1 mph (Exhibit 13-11)

S_0 = N/A mph (Exhibit 13-11)

S = 50.1 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Eastbound
Agency or Company	VHB, Inc.	Junction	Squire Road NB at Copeland Cir
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Friday Evening	Analysis Year	2022 Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Number of Lanes, N	2	Downstream Adj Ramp
☑ Yes ☐ On		Acceleration Lane Length, L_A	180	☐ Yes ☐ On
☐ No ☑ Off		Deceleration Lane Length L_D		☑ No ☐ Off
L_{up} =	370 ft	Freeway Volume, V_F	364	L_{down} = ft
V_u =	2046 veh/h	Ramp Volume, V_R	2426	V_D = veh/h
		Freeway Free-Flow Speed, S_{FF}	55.0	
		Ramp Free-Flow Speed, S_{FR}	35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	364	0.78	Level	2	0	0.990	1.00	471
Ramp	2426	0.89	Level	2	0	0.990	1.00	2753
UpStream	2046	0.93	Level	2	0	0.990	1.00	2222
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 471 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3224	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3224	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 26.5 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.388 (Exibit 13-11)

S_R = 50.0 mph (Exhibit 13-11)

S_0 = N/A mph (Exhibit 13-11)

S = 50.0 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Eastbound
Agency or Company	VHB, Inc.	Junction	Squire Road NB at Copeland Cir
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Saturday Afternoon	Analysis Year	2012 Existing Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp
☑ Yes ☐ On
☐ No ☑ Off
L_{up} = 370 ft
V_u = 1671 veh/h

Number of Lanes, N	2
Acceleration Lane Length, L_A	180
Deceleration Lane Length L_D	
Freeway Volume, V_F	286
Ramp Volume, V_R	2436
Freeway Free-Flow Speed, S_{FF}	55.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	286	0.88	Level	1	0	0.995	1.00	327
Ramp	2436	0.95	Level	2	0	0.990	1.00	2590
UpStream	1671	0.94	Level	2	0	0.990	1.00	1795
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)
P_{FM} = 1.000 using Equation (Exhibit 13-6)
V_{12} = 327 pc/h
V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2917	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2917	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 24.2 (pc/mi/ln)
LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.362 (Exibit 13-11)
S_R = 50.3 mph (Exhibit 13-11)
S_0 = N/A mph (Exhibit 13-11)
S = 50.3 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = using Equation (Exhibit 13-7)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)
S_R = mph (Exhibit 13-12)
S_0 = mph (Exhibit 13-12)
S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Eastbound
Agency or Company	VHB, Inc.	Junction	Squire Road NB at Copeland Cir
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Saturday Afternoon	Analysis Year	2022 No-Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 2	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 180	☑ No ☐ Off
L_{up} = 370 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 1849 veh/h	Freeway Volume, V_F: 300	V_D = veh/h
	Ramp Volume, V_R: 2646	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	300	0.88	Level	1	0	0.995	1.00	343
Ramp	2646	0.95	Level	2	0	0.990	1.00	2813
UpStream	1849	0.94	Level	2	0	0.990	1.00	1987
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 343 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3156	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3156	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 26.0 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.381 (Exibit 13-11)

S_R = 50.0 mph (Exhibit 13-11)

S_0 = N/A mph (Exhibit 13-11)

S = 50.0 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Eastbound
Agency or Company	VHB, Inc.	Junction	Squire Road NB at Copeland Cir
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Saturday Afternoon	Analysis Year	2022 Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 2	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 180	☑ No ☐ Off
L_{up} = 370 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 1983 veh/h	Freeway Volume, V_F: 300	V_D = veh/h
	Ramp Volume, V_R: 2756	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	300	0.88	Level	1	0	0.995	1.00	343
Ramp	2756	0.95	Level	2	0	0.990	1.00	2930
UpStream	1983	0.94	Level	2	0	0.990	1.00	2131
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 343 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3273	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3273	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 26.8 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.392 (Exibit 13-11)

S_R = 49.9 mph (Exhibit 13-11)

S_0 = N/A mph (Exhibit 13-11)

S = 49.9 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Northbound
Agency or Company	VHB, Inc.	Junction	Copeland Circle at Route 1 NB
Date Performed	7/30/2013	Jurisdiction	Revere, MA
Analysis Time Period	Friday Evening	Analysis Year	2012 Existing Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 2	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 220	☑ No ☐ Off
L_{up} = 2200 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 441 veh/h	Freeway Volume, V_F: 2142	V_D = veh/h
	Ramp Volume, V_R: 1234	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2142	0.89	Rolling	1	0	0.985	1.00	2443
Ramp	1234	0.90	Rolling	1	0	0.985	1.00	1392
UpStream	441	0.96	Level	1	0	0.995	1.00	462
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 2443 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3835	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3835	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 33.4 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.486 (Exibit 13-11)

S_R = 48.7 mph (Exhibit 13-11)

S_0 = N/A mph (Exhibit 13-11)

S = 48.7 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Northbound
Agency or Company	VHB, Inc.	Junction	Copeland Circle at Route 1 NB
Date Performed	7/30/2013	Jurisdiction	Revere, MA
Analysis Time Period	Friday Evening	Analysis Year	2022 No-Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 2	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 220	☑ No ☐ Off
L_{up} = 2200 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 476 veh/h	Freeway Volume, V_F: 2250	V_D = veh/h
	Ramp Volume, V_R: 1349	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2250	0.89	Rolling	1	0	0.985	1.00	2566
Ramp	1349	0.90	Rolling	1	0	0.985	1.00	1521
UpStream	476	0.96	Level	1	0	0.995	1.00	498
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 2566 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4087	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4087	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 35.3 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

M_S = 0.538 (Exibit 13-11)

S_R = 48.0 mph (Exhibit 13-11)

S_0 = N/A mph (Exhibit 13-11)

S = 48.0 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Northbound
Agency or Company	VHB, Inc.	Junction	Copeland Circle at Route 1 NB
Date Performed	7/30/2013	Jurisdiction	Revere, MA
Analysis Time Period	Friday Evening	Analysis Year	2022 Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 2	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 220	☑ No ☐ Off
L_{up} = 2200 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 476 veh/h	Freeway Volume, V_F: 2289	V_D = veh/h
	Ramp Volume, V_R: 1466	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2289	0.89	Rolling	1	0	0.985	1.00	2610
Ramp	1466	0.90	Rolling	1	0	0.985	1.00	1653
UpStream	476	0.96	Level	1	0	0.995	1.00	498
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 2610 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4263	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4263	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 36.6 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

M_S = 0.583 (Exibit 13-11)

S_R = 47.4 mph (Exhibit 13-11)

S_0 = N/A mph (Exhibit 13-11)

S = 47.4 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Northbound
Agency or Company	VHB, Inc.	Junction	Copeland Circle at Route 1 NB
Date Performed	7/30/2013	Jurisdiction	Revere, MA
Analysis Time Period	Saturday Afternoon	Analysis Year	2012 Existing Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 2	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 220	☑ No ☐ Off
L_{up} = 2200 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 441 veh/h	Freeway Volume, V_F: 2019	V_D = veh/h
	Ramp Volume, V_R: 1714	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2019	0.95	Rolling	1	0	0.985	1.00	2157
Ramp	1714	0.87	Rolling	1	0	0.985	1.00	2000
UpStream	441	0.95	Level	1	0	0.995	1.00	467
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 2157 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4157	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4157	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 35.6 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

M_S = 0.555 (Exibit 13-11)

S_R = 47.8 mph (Exhibit 13-11)

S_0 = N/A mph (Exhibit 13-11)

S = 47.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Northbound
Agency or Company	VHB, Inc.	Junction	Copeland Circle at Route 1 NB
Date Performed	7/30/2013	Jurisdiction	Revere, MA
Analysis Time Period	Saturday Afternoon	Analysis Year	2022 No-Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 2	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 220	☑ No ☐ Off
L_{up} = 2200 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 471 veh/h	Freeway Volume, V_F: 2122	V_D = veh/h
	Ramp Volume, V_R: 1854	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2122	0.95	Rolling	1	0	0.985	1.00	2267
Ramp	1854	0.87	Rolling	1	0	0.985	1.00	2163
UpStream	471	0.95	Level	1	0	0.995	1.00	498
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 2267 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4430	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4430	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 37.7 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

M_S = 0.633 (Exibit 13-11)

S_R = 46.8 mph (Exhibit 13-11)

S_0 = N/A mph (Exhibit 13-11)

S = 46.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Northbound
Agency or Company	VHB, Inc.	Junction	Copeland Circle at Route 1 NB
Date Performed	7/30/2013	Jurisdiction	Revere, MA
Analysis Time Period	Saturday Afternoon	Analysis Year	2022 Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 2	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 220	☑ No ☐ Off
L_{up} = 2200 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 471 veh/h	Freeway Volume, V_F: 2159	V_D = veh/h
	Ramp Volume, V_R: 1964	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2159	0.95	Rolling	1	0	0.985	1.00	2307
Ramp	1964	0.87	Rolling	1	0	0.985	1.00	2291
UpStream	471	0.95	Level	1	0	0.995	1.00	498
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 2307 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4598	Exhibit 13-8		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4598	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 38.9 (pc/mi/ln)

LOS = F (Exhibit 13-2)

Speed Determination

M_S = 0.693 (Exibit 13-11)

S_R = 46.0 mph (Exhibit 13-11)

S_0 = N/A mph (Exhibit 13-11)

S = 46.0 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Southbound
Agency or Company	VHB, Inc.	Junction	Copeland Circle at Route 1 SB
Date Performed	7/30/2013	Jurisdiction	Revere, MA
Analysis Time Period	Friday Evening	Analysis Year	2012 Existing Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 290	☑ No ☐ Off
L_{up} = 2500 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 864 veh/h	Freeway Volume, V_F: 1440	V_D = veh/h
	Ramp Volume, V_R: 268	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1440	0.81	Level	2	0	0.990	1.00	1796
Ramp	268	0.91	Level	2	0	0.990	1.00	297
UpStream	864	0.92	Level	3	0	0.985	1.00	953
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 4.86 (Equation 13-6 or 13-7)

P_{FM} = 0.586 using Equation (Exhibit 13-6)

V_{12} = 1052 pc/h

V_3 or V_{av34} 744 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2093	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1349	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 14.0 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.316 (Exibit 13-11)

S_R = 50.9 mph (Exhibit 13-11)

S_0 = 54.1 mph (Exhibit 13-11)

S = 52.0 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Southbound
Agency or Company	VHB, Inc.	Junction	Copeland Circle at Route 1 SB
Date Performed	7/30/2013	Jurisdiction	Revere, MA
Analysis Time Period	Friday Evening	Analysis Year	2022 No-Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 290	☑ No ☐ Off
L_{up} = 2500 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 970 veh/h	Freeway Volume, V_F: 1516	V_D = veh/h
	Ramp Volume, V_R: 289	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1516	0.81	Level	2	0	0.990	1.00	1890
Ramp	289	0.91	Level	2	0	0.990	1.00	321
UpStream	970	0.92	Level	3	0	0.985	1.00	1070
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 30.11 (Equation 13-6 or 13-7)

P_{FM} = 0.586 using Equation (Exhibit 13-6)

V_{12} = 1107 pc/h

V_3 or V_{av34} 783 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2211	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1428	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 14.6 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.317 (Exibit 13-11)

S_R = 50.9 mph (Exhibit 13-11)

S_0 = 54.0 mph (Exhibit 13-11)

S = 51.9 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Southbound
Agency or Company	VHB, Inc.	Junction	Copeland Circle at Route 1 SB
Date Performed	7/30/2013	Jurisdiction	Revere, MA
Analysis Time Period	Friday Evening	Analysis Year	2022 Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 290	☑ No ☐ Off
L_{up} = 2500 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 1097 veh/h	Freeway Volume, V_F: 1558	V_D = veh/h
	Ramp Volume, V_R: 289	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1558	0.81	Level	2	0	0.990	1.00	1943
Ramp	289	0.91	Level	2	0	0.990	1.00	321
UpStream	1097	0.92	Level	3	0	0.985	1.00	1210
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 41.46 (Equation 13-6 or 13-7)

P_{FM} = 0.586 using Equation (Exhibit 13-6)

V_{12} = 1138 pc/h

V_3 or V_{av34} 805 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2264	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1459	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 14.9 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.317 (Exibit 13-11)

S_R = 50.9 mph (Exhibit 13-11)

S_0 = 53.9 mph (Exhibit 13-11)

S = 51.9 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Southbound
Agency or Company	VHB, Inc.	Junction	Copeland Circle at Route 1 SB
Date Performed	7/30/2013	Jurisdiction	Revere, MA
Analysis Time Period	Saturday Afternoon	Analysis Year	2012 Existing Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 290	☑ No ☐ Off
L_{up} = 2500 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 786 veh/h	Freeway Volume, V_F: 2101	V_D = veh/h
	Ramp Volume, V_R: 381	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2101	0.75	Level	1	0	0.995	1.00	2815
Ramp	381	0.92	Level	2	0	0.990	1.00	418
UpStream	786	0.98	Level	3	0	0.985	1.00	814
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 248.82 (Equation 13-6 or 13-7)

P_{FM} = 0.586 using Equation (Exhibit 13-6)

V_{12} = 1649 pc/h

V_3 or V_{av34} 1166 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3233	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2067	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 19.6 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.332 (Exibit 13-11)

S_R= 50.7 mph (Exhibit 13-11)

S_0= 52.6 mph (Exhibit 13-11)

S = 51.4 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Southbound
Agency or Company	VHB, Inc.	Junction	Copeland Circle at Route 1 SB
Date Performed	7/30/2013	Jurisdiction	Revere, MA
Analysis Time Period	Saturday Afternoon	Analysis Year	2022 No-Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 290	☑ No ☐ Off
L_{up} = 2500 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 884 veh/h	Freeway Volume, V_F: 2210	V_D = veh/h
	Ramp Volume, V_R: 407	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2210	0.75	Level	1	0	0.995	1.00	2961
Ramp	407	0.92	Level	2	0	0.990	1.00	447
UpStream	884	0.98	Level	3	0	0.985	1.00	916
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 286.27 (Equation 13-6 or 13-7)

P_{FM} = 0.586 using Equation (Exhibit 13-6)

V_{12} = 1734 pc/h

V_3 or V_{av34} 1227 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3408	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2181	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 20.5 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.335 (Exibit 13-11)

S_R= 50.6 mph (Exhibit 13-11)

S_0= 52.4 mph (Exhibit 13-11)

S = 51.3 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Southbound
Agency or Company	VHB, Inc.	Junction	Copeland Circle at Route 1 SB
Date Performed	7/30/2013	Jurisdiction	Revere, MA
Analysis Time Period	Saturday Afternoon	Analysis Year	2022 Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 290	☑ No ☐ Off
L_{up} = 2500 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 1018 veh/h	Freeway Volume, V_F: 2255	V_D = veh/h
	Ramp Volume, V_R: 407	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2255	0.75	Level	1	0	0.995	1.00	3022
Ramp	407	0.92	Level	2	0	0.990	1.00	447
UpStream	1018	0.98	Level	3	0	0.985	1.00	1054
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 299.33 (Equation 13-6 or 13-7)

P_{FM} = 0.586 using Equation (Exhibit 13-6)

V_{12} = 1770 pc/h

V_3 or V_{av34} 1252 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3469	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2217	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 20.7 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.337 (Exibit 13-11)

S_R= 50.6 mph (Exhibit 13-11)

S_0= 52.3 mph (Exhibit 13-11)

S = 51.2 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Eastbound
Agency or Company	VHB, Inc.	Junction	Route 1 NB to Route 16 EB
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Friday Evening	Analysis Year	2012 Existing Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Number of Lanes, N	3	Downstream Adj Ramp	
☑ Yes	☐ On	Acceleration Lane Length, L_A	225	☐ Yes	☐ On
		Deceleration Lane Length L_D			
☐ No	☑ Off	Freeway Volume, V_F	1342	☑ No	☐ Off
L_{up} =	675 ft	Ramp Volume, V_R	1017	L_{down} =	ft
		Freeway Free-Flow Speed, S_{FF}	55.0		
V_u =	508 veh/h	Ramp Free-Flow Speed, S_{FR}	35.0	V_D =	veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1342	0.84	Level	2	0	0.990	1.00	1614
Ramp	1017	0.84	Level	1	0	0.995	1.00	1217
UpStream	508	0.94	Level	1	0	0.995	1.00	543
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 133.93 (Equation 13-6 or 13-7)

P_{FM} = 0.584 using Equation (Exhibit 13-6)

V_{12} = 942 pc/h

V_3 or V_{av34} 672 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2831	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2159	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 20.3 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.339 (Exibit 13-11)

S_R= 50.6 mph (Exhibit 13-11)

S_0= 54.4 mph (Exhibit 13-11)

S = 51.4 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Eastbound
Agency or Company	VHB, Inc.	Junction	Route 1 NB to Route 16 EB
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Friday Evening	Analysis Year	2022 No-Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 225	☑ No ☐ Off
L_{up} = 675 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 534 veh/h	Freeway Volume, V_F: 1445	V_D = veh/h
	Ramp Volume, V_R: 1087	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1445	0.84	Level	2	0	0.990	1.00	1737
Ramp	1087	0.84	Level	1	0	0.995	1.00	1301
UpStream	534	0.94	Level	1	0	0.995	1.00	571
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 178.23 (Equation 13-6 or 13-7)

P_{FM} = 0.584 using Equation (Exhibit 13-6)

V_{12} = 1014 pc/h

V_3 or V_{av34} 723 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3038	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2315	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 21.5 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.345 (Exibit 13-11)

S_R= 50.5 mph (Exhibit 13-11)

S_0= 54.2 mph (Exhibit 13-11)

S = 51.3 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Eastbound
Agency or Company	VHB, Inc.	Junction	Route 1 NB to Route 16 EB
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Friday Evening	Analysis Year	2022 Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 225	☑ No ☐ Off
L_{up} = 675 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 573 veh/h	Freeway Volume, V_F: 1561	V_D = veh/h
	Ramp Volume, V_R: 1087	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1561	0.84	Level	2	0	0.990	1.00	1877
Ramp	1087	0.84	Level	1	0	0.995	1.00	1301
UpStream	573	0.94	Level	1	0	0.995	1.00	613
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 208.19 (Equation 13-6 or 13-7)

P_{FM} = 0.584 using Equation (Exhibit 13-6)

V_{12} = 1096 pc/h

V_3 or V_{av34} 781 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3178	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2397	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 22.2 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.348 (Exibit 13-11)

S_R = 50.5 mph (Exhibit 13-11)

S_0 = 54.0 mph (Exhibit 13-11)

S = 51.3 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Eastbound
Agency or Company	VHB, Inc.	Junction	Route 1 NB to Route 16 EB
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Saturday Afternoon	Analysis Year	2012 Existing Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Number of Lanes, N	3	Downstream Adj Ramp	
☑ Yes	☐ On	Acceleration Lane Length, L_A	225	☐ Yes	☐ On
☐ No	☑ Off	Deceleration Lane Length L_D		☑ No	☐ Off
L_{up} =	675 ft	Freeway Volume, V_F	1023	L_{down} =	ft
V_u =	597 veh/h	Ramp Volume, V_R	478	V_D =	veh/h
		Freeway Free-Flow Speed, S_{FF}	55.0		
		Ramp Free-Flow Speed, S_{FR}	35.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1023	0.92	Level	1	0	0.995	1.00	1118
Ramp	478	0.93	Level	2	0	0.990	1.00	519
UpStream	597	0.96	Level	1	0	0.995	1.00	625
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = -121.58 (Equation 13-6 or 13-7)

P_{FM} = 0.584 using Equation (Exhibit 13-6)

V_{12} = 653 pc/h

V_3 or V_{av34} 465 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	1637	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1172	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 13.0 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.318 (Exibit 13-11)

S_R= 50.9 mph (Exhibit 13-11)

S_0= 55.0 mph (Exhibit 13-11)

S = 52.0 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Eastbound
Agency or Company	VHB, Inc.	Junction	Route 1 NB to Route 16 EB
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Saturday Afternoon	Analysis Year	2022 No-Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Number of Lanes, N	3	Downstream Adj Ramp	
☑ Yes	☐ On	Acceleration Lane Length, L_A	225	☐ Yes	☐ On
☐ No	☑ Off	Deceleration Lane Length L_D		☑ No	☐ Off
L_{up} =	675 ft	Freeway Volume, V_F	1101	L_{down} =	ft
V_u =	627 veh/h	Ramp Volume, V_R	514	V_D =	veh/h
		Freeway Free-Flow Speed, S_{FF}	55.0		
		Ramp Free-Flow Speed, S_{FR}	35.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1101	0.92	Level	1	0	0.995	1.00	1203
Ramp	514	0.93	Level	2	0	0.990	1.00	558
UpStream	627	0.96	Level	1	0	0.995	1.00	656
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = -95.05 (Equation 13-6 or 13-7)

P_{FM} = 0.584 using Equation (Exhibit 13-6)

V_{12} = 702 pc/h

V_3 or V_{av34} 501 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	1761	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1260	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 13.6 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.319 (Exibit 13-11)

S_R= 50.9 mph (Exhibit 13-11)

S_0= 55.0 mph (Exhibit 13-11)

S = 52.0 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Eastbound
Agency or Company	VHB, Inc.	Junction	Route 1 NB to Route 16 EB
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Saturday Afternoon	Analysis Year	2022 Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Number of Lanes, N	3	Downstream Adj Ramp	
☑ Yes	☐ On	Acceleration Lane Length, L_A	225	☐ Yes	☐ On
☐ No	☑ Off	Deceleration Lane Length L_D		☑ No	☐ Off
L_{up} =	675 ft	Freeway Volume, V_F	1228	L_{down} =	ft
V_u =	664 veh/h	Ramp Volume, V_R	514	V_D =	veh/h
		Freeway Free-Flow Speed, S_{FF}	55.0		
		Ramp Free-Flow Speed, S_{FR}	35.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1228	0.92	Level	1	0	0.995	1.00	1341
Ramp	514	0.93	Level	2	0	0.990	1.00	558
UpStream	664	0.96	Level	1	0	0.995	1.00	695
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = -65.51 (Equation 13-6 or 13-7)

P_{FM} = 0.584 using Equation (Exhibit 13-6)

V_{12} = 783 pc/h

V_3 or V_{av34} 558 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	1899	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1341	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 14.3 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.320 (Exibit 13-11)

S_R= 50.8 mph (Exhibit 13-11)

S_0= 54.8 mph (Exhibit 13-11)

S = 51.9 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Northbound
Agency or Company	VHB, Inc.	Junction	Route 16 EB to Route 1 NB
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Friday Evening	Analysis Year	2012 Existing Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 600	☑ No ☐ Off
L_{up} = 560 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 1017 veh/h	Freeway Volume, V_F: 2075	V_D = veh/h
	Ramp Volume, V_R: 508	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2075	0.89	Level	1	0	0.995	1.00	2343
Ramp	508	0.94	Level	1	0	0.995	1.00	543
UpStream	1017	0.84	Level	1	0	0.995	1.00	1217
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 312.20 (Equation 13-6 or 13-7)

P_{FM} = 0.594 using Equation (Exhibit 13-6)

V_{12} = 1392 pc/h

V_3 or V_{av34} 951 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2886	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1935	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 16.6 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.306 (Exibit 13-11)

S_R= 51.0 mph (Exhibit 13-11)

S_0= 53.4 mph (Exhibit 13-11)

S = 51.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Northbound
Agency or Company	VHB, Inc.	Junction	Route 16 EB to Route 1 NB
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Friday Evening	Analysis Year	2022 No-Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 600	☑ No ☐ Off
L_{up} = 560 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 1087 veh/h	Freeway Volume, V_F: 2181	V_D = veh/h
	Ramp Volume, V_R: 534	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2181	0.89	Level	1	0	0.995	1.00	2463
Ramp	534	0.94	Level	1	0	0.995	1.00	571
UpStream	1087	0.84	Level	1	0	0.995	1.00	1301
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 343.88 (Equation 13-6 or 13-7)

P_{FM} = 0.594 using Equation (Exhibit 13-6)

V_{12} = 1464 pc/h

V_3 or V_{av34} 999 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3034	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2035	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 17.3 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.309 (Exibit 13-11)

S_R = 51.0 mph (Exhibit 13-11)

S_0 = 53.2 mph (Exhibit 13-11)

S = 51.7 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Northbound
Agency or Company	VHB, Inc.	Junction	Route 16 EB to Route 1 NB
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Friday Evening	Analysis Year	2022 Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 600	☑ No ☐ Off
L_{up} = 560 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 1087 veh/h	Freeway Volume, V_F: 2181	V_D = veh/h
	Ramp Volume, V_R: 573	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2181	0.89	Level	1	0	0.995	1.00	2463
Ramp	573	0.94	Level	1	0	0.995	1.00	613
UpStream	1087	0.84	Level	1	0	0.995	1.00	1301
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 352.86 (Equation 13-6 or 13-7)

P_{FM} = 0.594 using Equation (Exhibit 13-6)

V_{12} = 1464 pc/h

V_3 or V_{av34} 999 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3076	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2077	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 17.6 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.310 (Exibit 13-11)

S_R = 51.0 mph (Exhibit 13-11)

S_0 = 53.2 mph (Exhibit 13-11)

S = 51.7 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Northbound
Agency or Company	VHB, Inc.	Junction	Route 16 EB to Route 1 NB
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Saturday Afternoon	Analysis Year	2012 Existing Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 600	☑ No ☐ Off
L_{up} = 560 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 478 veh/h	Freeway Volume, V_F: 1863	V_D = veh/h
	Ramp Volume, V_R: 597	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1863	0.95	Level	1	0	0.995	1.00	1971
Ramp	597	0.96	Level	2	0	0.990	1.00	628
UpStream	478	0.93	Level	2	0	0.990	1.00	519
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 250.79 (Equation 13-6 or 13-7)

P_{FM} = 0.594 using Equation (Exhibit 13-6)

V_{12} = 1171 pc/h

V_3 or V_{av34} 800 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2599	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1799	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 15.5 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.303 (Exibit 13-11)

S_R = 51.1 mph (Exhibit 13-11)

S_0 = 53.9 mph (Exhibit 13-11)

S = 51.9 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Northbound
Agency or Company	VHB, Inc.	Junction	Route 16 EB to Route 1 NB
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Saturday Afternoon	Analysis Year	2022 No-Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 600	☑ No ☐ Off
L_{up} = 560 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 514 veh/h	Freeway Volume, V_F: 1958	V_D = veh/h
	Ramp Volume, V_R: 627	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1958	0.95	Level	1	0	0.995	1.00	2071
Ramp	627	0.96	Level	2	0	0.990	1.00	660
UpStream	514	0.93	Level	2	0	0.990	1.00	558
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 279.03 (Equation 13-6 or 13-7)

P_{FM} = 0.594 using Equation (Exhibit 13-6)

V_{12} = 1231 pc/h

V_3 or V_{av34} 840 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2731	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1891	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 16.2 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.305 (Exibit 13-11)

S_R= 51.0 mph (Exhibit 13-11)

S_0= 53.8 mph (Exhibit 13-11)

S = 51.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Northbound
Agency or Company	VHB, Inc.	Junction	Route 16 EB to Route 1 NB
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Saturday Afternoon	Analysis Year	2022 Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 600	☑ No ☐ Off
L_{up} = 560 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 514 veh/h	Freeway Volume, V_F: 1958	V_D = veh/h
	Ramp Volume, V_R: 664	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1958	0.95	Level	1	0	0.995	1.00	2071
Ramp	664	0.96	Level	2	0	0.990	1.00	699
UpStream	514	0.93	Level	2	0	0.990	1.00	558
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 287.38 (Equation 13-6 or 13-7)

P_{FM} = 0.594 using Equation (Exhibit 13-6)

V_{12} = 1231 pc/h

V_3 or V_{av34} 840 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2770	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1930	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 16.4 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.306 (Exibit 13-11)

S_R= 51.0 mph (Exhibit 13-11)

S_0= 53.8 mph (Exhibit 13-11)

S = 51.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Southbound
Agency or Company	VHB, Inc.	Junction	Route 16 WB to Route 1 SB
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Friday Evening	Analysis Year	2012 Existing Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☑ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☐ Off	Acceleration Lane Length, L_A: 220	☑ No ☐ Off
L_{up} = 825 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 508 veh/h	Freeway Volume, V_F: 1200	V_D = veh/h
	Ramp Volume, V_R: 158	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1200	0.81	Level	2	0	0.990	1.00	1496
Ramp	158	0.89	Level	3	0	0.985	1.00	180
UpStream	508	0.86	Level	2	0	0.990	1.00	597
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.584 using Equation (Exhibit 13-6)

V_{12} = 873 pc/h

V_3 or V_{av34} 623 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	1676	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1053	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 12.2 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.317 (Exibit 13-11)

S_R = 50.9 mph (Exhibit 13-11)

S_0 = 54.6 mph (Exhibit 13-11)

S = 52.2 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Southbound
Agency or Company	VHB, Inc.	Junction	Route 16 WB to Route 1 SB
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Friday Evening	Analysis Year	2022 No-Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☑ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☐ Off	Acceleration Lane Length, L_A: 220	☑ No ☐ Off
L_{up} = 825 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 537 veh/h	Freeway Volume, V_F: 1261	V_D = veh/h
	Ramp Volume, V_R: 171	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1261	0.81	Level	2	0	0.990	1.00	1572
Ramp	171	0.89	Level	3	0	0.985	1.00	195
UpStream	537	0.86	Level	2	0	0.990	1.00	631
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.584 using Equation (Exhibit 13-6)

V_{12} = 918 pc/h

V_3 or V_{av34} 654 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	1767	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1113	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 12.7 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.317 (Exibit 13-11)

S_R = 50.9 mph (Exhibit 13-11)

S_0 = 54.4 mph (Exhibit 13-11)

S = 52.1 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Southbound
Agency or Company	VHB, Inc.	Junction	Route 16 WB to Route 1 SB
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Friday Evening	Analysis Year	2022 Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☑ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☐ Off	Acceleration Lane Length, L_A: 220	☑ No ☐ Off
L_{up} = 825 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 579 veh/h	Freeway Volume, V_F: 1261	V_D = veh/h
	Ramp Volume, V_R: 171	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1261	0.81	Level	2	0	0.990	1.00	1572
Ramp	171	0.89	Level	3	0	0.985	1.00	195
UpStream	579	0.86	Level	2	0	0.990	1.00	680
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.584 using Equation (Exhibit 13-6)

V_{12} = 918 pc/h

V_3 or V_{av34} = 654 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	1767	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1113	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 12.7 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.317 (Exibit 13-11)

S_R = 50.9 mph (Exhibit 13-11)

S_0 = 54.4 mph (Exhibit 13-11)

S = 52.1 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Southbound
Agency or Company	VHB, Inc.	Junction	Route 16 WB to Route 1 SB
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Saturday Afternoon	Analysis Year	2012 Existing Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Number of Lanes, N	3	Downstream Adj Ramp	
☑ Yes	☑ On	Acceleration Lane Length, L_A	220	☐ Yes	☐ On
☐ No	☐ Off	Deceleration Lane Length L_D		☑ No	☐ Off
L_{up} =	825 ft	Freeway Volume, V_F	1600	L_{down} =	ft
V_u =	882 veh/h	Ramp Volume, V_R	142	V_D =	veh/h
		Freeway Free-Flow Speed, S_{FF}	55.0		
		Ramp Free-Flow Speed, S_{FR}	35.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1600	0.75	Level	1	0	0.995	1.00	2144
Ramp	142	0.84	Level	1	0	0.995	1.00	170
UpStream	882	0.91	Level	1	0	0.995	1.00	974
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.584 using Equation (Exhibit 13-6)

V_{12} = 1251 pc/h

V_3 or V_{av34} 893 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2314	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1421	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 15.1 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.322 (Exibit 13-11)

S_R= 50.8 mph (Exhibit 13-11)

S_0= 53.6 mph (Exhibit 13-11)

S = 51.9 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Southbound
Agency or Company	VHB, Inc.	Junction	Route 16 WB to Route 1 SB
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Saturday Afternoon	Analysis Year	2022 No-Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☑ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☐ Off	Acceleration Lane Length, L_A: 220	☑ No ☐ Off
L_{up} = 825 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 929 veh/h	Freeway Volume, V_F: 1682	V_D = veh/h
	Ramp Volume, V_R: 154	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1682	0.75	Level	1	0	0.995	1.00	2254
Ramp	154	0.84	Level	1	0	0.995	1.00	184
UpStream	929	0.91	Level	1	0	0.995	1.00	1026
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.584 using Equation (Exhibit 13-6)

V_{12} = 1316 pc/h

V_3 or V_{av34} 938 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2438	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1500	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 15.7 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.323 (Exibit 13-11)

S_R = 50.8 mph (Exhibit 13-11)

S_0 = 53.4 mph (Exhibit 13-11)

S = 51.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Erica Guidoboni	Freeway/Dir of Travel	Southbound
Agency or Company	VHB, Inc.	Junction	Route 16 WB to Route 1 SB
Date Performed	7/9/13	Jurisdiction	Revere, MA
Analysis Time Period	Saturday Afternoon	Analysis Year	2022 Build Conditions

Project Description Suffolk Downs

Inputs

Upstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{up} = 825 ft
V_u = 973 veh/h

Number of Lanes, N	3
Acceleration Lane Length, L_A	220
Deceleration Lane Length L_D	
Freeway Volume, V_F	1682
Ramp Volume, V_R	154
Freeway Free-Flow Speed, S_{FF}	55.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1682	0.75	Level	1	0	0.995	1.00	2254
Ramp	154	0.84	Level	1	0	0.995	1.00	184
UpStream	973	0.91	Level	1	0	0.995	1.00	1075
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)
P_{FM} = 0.584 using Equation (Exhibit 13-6)
V_{12} = 1316 pc/h
V_3 or V_{av34} = 938 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2438	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1500	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 15.7 (pc/mi/ln)
LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.323 (Exibit 13-11)
S_R = 50.8 mph (Exhibit 13-11)
S_0 = 53.4 mph (Exhibit 13-11)
S = 51.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = using Equation (Exhibit 13-7)
V_{12} = pc/h
V_3 or V_{av34} = pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)
S_R = mph (Exhibit 13-12)
S_0 = mph (Exhibit 13-12)
S = mph (Exhibit 13-13)

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Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

Synchro 7 Capacity Analysis
2022 Build w. HCA Improvements Condition
Friday Evening Peak Hour

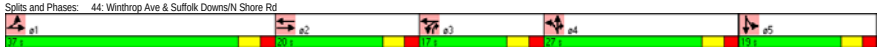
Signalized Synchro Analysis

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	478	1429	0	163	1024	0	468	50	440	153	27	355	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	11	11	9	11	12	10	12	12	12	12	16	
Storage Length (ft)	250		0	100		0	0		100	0		150	
Storage Lanes	1		0	1		0	1		1	0		1	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			No			Yes			No			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		335			635			5227			589		
Travel Time (s)		7.6			14.4			118.8			13.4		
Peak Hour Factor	0.85	0.85	0.85	0.83	0.83	0.83	0.91	0.91	0.91	0.79	0.79	0.79	
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	2%	2%	2%	2%	2%	2%	
Bus Blockages (#/hr)	0	2	0	0	2	0	0	0	0	0	0	0	
Shared Lane Traffic (%)							45%						
Lane Group Flow (vph)	562	1681	0	196	1234	0	283	286	484	0	228	449	
Turn Type	Prot			Prot			Split		pt+ov	Split		Free	
Protected Phases	1	1 2		3	2 3		4	4	3 4	5	5		2
Permitted Phases												Free	
Detector Phase	1	1 2		3	2 3		4	4	3 4	5	5		
Switch Phase													
Minimum Initial (s)	6.0			6.0			4.0	4.0		4.0	4.0		6.0
Minimum Split (s)	20.0			15.0			15.0	15.0		15.0	15.0		15.0
Total Split (s)	37.0	57.0	0.0	17.0	37.0	0.0	27.0	27.0	44.0	19.0	19.0	0.0	20.0
Total Split (%)	30.8%	47.5%	0.0%	14.2%	30.8%	0.0%	22.5%	22.5%	36.7%	15.8%	15.8%	0.0%	17%
Yellow Time (s)	3.0			3.0			3.0	3.0		3.0	3.0		3.0
All-Red Time (s)	2.0			2.0			2.0	2.0		2.0	2.0		2.0
Lost Time Adjust (s)	0.0	-2.0	0.0	-1.0	-2.0	0.0	-1.0	0.0	-1.0	0.0	0.0	-1.0	
Total Lost Time (s)	5.0	3.0	4.0	4.0	3.0	4.0	4.0	5.0	4.0	5.0	5.0	3.0	
Lead/Lag	Lead			Lead			Lag	Lag					Lag
Lead-Lag Optimize?	Yes			Yes			Yes	Yes					Yes
Recall Mode	None			None			None	None		None	None		None
v/c Ratio	1.18	1.09		1.13	0.88		0.94	0.92	0.92		1.10	0.25	
Control Delay	139.7	82.4		154.6	49.5		87.1	82.3	62.4		139.6	0.3	
Queue Delay	165.7	202.7		0.0	0.0		0.0	0.0	0.0		0.0	0.0	
Total Delay	305.3	285.2		154.6	49.5		87.1	82.3	62.4		139.6	0.3	
Queue Length 50th (ft)	~522	~769		~176	334		229	231	359		~200	0	
Queue Length 95th (ft)	#680	#822		#290	354		#410	#404	#564		#296	0	
Internal Link Dist (ft)		255			555			5147			509		
Turn Bay Length (ft)	250			100					100			150	
Base Capacity (vph)	477	1548		174	1403		301	312	528		208	1794	
Starvation Cap Reductn	115	458		0	0		0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0	0		0	0	
Reduced v/c Ratio	1.55	1.54		1.13	0.88		0.94	0.92	0.92		1.10	0.25	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Natural Cycle: 130
Control Type: Actuated-Uncoordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 44: Winthrop Ave & Suffolk Downs/N Shore Rd



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	478	1429	0	163	1024	0	468	50	440	153	27	355
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	9	11	12	10	12	12	12	12	16
Total Lost time (s)	5.0	3.0		4.0	3.0		4.0	5.0	4.0		5.0	3.0
Lane Util. Factor	1.00	0.95		1.00	0.91		0.95	0.95	1.00		1.00	1.00
Frt	1.00	1.00		1.00	1.00		1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	0.96	1.00		0.96	1.00
Satd. Flow (prot)	1787	3441		1608	4951		1569	1701	1583		1787	1794
Flt Permitted	0.95	1.00		0.95	1.00		0.95	0.96	1.00		0.96	1.00
Satd. Flow (perm)	1787	3441		1608	4951		1569	1701	1583		1787	1794
Peak-hour factor, PHF	0.85	0.85	0.85	0.83	0.83	0.83	0.91	0.91	0.91	0.79	0.79	0.79
Adj. Flow (vph)	562	1681	0	196	1234	0	514	55	484	194	34	449
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	562	1681	0	196	1234	0	283	286	484	0	228	449
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	2	0	0	2	0	0	0	0	0	0	0
Turn Type	Prot			Prot			Split		pt+ov	Split		Free
Protected Phases	1	1 2		3	2 3		4	4	3 4	5	5	
Permitted Phases												Free
Actuated Green, G (s)	32.0	52.0		12.0	32.0		22.0	22.0	39.0		14.0	120.0
Effective Green, g (s)	32.0	54.0		13.0	34.0		23.0	22.0	40.0		14.0	120.0
Actuated g/C Ratio	0.27	0.45		0.11	0.28		0.19	0.18	0.33		0.12	1.00
Clearance Time (s)	5.0			5.0			5.0	5.0			5.0	
Vehicle Extension (s)	3.0			3.0			3.0	3.0			3.0	
Lane Grp Cap (vph)	477	1548		174	1403		301	312	528		208	1794
v/s Ratio Prot	c0.31	c0.49		c0.12	0.25		0.18	0.17	c0.31		c0.13	
v/s Ratio Perm												0.25
v/c Ratio	1.18	1.09		1.13	0.88		0.94	0.92	0.92		1.10	0.25
Uniform Delay, d1	44.0	33.0		53.5	41.0		47.8	48.1	38.4		53.0	0.0
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	100.2	50.0		106.2	6.6		36.2	30.1	20.7		90.5	0.3
Delay (s)	144.2	83.0		159.7	47.7		84.0	78.2	59.1		143.5	0.3
Level of Service	F	F		F	D		F	E	E		F	A
Approach Delay (s)		98.3			63.0			71.0			48.5	
Approach LOS		F			E			E			D	

Intersection Summary

HCM Average Control Delay	77.4	HCM Level of Service	E
HCM Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	87.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	255	13	1299	480	65	0	695	1735	129	530	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	10	16	12	12	12	12	12	14	12	16	12
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		1	2		1	0		2	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		485			572			480			673	
Travel Time (s)		11.0			13.0			10.9			15.3	
Peak Hour Factor	0.90	0.90	0.90	0.92	0.92	0.92	0.97	0.97	0.97	0.94	0.94	0.94
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	3%	3%	3%	3%	3%	3%
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	294	14	1412	522	71	0	716	1789	137	583	0
Turn Type	Split		Prot	Split		Free			pt+ov	Prot		
Protected Phases	2	2	2	1	1			4	1 4	3	4	
Permitted Phases						Free						
Detector Phase	2	2	2	1	1			4	1 4	3	4	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0			10.0		6.0	10.0	
Minimum Split (s)	33.0	33.0	33.0	28.0	28.0			26.0		17.0	26.0	
Total Split (s)	33.0	33.0	33.0	54.0	54.0	0.0	0.0	26.0	80.0	17.0	26.0	0.0
Total Split (%)	25.4%	25.4%	25.4%	41.5%	41.5%	0.0%	0.0%	20.0%	61.5%	13.1%	20.0%	0.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0			4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0			2.0		2.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	0.0	0.0	-1.0	-1.0	0.0	-1.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	4.0	5.0	5.0	6.0	5.0	4.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead							
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes							
Recall Mode	Min	Min	Min	None	None			Min		None	Min	
v/c Ratio		0.64	0.05	1.00	0.68	0.04		1.16	0.91	0.85	0.84	
Control Delay		54.7	19.7	59.5	34.8	0.0		132.4	24.3	93.6	59.2	
Queue Delay		0.0	0.0	43.0	2.3	0.0		0.0	0.0	0.0	0.0	
Total Delay		54.7	19.7	102.5	37.0	0.0		132.4	24.3	93.6	59.2	
Queue Length 50th (ft)		113	0	550	323	0		−342	548	105	229	
Queue Length 95th (ft)		161	19	#765	481	0		#492	#883	#232	#334	
Internal Link Dist (ft)		405			492			400			593	
Turn Bay Length (ft)												
Base Capacity (vph)		753	417	1412	766	1583		618	1968	162	698	
Starvation Cap Reductn		0	0	147	131	0		0	0	0	0	
Spillback Cap Reductn		0	0	0	0	0		0	0	0	0	
Storage Cap Reductn		0	0	0	0	0		0	0	0	0	
Reduced v/c Ratio		0.39	0.03	1.12	0.82	0.04		1.16	0.91	0.85	0.84	

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 119.2
Natural Cycle: 145
Control Type: Actuated-Uncoordinated
- Volume exceeds capacity, queue is theoretically infinite.
  Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
  Queue shown is maximum after two cycles.

Splits and Phases: 8: Winthrop Avenue & Route 16



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	255	13	1299	480	65	0	695	1735	129	530	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	16	12	12	12	12	12	14	12	16	12
Total Lost time (s)		5.0	5.0	5.0	5.0	4.0		5.0	5.0	6.0	5.0	
Lane Util. Factor		0.95	1.00	0.97	1.00	1.00		0.95	0.88	1.00	0.95	
Frt		1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	1.00	
Flt Protected		1.00	1.00	0.95	1.00	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)		3203	1729	3433	1863	1583		3505	2944	1752	3953	
Flt Permitted		1.00	1.00	0.95	1.00	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (perm)		3203	1729	3433	1863	1583		3505	2944	1752	3953	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.97	0.97	0.97	0.94	0.94	0.94
Adj. Flow (vph)	11	283	14	1412	522	71	0	716	1789	137	564	19
RTOR Reduction (vph)	0	0	12	0	0	0	0	0	115	0	2	0
Lane Group Flow (vph)	0	294	2	1412	522	71	0	716	1674	137	581	0
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	3%	3%	3%	3%	3%	3%
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	0
Turn Type	Split		Prot	Split		Free			pt+ov	Prot		
Protected Phases	2	2	2	1	1			4	1 4	3	4	
Permitted Phases						Free						
Actuated Green, G (s)		16.1	16.1	48.0	48.0	119.1		20.0	74.0	11.0	20.0	
Effective Green, g (s)		17.1	17.1	49.0	49.0	119.1		21.0	75.0	11.0	21.0	
Actuated g/C Ratio		0.14	0.14	0.41	0.41	1.00		0.18	0.63	0.09	0.18	
Clearance Time (s)		6.0	6.0	6.0	6.0			6.0		6.0	6.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)		460	248	1412	766	1583		618	1854	162	697	
v/s Ratio Prot		c0.09	0.00	c0.41	0.28			c0.20	0.57	c0.08	0.15	
v/s Ratio Perm						0.04						
v/c Ratio		0.64	0.01	1.00	0.68	0.04		1.16	0.90	0.85	0.83	
Uniform Delay, d1		48.1	43.7	35.0	28.7	0.0		49.0	18.9	53.2	47.4	
Progression Factor		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2		2.9	0.0	24.0	2.5	0.1		88.5	6.6	31.2	8.5	
Delay (s)		51.0	43.7	59.0	31.2	0.1		137.6	25.5	84.5	55.9	
Level of Service		D	D	E	C	A		F	C	F	E	
Approach Delay (s)		50.7			49.7			57.5			61.3	
Approach LOS		D			D			E			E	

Intersection Summary

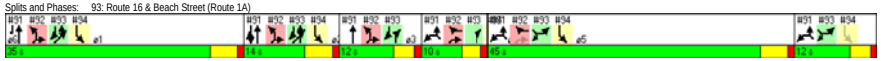
HCM Average Control Delay	54.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	119.1	Sum of lost time (s)	21.0
Intersection Capacity Utilization	88.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	NBR	SBR	SEL	SER2	NEL	NET	ø2	ø3	ø4	ø5	ø6
Lane Configurations											
Volume (vph)	753	972	634	910	1316	663					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900					
Lane Width (ft)	12	13	12	14	12	16					
Storage Length (ft)	0	0	100		0						
Storage Lanes	2	2	0		2						
Taper Length (ft)	25	25	25		25						
Right Turn on Red	No			Yes							
Link Speed (mph)			30			30					
Link Distance (ft)			186			610					
Travel Time (s)			4.2			13.9					
Peak Hour Factor	0.86	0.78	0.85	0.93	0.73	0.73					
Heavy Vehicles (%)	2%	7%	3%	5%	2%	2%					
Shared Lane Traffic (%)											
Lane Group Flow (vph)	876	1246	746	978	1803	908					
Turn Type	custom	custom		Prot	Prot						
Protected Phases	2 3 4	1 2 3	5 6	5 6	1 2	1	2	3	4	5	6
Permitted Phases											
Minimum Split (s)						35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	36.0	61.0	57.0	57.0	49.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	28.1%	47.7%	44.5%	44.5%	38.3%	27.3%	11%	9%	8%	35%	9%
Yellow Time (s)						4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)						1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0					
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0					
Lead/Lag						Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio	1.07	1.02	0.50	0.63	1.42	0.94					
Control Delay	96.9	39.5	18.1	11.9	226.1	64.6					
Queue Delay	0.0	31.1	11.1	3.8	0.0	0.0					
Total Delay	96.9	70.6	29.1	15.7	226.1	64.6					
Queue Length 50th (ft)	~456	~216	142	105	~1037	390					
Queue Length 95th (ft)	#553	70	165	165	#844	361					
Internal Link Dist (ft)			106			530					
Turn Bay Length (ft)			100	100							
Base Capacity (vph)	820	1222	1482	1557	1271	971					
Starvation Cap Reductn	0	91	710	478	0	0					
Spillback Cap Reductn	0	0	0	0	0	0					
Storage Cap Reductn	0	0	0	0	0	0					
Reduced v/c Ratio	1.07	1.10	0.97	0.91	1.42	0.94					

Intersection Summary	
Area Type:	Other
Cycle Length: 128	
Actuated Cycle Length: 128	
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green	
Natural Cycle: 150	
Control Type: Pretimed	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 93: Route 16 & Beach Street (Route 1A)



Movement	NBR	SBR	SEL	SER2	NEL	NET
Lane Configurations						
Volume (vph)	753	972	634	910	1316	663
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	13	12	14	12	16
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.88	0.88	0.97	0.88	0.97	0.95
Frt	1.00	0.85	1.00	1.00	1.00	1.00
Flt Protected	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	3278	2745	3579	3397	3614	4011
Flt Permitted	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	3278	2745	3579	3397	3614	4011
Peak-hour factor, PHF	0.86	0.78	0.85	0.93	0.73	0.73
Adj. Flow (vph)	876	1246	746	978	1803	908
RTOR Reduction (vph)	0	0	0	148	0	0
Lane Group Flow (vph)	876	1246	746	830	1803	908
Heavy Vehicles (%)	2%	7%	3%	5%	2%	2%
Turn Type	custom	custom		Prot	Prot	
Protected Phases	2 3 4	1 2 3	5 6	5 6	1 2	1
Permitted Phases						
Actuated Green, G (s)	32.0	57.0	53.0	53.0	44.0	30.0
Effective Green, g (s)	30.0	58.0	54.0	54.0	45.0	31.0
Actuated g/C Ratio	0.23	0.45	0.42	0.42	0.35	0.24
Clearance Time (s)						5.0
Lane Grp Cap (vph)	768	1244	1510	1433	1271	971
v/s Ratio Prot	c0.27	0.45	0.21	c0.24	c0.50	0.23
v/s Ratio Perm						
v/c Ratio	1.14	1.00	0.49	0.58	1.42	0.94
Uniform Delay, d1	49.0	35.0	27.0	28.3	41.5	47.5
Progression Factor	1.00	0.28	0.60	0.47	1.00	1.00
Incremental Delay, d2	78.6	21.8	1.1	1.7	193.0	16.9
Delay (s)	127.6	31.7	17.4	15.0	234.5	64.4
Level of Service	F	C	B	B	F	E
Approach Delay (s)			16.0			177.6
Approach LOS			B			F

Intersection Summary			
HCM Average Control Delay	100.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	Err%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	0	1909	1215	171	300	529
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			150	0	0
Storage Lanes	0			1	2	2
Taper Length (ft)	25			25	25	25
Right Turn on Red				Yes		Yes
Link Speed (mph)		30	30		30	
Link Distance (ft)		1034	855		674	
Travel Time (s)		23.5	19.4		15.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	2%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	2075	1321	186	326	575
Turn Type				Free		Perm
Protected Phases		2	6		8	
Permitted Phases				Free		8
Detector Phase		2	6		8	8
Switch Phase						
Minimum Initial (s)		4.0	4.0		4.0	4.0
Minimum Split (s)		21.0	21.0		21.0	21.0
Total Split (s)	0.0	77.0	77.0	0.0	43.0	43.0
Total Split (%)	0.0%	64.2%	64.2%	0.0%	35.8%	35.8%
Yellow Time (s)		3.0	3.0		3.0	3.0
All-Red Time (s)		2.0	2.0		2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode		C-Min	C-Max		None	None
v/c Ratio		0.60	0.38	0.12	0.41	0.80
Control Delay		5.7	8.9	0.1	40.1	44.4
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		5.7	8.9	0.1	40.1	44.4
Queue Length 50th (ft)		127	142	0	111	201
Queue Length 95th (ft)		m135	209	0	142	252
Internal Link Dist (ft)		954	775		594	
Turn Bay Length (ft)				150		
Base Capacity (vph)		3464	3464	1568	1087	952
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.60	0.38	0.12	0.30	0.60

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 14 (12%), Referenced to phase 2:EBT and 6:WBT, Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 180: Route 16 (Revere Beach Pkwy) & Route 1 SB Off Ramp



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	0	1909	1215	171	300	529
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	4.0	5.0	5.0
Lane Util. Factor		0.91	0.91	1.00	0.97	0.88
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		5036	5036	1568	3433	2787
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		5036	5036	1568	3433	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	2075	1321	186	326	575
RTOR Reduction (vph)	0	0	0	0	0	78
Lane Group Flow (vph)	0	2075	1321	186	326	497
Heavy Vehicles (%)	3%	3%	3%	3%	2%	2%
Turn Type				Free		Perm
Protected Phases		2	6		8	
Permitted Phases				Free		8
Actuated Green, G (s)		82.5	82.5	120.0	27.5	27.5
Effective Green, g (s)		82.5	82.5	120.0	27.5	27.5
Actuated g/C Ratio		0.69	0.69	1.00	0.23	0.23
Clearance Time (s)		5.0	5.0		5.0	5.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		3462	3462	1568	787	639
v/s Ratio Prot		c0.41	0.26		0.09	
v/s Ratio Perm				0.12		c0.18
v/c Ratio		0.60	0.38	0.12	0.41	0.78
Uniform Delay, d1		10.0	7.9	0.0	39.4	43.4
Progression Factor		0.49	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.4	0.3	0.1	0.4	5.9
Delay (s)		5.2	8.2	0.1	39.7	49.3
Level of Service		A	A	A	D	D
Approach Delay (s)		5.2	7.2		45.9	
Approach LOS		A	A		D	

Intersection Summary			
HCM Average Control Delay	14.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		

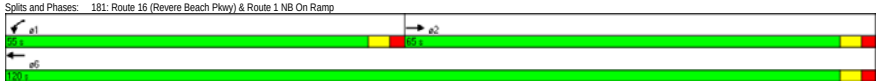
c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1811	0	600	1385	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Right Turn on Red		Yes				Yes
Link Speed (mph)	30			30	30	
Link Distance (ft)	855			522	587	
Travel Time (s)	19.4			11.9	13.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	2%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1968	0	652	1505	0	0
Turn Type			Prot			
Protected Phases	2		1	6		
Permitted Phases						
Detector Phase	2		1	6		
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0		
Minimum Split (s)	21.0		9.0	21.0		
Total Split (s)	65.0	0.0	55.0	120.0	0.0	0.0
Total Split (%)	54.2%	0.0%	45.8%	100.0%	0.0%	0.0%
Yellow Time (s)	3.0		3.0	3.0		
All-Red Time (s)	2.0		2.0	2.0		
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	4.0	4.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	C-Min		None	C-Max		
v/c Ratio	0.75		0.94	0.43		
Control Delay	24.6		57.0	0.4		
Queue Delay	0.0		0.0	0.0		
Total Delay	24.6		57.0	0.4		
Queue Length 50th (ft)	309		462	0		
Queue Length 95th (ft)	357		#692	0		
Internal Link Dist (ft)	775			442	507	
Turn Bay Length (ft)						
Base Capacity (vph)	2620		730	3505		
Starvation Cap Reductn	0		0	0		
Spillback Cap Reductn	0		0	0		
Storage Cap Reductn	0		0	0		
Reduced v/c Ratio	0.75		0.89	0.43		

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 181: Route 16 (Revere Beach Pkwy) & Route 1 NB On Ramp



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1811	0	600	1385	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0		
Lane Util. Factor	0.91		1.00	0.95		
Frt	1.00		1.00	1.00		
Flt Protected	1.00		0.95	1.00		
Satd. Flow (prot)	5036		1752	3505		
Flt Permitted	1.00		0.95	1.00		
Satd. Flow (perm)	5036		1752	3505		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1968	0	652	1505	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1968	0	652	1505	0	0
Heavy Vehicles (%)	3%	3%	3%	3%	2%	2%
Turn Type			Prot			
Protected Phases	2		1	6		
Permitted Phases						
Actuated Green, G (s)	62.4		47.6	120.0		
Effective Green, g (s)	62.4		47.6	120.0		
Actuated g/C Ratio	0.52		0.40	1.00		
Clearance Time (s)	5.0		5.0	5.0		
Vehicle Extension (s)	3.0		3.0	3.0		
Lane Grp Cap (vph)	2619		695	3505		
v/s Ratio Prot	c0.39		c0.37	0.43		
v/s Ratio Perm						
v/c Ratio	0.75		0.94	0.43		
Uniform Delay, d1	22.7		34.8	0.0		
Progression Factor	0.97		1.00	1.00		
Incremental Delay, d2	1.7		20.2	0.4		
Delay (s)	23.8		55.0	0.4		
Level of Service	C		D	A		
Approach Delay (s)	23.8			16.9	0.0	
Approach LOS	C			B	A	

Intersection Summary			
HCM Average Control Delay	20.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	76.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1474	163	233	1742	6	280	289	152	178	189	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	10	10	10	11	11	12	12	12	12
Storage Length (ft)	0		0	400		0	300		50	0		80
Storage Lanes	0		0	1		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			No			No
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2232			1034			1675			1148	
Travel Time (s)		50.7			23.5			38.1			26.1	
Confl. Peds. (#/hr)	6					6	5		30	30		5
Peak Hour Factor	0.98	0.98	0.98	0.93	0.93	0.93	0.86	0.86	0.86	0.96	0.96	0.96
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	2%	2%	2%	1%	1%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1670	0	251	1879	0	326	336	177	185	197	157
Turn Type				Prot			Split		Prot	Split		Perm
Protected Phases		2		1	6		7	7	7	8	8	
Permitted Phases												8
Detector Phase		2		1	6		7	7	7	8	8	8
Switch Phase												
Minimum Initial (s)		15.0		8.0	15.0		8.0	8.0	8.0	10.0	10.0	10.0
Minimum Split (s)		21.0		13.0	21.0		13.0	13.0	13.0	16.0	16.0	16.0
Total Split (s)	0.0	44.0	0.0	18.0	62.0	0.0	28.0	28.0	28.0	30.0	30.0	30.0
Total Split (%)	0.0%	36.7%	0.0%	15.0%	51.7%	0.0%	23.3%	23.3%	23.3%	25.0%	25.0%	25.0%
Yellow Time (s)		5.0		4.0	5.0		4.0	4.0	4.0	5.0	5.0	5.0
All-Red Time (s)		1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	5.0	6.0	4.0	5.0	5.0	5.0	6.0	6.0	6.0
Lead/Lag		Lead		Lag								
Lead-Lag Optimize?												
Recall Mode		C-Min		None	C-Min		None	None	None	None	None	None
v/c Ratio		1.05		1.42	0.83		0.99	0.97	0.58	0.56	0.56	0.54
Control Delay		75.4		251.9	23.7		97.1	91.0	52.9	50.8	50.7	51.0
Queue Delay		0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		75.4		251.9	23.7		97.1	91.0	52.9	50.8	50.7	51.0
Queue Length 50th (ft)		~532		~266	352		255	261	126	129	138	109
Queue Length 95th (ft)		#631		#430	382		#414	#417	192	205	215	180
Internal Link Dist (ft)		2152			954			1595			1068	
Turn Bay Length (ft)				400			300		50			80
Base Capacity (vph)		1594		177	2257		328	345	303	357	376	314
Starvation Cap Reductn		0		0	0		0	0	0	0	0	0
Spillback Cap Reductn		0		0	0		0	0	0	0	0	0
Storage Cap Reductn		0		0	0		0	0	0	0	0	0
Reduced v/c Ratio		1.05		1.42	0.83		0.99	0.97	0.58	0.52	0.52	0.50

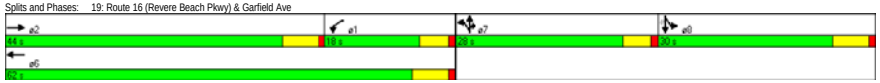
Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 100
Control Type: Actuated-Coordinated
Description: HAS EXCL PED PHASE

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 19: Route 16 (Revere Beach Pkwy) & Garfield Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1474	163	233	1742	6	280	289	152	178	189	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	10	10	10	11	11	12	12	12	12
Total Lost time (s)		6.0		5.0	6.0		5.0	5.0	5.0	6.0	6.0	6.0
Lane Util. Factor		0.91		1.00	0.91		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.98
Flpb, ped/bikes		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.99		1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		4795		1636	4698		1711	1801	1583	1787	1881	1567
Flt Permitted		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		4795		1636	4698		1711	1801	1583	1787	1881	1567
Peak-hour factor, PHF	0.98	0.98	0.98	0.93	0.93	0.93	0.86	0.86	0.86	0.96	0.96	0.96
Adj. Flow (vph)	0	1504	166	251	1873	6	326	336	177	185	197	157
RTOR Reduction (vph)	0	11	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1659	0	251	1879	0	326	336	177	185	197	157
Confl. Peds. (#/hr)	6					6	5		30	30		5
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	2%	2%	2%	1%	1%	1%
Turn Type				Prot			Split		Prot	Split		Perm
Protected Phases		2		1	6		7	7	7	8	8	
Permitted Phases												8
Actuated Green, G (s)		39.6		13.0	57.6		23.0	23.0	23.0	22.4	22.4	22.4
Effective Green, g (s)		39.6		13.0	57.6		23.0	23.0	23.0	22.4	22.4	22.4
Actuated g/C Ratio		0.33		0.11	0.48		0.19	0.19	0.19	0.19	0.19	0.19
Clearance Time (s)		6.0		5.0	6.0		5.0	5.0	5.0	6.0	6.0	6.0
Vehicle Extension (s)		4.0		1.0	4.0		1.0	1.0	1.0	8.0	8.0	8.0
Lane Grp Cap (vph)		1582		177	2255		328	345	303	334	351	293
v/s Ratio Prot		c0.35		c0.15	0.40		c0.19	0.19	0.11	0.10	c0.10	
v/s Ratio Perm												0.10
v/c Ratio		1.05		1.42	0.83		0.99	0.97	0.58	0.55	0.56	0.54
Uniform Delay, d1		40.2		53.5	27.0		48.4	48.2	44.1	44.3	44.3	44.1
Progression Factor		1.00		0.87	0.73		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		36.6		216.2	3.6		47.7	41.0	1.9	6.0	5.9	6.4
Delay (s)		76.8		262.6	23.2		96.2	89.2	46.0	50.3	50.2	50.5
Level of Service		E		F	C		F	F	D	D	D	D
Approach Delay (s)		76.8			51.4			82.8			50.3	
Approach LOS		E			D			F			D	

Intersection Summary

HCM Average Control Delay	64.6	HCM Level of Service	E
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	89.3%	ICU Level of Service	E
Analysis Period (min)	15		

Description: HAS EXCL PED PHASE
c Critical Lane Group

Caesars Resort at Suffolk Downs – DEIR/ExPNF Attachment A

Synchro 7 Capacity Analysis
2022 Build w. HCA Improvements Condition
Saturday Afternoon Peak Hour

Signalized Synchro Analysis

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	248	922	0	153	679	0	600	50	420	132	34	209	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	11	11	9	11	12	10	12	12	12	12	16	
Storage Length (ft)	250		0	100		0	0		100	0		150	
Storage Lanes	1		0	1		0	1		1	0		1	
Taper Length (ft)	25		25	25		25	25		25	25		25	
Right Turn on Red			No			Yes			No			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		335			635			5227			589		
Travel Time (s)		7.6			14.4			118.8			13.4		
Peak Hour Factor	0.92	0.92	0.92	0.80	0.80	0.80	0.90	0.90	0.90	0.65	0.65	0.65	
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	0%	0%	0%	
Bus Blockages (#/hr)	0	0	0	0	2	0	0	0	0	0	0	0	
Shared Lane Traffic (%)							46%						
Lane Group Flow (vph)	270	1002	0	191	849	0	360	363	467	0	255	322	
Turn Type	Prot			Prot			Split		pt+ov	Split		Free	
Protected Phases	1	1 2		3	2 3		4	4	3 4	5	5		2
Permitted Phases												Free	
Detector Phase	1	1 2		3	2 3		4	4	3 4	5	5		
Switch Phase													
Minimum Initial (s)	6.0			6.0			4.0	4.0		4.0	4.0		6.0
Minimum Split (s)	15.0			15.0			15.0	15.0		15.0	15.0		15.0
Total Split (s)	24.0	43.0	0.0	20.0	39.0	0.0	34.0	34.0	54.0	23.0	23.0	0.0	19.0
Total Split (%)	20.0%	35.8%	0.0%	16.7%	32.5%	0.0%	28.3%	28.3%	45.0%	19.2%	19.2%	0.0%	16%
Yellow Time (s)	3.0			3.0			3.0	3.0		3.0	3.0		3.0
All-Red Time (s)	2.0			2.0			2.0	2.0		2.0	2.0		2.0
Lost Time Adjust (s)	0.0	-2.0	0.0	-1.0	-2.0	0.0	-1.0	0.0	-1.0	0.0	0.0	-1.0	
Total Lost Time (s)	5.0	3.0	4.0	4.0	3.0	4.0	4.0	5.0	4.0	5.0	5.0	3.0	
Lead/Lag	Lead			Lead			Lag	Lag					Lag
Lead-Lag Optimize?	Yes			Yes			Yes	Yes					Yes
Recall Mode	None			None			None	None		None	None		None
v/c Ratio	0.94	0.86		0.89	0.57		0.93	0.89	0.71		0.93	0.18	
Control Delay	89.6	45.6		89.2	37.0		74.6	69.0	36.0		89.4	0.2	
Queue Delay	0.0	127.8		0.0	0.0		0.0	0.0	0.0		0.0	0.0	
Total Delay	89.6	173.4		89.2	37.0		74.6	69.0	36.0		89.4	0.2	
Queue Length 50th (ft)	210	380		148	203		286	286	293		198	0	
Queue Length 95th (ft)	#376	468		#235	215		#474	#466	422		201	0	
Internal Link Dist (ft)		255			555			5147			509		
Turn Bay Length (ft)	250			100					100			150	
Base Capacity (vph)	288	1171		215	1495		399	417	670		276	1830	
Starvation Cap Reductn	0	390		0	0		0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0	0		0	0	
Reduced v/c Ratio	0.94	1.28		0.89	0.57		0.90	0.87	0.70		0.92	0.18	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 119.2
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 44: Winthrop Ave & Suffolk Downs



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	248	922	0	153	679	0	600	50	420	132	34	209
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	9	11	12	10	12	12	12	12	16
Total Lost time (s)	5.0	3.0		4.0	3.0		4.0	5.0	4.0		5.0	3.0
Lane Util. Factor	1.00	0.95		1.00	0.91		0.95	0.95	1.00		1.00	1.00
Frt	1.00	1.00		1.00	1.00		1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	0.96	1.00		0.96	1.00
Satd. Flow (prot)	1805	3490		1608	4951		1585	1715	1599		1827	1830
Flt Permitted	0.95	1.00		0.95	1.00		0.95	0.96	1.00		0.96	1.00
Satd. Flow (perm)	1805	3490		1608	4951		1585	1715	1599		1827	1830
Peak-hour factor, PHF	0.92	0.92	0.92	0.80	0.80	0.80	0.90	0.90	0.90	0.65	0.65	0.65
Adj. Flow (vph)	270	1002	0	191	849	0	667	56	467	203	52	322
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	270	1002	0	191	849	0	360	363	467	0	255	322
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	2	0	0	0	0	0	0	0
Turn Type	Prot			Prot			Split		pt+ov	Split		Free
Protected Phases	1	1 2		3	2 3		4	4	3 4	5	5	
Permitted Phases												Free
Actuated Green, G (s)	19.0	38.0		15.0	34.0		28.3	28.3	48.3		17.9	119.2
Effective Green, g (s)	19.0	40.0		16.0	36.0		29.3	28.3	49.3		17.9	119.2
Actuated g/C Ratio	0.16	0.34		0.13	0.30		0.25	0.24	0.41		0.15	1.00
Clearance Time (s)	5.0			5.0			5.0	5.0			5.0	
Vehicle Extension (s)	3.0			3.0			3.0	3.0			3.0	
Lane Grp Cap (vph)	288	1171		216	1495		390	407	661		274	1830
v/s Ratio Prot	0.15	c0.29		c0.12	0.17		c0.23	0.21	0.29		c0.14	
v/s Ratio Perm												0.18
v/c Ratio	0.94	0.86		0.88	0.57		0.92	0.89	0.71		0.93	0.18
Uniform Delay, d1	49.5	36.9		50.7	35.0		43.9	44.0	29.0		50.0	0.0
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	36.3	6.3		31.9	0.5		27.1	21.0	3.4		36.2	0.2
Delay (s)	85.8	43.2		82.6	35.5		70.9	65.0	32.4		86.3	0.2
Level of Service	F	D		F	D		E	E	C		F	A
Approach Delay (s)		52.3			44.2			54.0			38.2	
Approach LOS		D			D			D			D	

Intersection Summary

HCM Average Control Delay	48.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	119.2	Sum of lost time (s)	16.0
Intersection Capacity Utilization	71.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	7	205	8	1260	274	75	0	651	1329	109	437	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	10	16	12	12	12	12	12	14	12	16	12
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		1	2		1	0		2	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		485			572			480			673	
Travel Time (s)		11.0			13.0			10.9			15.3	
Peak Hour Factor	0.90	0.90	0.90	0.92	0.92	0.92	0.97	0.97	0.97	0.94	0.94	0.94
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	3%	3%	3%	3%	3%	3%
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	236	9	1370	298	82	0	671	1370	116	500	0
Turn Type	Split		Prot	Split		Free			pt+ov	Prot		
Protected Phases	2	2	2	1	1			4	1 4	3	4	
Permitted Phases						Free						
Detector Phase	2	2	2	1	1			4	1 4	3	4	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0			10.0		6.0	10.0	
Minimum Split (s)	33.0	33.0	33.0	28.0	28.0			26.0		17.0	26.0	
Total Split (s)	33.0	33.0	33.0	54.0	54.0	0.0	0.0	26.0	80.0	17.0	26.0	0.0
Total Split (%)	25.4%	25.4%	25.4%	41.5%	41.5%	0.0%	0.0%	20.0%	61.5%	13.1%	20.0%	0.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0			4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0			2.0		2.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	0.0	0.0	-1.0	-1.0	0.0	-1.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	4.0	5.0	5.0	6.0	5.0	4.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead							
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes							
Recall Mode	Min	Min	Min	None	None			Min		None	Min	
v/c Ratio		0.58	0.04	0.95	0.38	0.05		1.06	0.67	0.72	0.70	
Control Delay		53.8	23.2	47.5	25.6	0.1		99.3	10.4	77.7	50.8	
Queue Delay		0.0	0.0	27.7	0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay		53.8	23.2	75.2	25.6	0.1		99.3	10.4	77.7	50.8	
Queue Length 50th (ft)		89	0	504	152	0		~293	227	86	185	
Queue Length 95th (ft)		132	16	#701	239	0		#435	339	#183	256	
Internal Link Dist (ft)		405			492			400			593	
Turn Bay Length (ft)												
Base Capacity (vph)		770	423	1445	784	1583		632	2052	166	713	
Starvation Cap Reductn		0	0	153	0	0		0	0	0	0	
Spillback Cap Reductn		0	0	0	0	0		0	0	0	0	
Storage Cap Reductn		0	0	0	0	0		0	0	0	0	
Reduced v/c Ratio		0.31	0.02	1.06	0.38	0.05		1.06	0.67	0.70	0.70	

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 116.5
Natural Cycle: 135
Control Type: Actuated-Uncoordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Winthrop Avenue & Route 16



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	7	205	8	1260	274	75	0	651	1329	109	437	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	16	12	12	12	12	12	14	12	16	12
Total Lost time (s)		5.0	5.0	5.0	5.0	4.0		5.0	5.0	6.0	5.0	
Lane Util. Factor		0.95	1.00	0.97	1.00	1.00		0.95	0.88	1.00	0.95	
Frt		1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	0.99	
Flt Protected		1.00	1.00	0.95	1.00	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)		3203	1729	3433	1863	1583		3505	2944	1752	3930	
Flt Permitted		1.00	1.00	0.95	1.00	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (perm)		3203	1729	3433	1863	1583		3505	2944	1752	3930	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.97	0.97	0.97	0.94	0.94	0.94
Adj. Flow (vph)	8	228	9	1370	298	82	0	671	1370	116	465	35
RTOR Reduction (vph)	0	0	8	0	0	0	0	0	155	0	4	0
Lane Group Flow (vph)	0	236	1	1370	298	82	0	671	1215	116	496	0
Heavy Vehicles (%)	5%	5%	5%	2%	2%	2%	3%	3%	3%	3%	3%	3%
Bus Blockages (#/hr)	0	0	2	0	0	0	0	0	0	0	0	0
Turn Type	Split		Prot	Split		Free			pt+ov	Prot		
Protected Phases	2	2	2	1	1			4	1 4	3	4	
Permitted Phases						Free						
Actuated Green, G (s)		13.8	13.8	48.0	48.0	116.4		20.0	74.0	10.6	20.0	
Effective Green, g (s)		14.8	14.8	49.0	49.0	116.4		21.0	75.0	10.6	21.0	
Actuated g/C Ratio		0.13	0.13	0.42	0.42	1.00		0.18	0.64	0.09	0.18	
Clearance Time (s)		6.0	6.0	6.0	6.0			6.0		6.0	6.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)		407	220	1445	784	1583		632	1897	160	709	
v/s Ratio Prot		c0.07	0.00	c0.40	0.16			c0.19	0.41	c0.07	0.13	
v/s Ratio Perm						0.05						
v/c Ratio		0.58	0.01	0.95	0.38	0.05		1.06	0.64	0.72	0.70	
Uniform Delay, d1		47.9	44.4	32.5	23.2	0.0		47.7	12.5	51.5	44.7	
Progression Factor		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2		2.0	0.0	13.2	0.3	0.1		53.3	0.7	15.0	3.0	
Delay (s)		49.9	44.4	45.6	23.5	0.1		101.0	13.3	66.5	47.8	
Level of Service		D	D	D	C	A		F	B	E	D	
Approach Delay (s)		49.7			39.7			42.1			51.3	
Approach LOS		D			D			D			D	

Intersection Summary

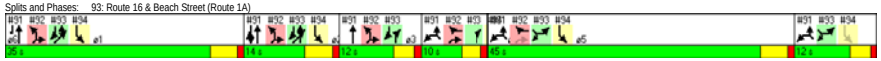
HCM Average Control Delay	42.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	116.4	Sum of lost time (s)	21.0
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	NBR	SBR	SEL	SER2	NEL	NET	ø2	ø3	ø4	ø5	ø6
Lane Configurations											
Volume (vph)	710	979	737	1249	1014	739					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900					
Lane Width (ft)	12	13	12	14	12	16					
Storage Length (ft)	0	0	100		0						
Storage Lanes	2	2	0		2						
Taper Length (ft)	25	25	25		25						
Right Turn on Red	No			Yes							
Link Speed (mph)			30			30					
Link Distance (ft)			186			610					
Travel Time (s)			4.2			13.9					
Peak Hour Factor	0.94	0.94	0.79	0.93	0.73	0.94					
Heavy Vehicles (%)	3%	4%	2%	2%	4%	3%					
Shared Lane Traffic (%)											
Lane Group Flow (vph)	755	1041	933	1343	1389	786					
Turn Type	custom	custom		Prot	Prot						
Protected Phases	2 3 4	1 2 3	5 6	5 6	1 2	1	2	3	4	5	6
Permitted Phases											
Minimum Split (s)						35.0	14.0	12.0	10.0	45.0	12.0
Total Split (s)	36.0	61.0	57.0	57.0	49.0	35.0	14.0	12.0	10.0	45.0	12.0
Total Split (%)	28.1%	47.7%	44.5%	44.5%	38.3%	27.3%	11%	9%	8%	35%	9%
Yellow Time (s)						4.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)						1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0					
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0					
Lead/Lag						Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes	Yes
v/c Ratio	0.93	0.83	0.62	0.83	1.11	0.82					
Control Delay	65.7	11.0	22.8	21.3	102.0	53.8					
Queue Delay	0.0	1.9	23.7	9.2	0.0	0.0					
Total Delay	65.7	12.8	46.5	30.4	102.0	53.8					
Queue Length 50th (ft)	349	121	225	323	~680	325					
Queue Length 95th (ft)	#479	99	245	468	#536	402					
Internal Link Dist (ft)			106			530					
Turn Bay Length (ft)			100	100							
Base Capacity (vph)	812	1258	1496	1618	1246	962					
Starvation Cap Reductn	0	101	589	258	0	0					
Spillback Cap Reductn	0	0	0	0	0	0					
Storage Cap Reductn	0	0	0	0	0	0					
Reduced v/c Ratio	0.93	0.90	1.03	0.99	1.11	0.82					

Intersection Summary	
Area Type:	Other
Cycle Length: 128	
Actuated Cycle Length: 128	
Offset: 0 (0%), Referenced to phase 5:NWL, Start of Green	
Natural Cycle: 130	
Control Type: Pretimed	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 93: Route 16 & Beach Street (Route 1A)



Movement	NBR	SBR	SEL	SER2	NEL	NET
Lane Configurations						
Volume (vph)	710	979	737	1249	1014	739
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	13	12	14	12	16
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.88	0.88	0.97	0.88	0.97	0.95
Frt	1.00	0.85	1.00	1.00	1.00	1.00
Flt Protected	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	3247	2824	3614	3497	3544	3972
Flt Permitted	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	3247	2824	3614	3497	3544	3972
Peak-hour factor, PHF	0.94	0.94	0.79	0.93	0.73	0.94
Adj. Flow (vph)	755	1041	933	1343	1389	786
RTOR Reduction (vph)	0	0	0	168	0	0
Lane Group Flow (vph)	755	1041	933	1175	1389	786
Heavy Vehicles (%)	3%	4%	2%	2%	4%	3%
Turn Type	custom	custom		Prot	Prot	
Protected Phases	2 3 4	1 2 3	5 6	5 6	1 2	1
Permitted Phases						
Actuated Green, G (s)	32.0	57.0	53.0	53.0	44.0	30.0
Effective Green, g (s)	30.0	58.0	54.0	54.0	45.0	31.0
Actuated g/C Ratio	0.23	0.45	0.42	0.42	0.35	0.24
Clearance Time (s)						5.0
Lane Grp Cap (vph)	761	1280	1525	1475	1246	962
v/s Ratio Prot	c0.23	0.37	0.26	c0.34	c0.39	0.20
v/s Ratio Perm						
v/c Ratio	0.99	0.81	0.61	0.80	1.11	0.82
Uniform Delay, d1	48.9	30.3	28.8	32.2	41.5	45.8
Progression Factor	1.00	0.23	0.70	0.63	1.00	1.00
Incremental Delay, d2	30.8	3.1	1.7	4.2	63.1	7.6
Delay (s)	79.7	10.2	21.9	24.6	104.6	53.5
Level of Service	E	B	C	C	F	D
Approach Delay (s)			23.5			86.1
Approach LOS			C			F

Intersection Summary			
HCM Average Control Delay	49.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	128.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	Err%	ICU Level of Service	H
Analysis Period (min)	15		

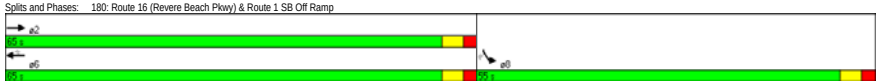
c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	0	1667	1189	154	300	923
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			150	0	0
Storage Lanes	0			1	2	2
Taper Length (ft)	25			25	25	25
Right Turn on Red				Yes		Yes
Link Speed (mph)		30	30		30	
Link Distance (ft)		1034	855		674	
Travel Time (s)		23.5	19.4		15.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	2%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1812	1292	167	326	1003
Turn Type				Perm		Perm
Protected Phases		2	6		8	
Permitted Phases				6		8
Detector Phase		2	6	6	8	8
Switch Phase						
Minimum Initial (s)		4.0	4.0	4.0	4.0	4.0
Minimum Split (s)		21.0	21.0	21.0	21.0	21.0
Total Split (s)	0.0	65.0	65.0	65.0	55.0	55.0
Total Split (%)	0.0%	54.2%	54.2%	54.2%	45.8%	45.8%
Yellow Time (s)		3.0	3.0	3.0	3.0	3.0
All-Red Time (s)		2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode		C-Min	C-Max	C-Max	None	None
v/c Ratio		0.68	0.49	0.19	0.24	0.90
Control Delay		8.3	19.2	4.0	24.8	43.6
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		8.3	19.2	4.0	24.8	43.6
Queue Length 50th (ft)		138	232	7	84	378
Queue Length 95th (ft)		152	280	43	115	473
Internal Link Dist (ft)		954	775		594	
Turn Bay Length (ft)				150		
Base Capacity (vph)		2662	2662	899	1430	1196
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.68	0.49	0.19	0.23	0.84

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 14 (12%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 180: Route 16 (Revere Beach Pkwy) & Route 1 SB Off Ramp



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	0	1667	1189	154	300	923
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0	5.0
Lane Util. Factor		0.91	0.91	1.00	0.97	0.88
Frt		1.00	1.00	0.85	1.00	0.85
Flt Protected		1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		5036	5036	1568	3433	2787
Flt Permitted		1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		5036	5036	1568	3433	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1812	1292	167	326	1003
RTOR Reduction (vph)	0	0	0	70	0	36
Lane Group Flow (vph)	0	1812	1292	97	326	967
Heavy Vehicles (%)	3%	3%	3%	3%	2%	2%
Turn Type				Perm		Perm
Protected Phases		2	6		8	
Permitted Phases				6		8
Actuated Green, G (s)		63.4	63.4	63.4	46.6	46.6
Effective Green, g (s)		63.4	63.4	63.4	46.6	46.6
Actuated g/C Ratio		0.53	0.53	0.53	0.39	0.39
Clearance Time (s)		5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		2661	2661	828	1333	1082
v/s Ratio Prot		c0.36	0.26		0.09	
v/s Ratio Perm				0.06		c0.35
v/c Ratio		0.68	0.49	0.12	0.24	0.89
Uniform Delay, d1		20.8	18.0	14.2	24.8	34.4
Progression Factor		0.34	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.9	0.6	0.3	0.1	9.6
Delay (s)		8.1	18.6	14.5	24.9	44.0
Level of Service		A	B	B	C	D
Approach Delay (s)		8.1	18.1		39.3	
Approach LOS		A	B		D	

Intersection Summary

HCM Average Control Delay	20.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	63.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1478	0	600	1343	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Right Turn on Red		Yes				Yes
Link Speed (mph)	30			30	30	
Link Distance (ft)	855			522	587	
Travel Time (s)	19.4			11.9	13.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	2%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1607	0	652	1460	0	0
Turn Type			Prot			
Protected Phases	2		1	6		
Permitted Phases						
Detector Phase	2		1	6		
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0		
Minimum Split (s)	21.0		9.0	21.0		
Total Split (s)	49.0	0.0	61.0	110.0	0.0	0.0
Total Split (%)	44.5%	0.0%	55.5%	100.0%	0.0%	0.0%
Yellow Time (s)	3.0		3.0	3.0		
All-Red Time (s)	2.0		2.0	2.0		
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0	4.0	4.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	C-Min		None	C-Max		
v/c Ratio	0.67		0.86	0.42		
Control Delay	25.4		39.2	0.4		
Queue Delay	0.0		0.0	0.0		
Total Delay	25.4		39.2	0.4		
Queue Length 50th (ft)	318		396	0		
Queue Length 95th (ft)	422		494	0		
Internal Link Dist (ft)	775			442	507	
Turn Bay Length (ft)						
Base Capacity (vph)	2387		892	3505		
Starvation Cap Reductn	0		0	0		
Spillback Cap Reductn	0		0	0		
Storage Cap Reductn	0		0	0		
Reduced v/c Ratio	0.67		0.73	0.42		

Intersection Summary	
Area Type:	Other
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 22 (20%), Referenced to phase 2:EBT and 6:WBT, Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	

Splits and Phases: 181: Route 16 (Revere Beach Pkwy) & Route 1 NB On Ramp



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1478	0	600	1343	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0		
Lane Util. Factor	0.91		1.00	0.95		
Frt	1.00		1.00	1.00		
Flt Protected	1.00		0.95	1.00		
Satd. Flow (prot)	5036		1752	3505		
Flt Permitted	1.00		0.95	1.00		
Satd. Flow (perm)	5036		1752	3505		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1607	0	652	1460	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1607	0	652	1460	0	0
Heavy Vehicles (%)	3%	3%	3%	3%	2%	2%
Turn Type			Prot			
Protected Phases	2		1	6		
Permitted Phases						
Actuated Green, G (s)	52.1		47.9	110.0		
Effective Green, g (s)	52.1		47.9	110.0		
Actuated g/C Ratio	0.47		0.44	1.00		
Clearance Time (s)	5.0		5.0	5.0		
Vehicle Extension (s)	3.0		3.0	3.0		
Lane Grp Cap (vph)	2385		763	3505		
v/s Ratio Prot	c0.32		c0.37	0.42		
v/s Ratio Perm						
v/c Ratio	0.67		0.85	0.42		
Uniform Delay, d1	22.4		27.9	0.0		
Progression Factor	1.00		1.00	1.00		
Incremental Delay, d2	1.5		9.2	0.4		
Delay (s)	23.9		37.1	0.4		
Level of Service	C		D	A		
Approach Delay (s)	23.9			11.7	0.0	
Approach LOS	C			B	A	

Intersection Summary			
HCM Average Control Delay	17.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	70.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1219	115	238	1557	6	213	251	149	179	176	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	10	10	10	11	11	12	12	12	12
Storage Length (ft)	0		0	200		0	300		50	0		80
Storage Lanes	0		0	1		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			No			No
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2232			1034			1675			1148	
Travel Time (s)		50.7			23.5			38.1			26.1	
Confl. Peds. (#/hr)	5					5	3		18	18		3
Peak Hour Factor	0.95	0.95	0.95	0.97	0.97	0.97	0.89	0.89	0.89	0.93	0.93	0.93
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1404	0	245	1611	0	239	282	167	192	189	118
Turn Type				Prot			Split		Prot	Split		Perm
Protected Phases		2		1	6		7	7	7	8	8	
Permitted Phases												8
Detector Phase		2		1	6		7	7	7	8	8	8
Switch Phase												
Minimum Initial (s)		15.0		8.0	15.0		8.0	8.0	8.0	10.0	10.0	10.0
Minimum Split (s)		21.0		13.0	21.0		13.0	13.0	13.0	16.0	16.0	16.0
Total Split (s)	0.0	43.0	0.0	27.0	70.0	0.0	28.0	28.0	28.0	22.0	22.0	22.0
Total Split (%)	0.0%	35.8%	0.0%	22.5%	58.3%	0.0%	23.3%	23.3%	23.3%	18.3%	18.3%	18.3%
Yellow Time (s)		5.0		4.0	5.0		4.0	4.0	4.0	5.0	5.0	5.0
All-Red Time (s)		1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	5.0	6.0	4.0	5.0	5.0	5.0	6.0	6.0	6.0
Lead/Lag		Lead		Lag								
Lead-Lag Optimize?												
Recall Mode		C-Min		None	C-Min		None	None	None	None	None	None
v/c Ratio		0.86		0.89	0.62		0.80	0.90	0.61	0.73	0.68	0.51
Control Delay		44.2		65.6	12.3		67.5	79.1	55.2	66.3	62.4	56.4
Queue Delay		0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		44.2		65.6	12.3		67.5	79.1	55.2	66.3	62.4	56.4
Queue Length 50th (ft)		381		181	235		176	211	118	146	142	86
Queue Length 95th (ft)		#474		m#270	228		#269	#340	189	#267	#252	151
Internal Link Dist (ft)		2152			954			1595			1068	
Turn Bay Length (ft)				200			300		50			80
Base Capacity (vph)		1638		306	2606		331	348	306	263	277	231
Starvation Cap Reductn		0		0	0		0	0	0	0	0	0
Spillback Cap Reductn		0		0	0		0	0	0	0	0	0
Storage Cap Reductn		0		0	0		0	0	0	0	0	0
Reduced v/c Ratio		0.86		0.80	0.62		0.72	0.81	0.55	0.73	0.68	0.51

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated
Description: HAS EXCL PED PHASE
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 19: Route 16 (Revere Beach Pkwy) & Garfield Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1219	115	238	1557	6	213	251	149	179	176	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	10	10	10	11	11	12	12	12	12
Total Lost time (s)		6.0		5.0	6.0		5.0	5.0	5.0	6.0	6.0	6.0
Lane Util. Factor		0.91		1.00	0.91		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.98
Flpb, ped/bikes		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.99		1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		4900		1668	4790		1728	1818	1599	1787	1881	1570
Flt Permitted		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		4900		1668	4790		1728	1818	1599	1787	1881	1570
Peak-hour factor, PHF	0.95	0.95	0.95	0.97	0.97	0.97	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	0	1283	121	245	1605	6	239	282	167	192	189	118
RTOR Reduction (vph)	0	9	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1395	0	245	1611	0	239	282	167	192	189	118
Confl. Peds. (#/hr)	5					5	3		18	18		3
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type				Prot			Split		Prot	Split		Perm
Protected Phases		2		1	6		7	7	7	8	8	
Permitted Phases												8
Actuated Green, G (s)		39.9		19.7	64.6		20.7	20.7	20.7	17.7	17.7	17.7
Effective Green, g (s)		39.9		19.7	64.6		20.7	20.7	20.7	17.7	17.7	17.7
Actuated g/C Ratio		0.33		0.16	0.54		0.17	0.17	0.17	0.15	0.15	0.15
Clearance Time (s)		6.0		5.0	6.0		5.0	5.0	5.0	6.0	6.0	6.0
Vehicle Extension (s)		4.0		1.0	4.0		1.0	1.0	1.0	8.0	8.0	8.0
Lane Grp Cap (vph)		1629		274	2579		298	314	276	264	277	232
v/s Ratio Prot		c0.28		c0.15	0.34		0.14	c0.16	0.10	c0.11	0.10	
v/s Ratio Perm												0.08
v/c Ratio		0.86		0.89	0.62		0.80	0.90	0.61	0.73	0.68	0.51
Uniform Delay, d1		37.4		49.1	19.3		47.7	48.6	45.9	48.8	48.5	47.1
Progression Factor		1.00		0.77	0.58		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		6.0		23.0	0.9		13.6	25.9	2.6	16.1	12.8	7.3
Delay (s)		43.4		61.0	12.1		61.3	74.5	48.4	64.9	61.3	54.4
Level of Service		D		E	B		E	E	D	E	E	D
Approach Delay (s)		43.4			18.6			63.6			61.1	
Approach LOS		D			B			E			E	

Intersection Summary

HCM Average Control Delay	38.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	80.8%	ICU Level of Service	D
Analysis Period (min)	15		

Description: HAS EXCL PED PHASE
c Critical Lane Group

Attachment B1

Host Community Agreement Boston

HOST COMMUNITY AGREEMENT

This Host Community Agreement (the "Agreement," as more particularly defined below) dated as of the 27th day of August, 2013 (the "Effective Date") is made by and between the City of Boston, Massachusetts, a municipal corporation (the "City," as more particularly defined below), acting by and through its Mayor, with a principal place of business at 1 City Hall Square, Suite 500, Boston, Massachusetts 02201 and Sterling Suffolk Racecourse, LLC, a Massachusetts limited liability company with a principal place of business at 525 William F. McClellan Highway, East Boston, Massachusetts 02128 ("Sterling Suffolk"). Capitalized terms used and not defined elsewhere in this Agreement are defined in Article I.

RECITALS

WHEREAS, the Commonwealth of Massachusetts (the "Commonwealth") on November 22, 2011 enacted "An Act Establishing Expanded Gaming in the Commonwealth," Chapter 194 of the Acts of 2011, principally codified at M.G.L. c. 23K (as may be amended from time to time, and together with any rules, regulations, policies and guidance promulgated thereunder, the "Act");

WHEREAS, the Act reflects the public policies of the Commonwealth with regard to the operation and regulation of expanded gaming as well as the public benefits to the Commonwealth and its citizens expected from a gaming project conducted in accordance with such policies, such as the creation of jobs, the generation of revenues for public purposes, and the increase of tourism and economic development within the Commonwealth;

WHEREAS, the Act established the Massachusetts Gaming Commission (the "Commission") having the authority and responsibility to select, license, oversee and regulate expanded gaming facilities in the Commonwealth;

WHEREAS, the Commission has the authority under the Act to issue not more than three Category 1 licenses to qualified applicants based on the applications submitted to the Commission;

WHEREAS, the Commission has the authority under the Act to award not more than one Category 1 license in Region A, which is defined in the Act as Suffolk, Middlesex, Essex, Norfolk and Worcester counties;

WHEREAS, the Act establishes that the Commonwealth will receive 25% of annual gross gaming revenue from a Category 1 licensee, and such revenue will be dispersed by the Commonwealth into pre-determined funds as follows: 20% to Gaming Local Aid Fund, 14% to the Education Fund, 15% to Transportation Infrastructure and Development Fund, 10% to Commonwealth Stabilization Fund, 10% to debt reduction, 9.5% to Gaming Economic Development Fund, 6.5% to Community Mitigation Fund, 5% to Public Health Trust Fund, 4.5% to Local Capital Projects Fund, 2.5% to Race Horse Development Fund, 2% to Massachusetts Cultural Council, and 1% to Massachusetts Tourism Fund;

WHEREAS, the Act provides that no applicant is eligible to receive a gaming license unless the applicant provides the Commission a signed agreement between the applicant and the municipality or municipalities, designated as a host community, in which the applicant has proposed locating a gaming establishment (a "Host Community Agreement"), which Host Community Agreement sets forth the conditions for a gaming establishment in a host community and provides for the payment by such applicant of a community impact payment to the host community to mitigate the impacts of the gaming establishment upon the host community;

WHEREAS, Sterling Suffolk is the owner of a 161 acre parcel of land (as more particularly described herein, the "Property") located in both the East Boston neighborhood (Ward 1) of the City and in the City of Revere, Massachusetts ("Revere"), as shown on the plan attached hereto as Exhibit A on which Sterling Suffolk operates Suffolk Downs, a thoroughbred horse racing facility licensed by the Commonwealth pursuant to the provisions of M.G.L. c. 128A which is licensed by the Commonwealth to conduct simulcast wagering pursuant to the provisions of M.G.L. c. 128C;

WHEREAS, Sterling Suffolk proposes to construct a resort-style destination gaming establishment on the Property consisting of (i) two distinct gaming areas providing between 150,000 and 250,000 square feet of gaming space with between 4,000 to 6,600 gaming positions (consisting of an evolving combination of slot machines and table games), (ii) a World Series of Poker™ room or rooms, (iii) two luxury hotels providing a total of 450 rooms, (iv) between 24,000 and 46,000 square feet of meeting and entertainment space, (v) bars, nightclubs and between 10 and 17 restaurants, including fine dining concepts, casual dining and a local marketplace, collectively containing between 1,700 and 2,600 seats, (vi) up to 30,000 square feet of retail space, including a spa, (vii) thoroughbred horse racing and simulcast wagering, (viii) a seven-story parking garage with up to 2,600 spaces, (ix) valet parking area for up to 460 additional vehicles, (x) up to approximately 2,100 surface parking spaces, (xi) a central utility plant, and (xii) other amenities and uses customarily accessory or ancillary to the foregoing (as the same may be approved by the City and the BRA, collectively, the "Project");

WHEREAS, Sterling Suffolk has contracted with Caesars Massachusetts Management Company, LLC, to operate the Casino portion of the Project;

WHEREAS, the Project, including the Casino, hotels and other components and amenities, will have all the superior level finishes, amenities and services provided at the highest level of casino developments in the United States and in no event any lesser quality than what is found at the Caesars Palace resort in Las Vegas, Nevada;

WHEREAS, the Project has been designed to be one of the greenest casino development projects in the United States as a result of the sustainability commitments agreed to by the Parties, all as more particularly set forth herein;

WHEREAS, the City, upon analysis, reporting and advice, has determined that the Project as planned keeps the race track at Suffolk Downs open and operational and therefore maintains jobs and a local industry, in addition to supporting related agriculture and the preservation of family farms and related open space in the Commonwealth;

WHEREAS, the portion of the Property within the City, identified as Tax Parcel 0102524000, currently generates $1,194,632.84 in annual real property taxes for the City;

WHEREAS, the Project will result in at least One Billion Dollars ($1,000,000,000) of capital investment by the Developer (as hereinafter defined) as well as at least 2,500 construction jobs and 4,000 permanent jobs, as well as indirect jobs, revenue and expenditures, including, without limitation, increased tourism and visitor-related revenue;

WHEREAS, the City is a host community for this Project as such term is defined in the Act under the Act and this Agreement is intended to be the Host Community Agreement with the City as required by the Act;

WHEREAS, although the Project is located within two host communities, the Community Impacts emanating from the Project will disproportionately burden the City as approximately 116 acres of the 161-acre Property are located in East Boston and approximately 45 acres of which are located in Revere as shown on Exhibit A, and in particular the East Boston community, as a result of the location of the Gaming establishment on the portion of the Property within the City and the related burdens resulting therefrom on the City and in particular the East Boston community, including, without limitation, as a result of construction and demolition proximate to residential neighborhoods in the East Boston community and impacts on the transportation and utility infrastructure in the City as approximately seventy percent (70%) of the traffic to the Project is expected to arrive via roads within the East Boston community in the City;

WHEREAS, the City, following an extensive review process, including extensive outreach and input from the community and analysis and input by subject matter experts engaged by the City, the City's own departmental experts, and the Host Community Advisory Committee, a five-member non-governmental body established by the Mayor, enters into this Agreement to provide for the mitigation of Project impacts as required by the Act;

WHEREAS, this Agreement recognizes and provides for the mitigation of Project impacts to the City and in particular the unique impacts on the East Boston community, which East Boston community will be most affected by the introduction of gaming into their community and subject to a disproportionally greater impact than any other community in the City during the construction period of the Project and thereafter, when the Project is open and operating in the East Boston community, including, without limitation, disproportionately greater impacts as a result of traffic, public transportation infrastructure, public safety services and construction and demolition;

WHEREAS, the Developer will pay an upfront fee to the City in the amount of Thirty-Three Million Four Hundred Thousand Dollars ($33,400,000.00) to be used by the City to support local businesses, construct a community center and improve schools and parks, all as more particularly set forth herein;

WHEREAS, the Developer will pay a minimum annual fee to the City in most years in the amount of Thirty-Two Million Dollars ($32,000,000.00) as well as a percentage of gross gaming revenues, all as more particularly set forth herein, which annual payment will cover both the real property taxes for the portion of the Property in the City and mitigation payments to enable the City to mitigate foreseen and unforeseen community impacts from the Project;

WHEREAS, the Developer's obligations to pay the upfront fee and annual fees set forth above and to comply with the terms of this Agreement are secured by, among other things, letters of credit;

WHEREAS, when the Project is operational, the Developer will use best efforts to spend a minimum of Fifty Million Dollars ($50,000,000.00) annually in goods and services from vendors and companies located in the City of Boston with specific spending requirements for vendors and companies located in East Boston, all as set forth herein;

WHEREAS, the Developer shall implement and fund a minimum of Forty-Five Million Dollars ($45,000,000.00) of traffic and public transportation improvements in the East Boston community and in Revere, all as set forth herein;

WHEREAS, the City will establish, pursuant to this Agreement, a Construction Impact Working Group (as hereinafter defined) to oversee impacts and mitigation to the City and the East Boston community during the construction of the Project;

WHEREAS, the City has or will establish the Gaming Accountability Office which will work with the community, the Construction Impact Working Group and all City impacted agencies, department, offices and commissions to review, monitor, analyze and seek compensation from the Community Impact Trust for the mitigation of impacts from the Project, including without limitation, Boston Police Department, Boston Fire Department, Emergency Medical Services, Boston Public Health Commission, Mayor's Office of Arts, Tourism and Special Events, Department of Neighborhood Development, Office of Small Business, Transportation Department, Environment and Energy Services Cabinet, Boston Public Library, Boston Centers for Youth and Families, the Commission on the Affairs for the Elderly and the Parks and Recreation Department;

WHEREAS, pursuant to the Act, if the gaming establishment is proposed to be located in a city with a population of at least 125,000 residents as enumerated by the most recent enumerated federal census, "host community" shall mean the ward in which the gaming establishment is to be located for the purpose of receiving a certified and binding vote on a ballot question at an election;

WHEREAS, the City has a population of 617,594 residents as enumerated in the 2010 United States Census and the community of East Boston (Ward 1) has a population of 40,508 as enumerated by the most recent enumerated federal census;

WHEREAS, the Project is located within Ward 1 of the City, as more particularly shown on Exhibit B; and

WHEREAS, the Act requires that the governing body of the City set a date for a vote within Ward 1 for the purpose of receiving a certified and binding vote on a ballot question;

NOW, THEREFORE, in accordance with the Act and in consideration of their mutual execution and delivery of this Agreement and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Parties hereby agree as follows:

I. DEFINITIONS

The following terms are expressly defined as follows:

(a) "121A Approvals" means any and all agreements and approvals from the City and/or the BRA necessary to allow the Project to qualify for alternative tax payments pursuant to M.G.L. c. 121A and the regulations promulgated thereunder and the Massachusetts Acts and Resolves of 1960, Chapter 652, as amended (collectively, "M.G.L. c. 121A"), including, without limitation, the application by the Developer or its designee for authorization and approval of the Project as a Redevelopment Project pursuant to M.G.L. c. 121A, a Regulatory Agreement by and between the Developer or its designee and the BRA, and the 6A Agreement by and between the Developer or its designee and the City.

(b) "6A Agreement" means the agreement between the City and Sterling Suffolk or its designee under M.G.L. c. 121A, § 6A. The payments due and owing under the 6A Agreement shall include payments to be made by the Developer or its designee to the City, including, but not limited to, the Developer's Upfront Community Impact Fee and Annual Host Community Agreement Fee payments.

(c) "Acquiring Party" shall have the meaning ascribed to it in Exhibit Q of this Agreement.

(d) "Act" shall have the meaning ascribed to it in the recitals of this Agreement.

(e) "Additional Annual Host Community Agreement Fee" shall have the meaning ascribed to it in Section IV.C. of this Agreement.

(f) "Affiliate" means a Person in which a cumulative total of more than fifty percent (50%) of the beneficial interests are owned, directly or indirectly, by the owners of the beneficial interests in the Developer, as of the Effective Date, a trust or trust for the benefit of their immediate family members, or their respective heirs at law. Notwithstanding the foregoing, the term "Affiliate" shall include any publicly-traded company that directly or indirectly owns more than fifty percent (50%) of the Developer, and the direct and indirect subsidiaries of such publicly-traded company, but shall not include any direct or indirect shareholder or director of such publicly-traded company or any Affiliate of such shareholder or director of such publicly-traded company (other than the publicly-traded company and the direct and indirect controlled subsidiaries of such publicly-traded company).

(g) "Agreement" means this Host Community Agreement including all exhibits and schedules attached hereto, as the same may be reopened from time to time in accordance with the terms herein.

(h) "Annual Host Community Agreement Fee" shall have the meaning ascribed to it in Section IV.C. of this Agreement. As noted herein, the Annual Host Community Agreement Fee shall be made payable to the City in accordance with the terms of the 6A Agreement, to the extent the 121A Approvals are granted.

(i) "Approvals" means all or any licenses, permits, approvals, consents, actions and authorizations that the Developer is required to obtain from any Governmental Authority to perform and carry out its obligations under this Agreement, including, but not limited to, the Approvals listed in Exhibit C attached hereto, the 121A Approvals (to the extent the 121A Approvals are granted by the City and the BRA) and such other permits and licenses necessary to complete the Work, and to open, operate and occupy the Property and the Project.

(j) "Authorized Lender" means any bank, insurance company or other entity (i) regularly involved in the business of making, servicing or investing in real estate mortgages or financing of personal property which is not a Finance Affiliate, including, without limitation, Bank of America, N.A., a national banking association, or (ii) that has been qualified for licensure pursuant to Sections 12 and 16 of the Act or been granted a waiver by the Commission pursuant to the Act and 205 CMR 116.03(1)c.

(k) "Authorized Mortgage" shall have the meaning ascribed to it in Exhibit Q of this Agreement.

(l) "Authorized Representatives" means a Party's employees, agents, consultants, contractors, subcontractors and representatives.

(m) "Base Annual Host Community Agreement Fee" shall have the meaning ascribed to it in Section IV.C. of this Agreement.

(n) "BRA" means the Boston Redevelopment Authority, a public body organized and existing under M.G.L. c. 121B, as amended.

(o) "Casino" means any premises on the Property wherein Gaming is conducted by the Developer pursuant to the Act or other applicable law and this Agreement, and includes all buildings, improvements, equipment and facilities developed, constructed, used, or maintained in connection with such Gaming.

(p) "Casino Year" means the one-year period beginning on January 1 of each year and ending on December 31, except that (a) the first Casino Year shall begin on the Early Opening Operations Commencement Date and end on the next succeeding December 31, and (b) the last Casino Year shall begin on the day following expiration of the preceding Casino Year and ends on the date that is the last day of the Term.

(q) "Category 1 License" shall have the same meaning ascribed to it in the Act.

(r) "City" means the City of Boston, Massachusetts, a municipal corporation with a modified Plan A form of government, as more particularly set forth in Chapter 452 of the Massachusetts Acts of 1948, as amended or modified by, among other references, Chapter 376 of the Massachusetts Acts of 1951 and Chapter 605 of the Massachusetts Acts of 1982, and all of the City's agencies, departments, offices and commissions.

(s) "City Council" means the City Council of the City.

(t) "City Representative" means the Director of the Gaming Accountability Office or such other individual that may be designated by the Mayor from time to time who is the City's authorized representative with respect to any matter related to or arising from this Agreement or the Project, and upon whose consent, approval or direction the Developer may rely as the consent, approval or direction from the City for all purposes of this Agreement.

(u) "Commission" shall have the meaning ascribed to it in the recitals of this Agreement.

(v) "Commonwealth" shall have the meaning ascribed to it in the recitals of this Agreement.

(w) "Community Impacts" means both the known and unknown direct and indirect impacts to the community from or related to the development or operation of the Project, including, without limitation, (i) increased use of City services, (ii) increased use of infrastructure, (iii) the need for additional infrastructure, (iv) the need for additional City employees, services and/or equipment, (v) increased traffic and traffic congestion, (vi) increased pollution, including air, noise, water, and light pollution, (vii) issues related to public health, safety, welfare, education and addictive behavior, (viii) loss of existing City revenue, (ix) issues related to education, businesses, and housing, (x) issues related to public safety including police, fire and emergency medical services, (xi) issues related to quality of life, (xii) increased use of City streets for parking, as well as a reduced use of public parking facilities as a result of additional parking being made available at the Project, and (xiii) costs related to mitigating other impacts to the City, its services and its residents.

(x) "Community Impact Trust" shall have the meaning ascribed to it in Section IV.D. of this Agreement.

(y) "Condemnation" means a taking of all or any part of the Project by eminent domain, condemnation or similar proceeding by a competent authority for public or quasi-public purposes.

(z) "Construction Commencement Date" shall mean the date that any material Work on the Project begins pursuant to any full or partial building permit or demolition permit issued to Developer from the City's Inspectional Service Department for any portion or component of the Project, other than any Limited Preparatory Work, provided that the Construction Commencement Date shall be not later than sixty (60) days after the date Developer first conducts any Limited Preparatory Work.

(aa) "Construction Impact Working Group" shall have the meaning ascribed to it in Section III.G. of this Agreement.

(bb) "Construction Letter of Credit" shall have the meaning ascribed to it in Article IX of this Agreement.

(cc) "Control(s)" or "Controlled" means the possession, direct or indirect, of the power to direct or cause the direction of the management and policies of a Person, whether through the ownership of voting securities, by contract or otherwise, as such terms are used by and interpreted under federal securities laws, rules and regulations.

(dd) "CPI" shall mean the United States Department of Labor, Bureau of Labor Statistics, Consumer Price Index for all Urban Consumers, Boston-Brockton-Nashua, MA-NH-ME-CT All Items, 1982-84=100. In the event that the United States Department of Labor shall cease to promulgate the CPI, the Developer and the City shall agree to meet and discuss in good faith the adoption of the commonly accepted alternative to the CPI for the purposes hereof.

(ee) "Damage Period" shall have the meaning ascribed to it in Section VIII.D. of this Agreement.

(ff) "Developer" means Sterling Suffolk, any designee of Sterling Suffolk under the 121A Approvals (to the extent the 121A Approvals are granted), the Operator, and each parties respective successors or assigns as permitted hereunder.

(gg) "Development Process Cost Fees" means, to the extent not otherwise previously paid by the Developer to the City, whether directly or indirectly, a fee to reimburse the City for the aggregate amount of any and all costs and expenses in good faith paid or incurred by the City and its agencies, including, without limitation, the BRA and the City's Public Health Commission, to third parties (including attorneys, accountants, consultants, engineers and others) in connection with the planning, preparation and negotiation of this Agreement, the enforcement of this Agreement, the Election, the planning, development, ownership, management and operation of the Project, and the issuance of a Category 1 License to the Developer and any renewals thereof; provided, however, that notwithstanding anything to the contrary contained herein, Development Process Cost Fees shall not include costs and fees incurred by the City arising from or related to the City's breach of its obligations under this Agreement or the gross negligence or willful misconduct of the City or its Authorized Representatives.

(hh) "Development Dispute Cost Fees" means, to the extent not otherwise previously paid by the Developer to the City, whether directly or indirectly, a fee to reimburse the City for the aggregate amount of any and all reasonable costs and expenses (including, without limitation, attorneys' fees) in good faith paid or incurred by the City and its agencies, including, without limitation, the BRA and the Public Health Commission, in enforcing this Agreement and in defending lawsuits brought by third parties against the City and its employees and agencies as a result of the Project, the

Election and/or any approvals granted by the City or its agencies for any portion of the Project; provided, however, that notwithstanding anything to the contrary contained herein, Development Dispute Cost Fees shall not include costs and fees incurred by the City arising from or related to the City's breach of its obligations under this Agreement or the gross negligence or willful misconduct of the City or its Authorized Representatives.

(ii) "Direct or Indirect Interest" means an interest in an entity held directly or an interest held indirectly through interests in one or more intermediary entities connected through a chain of ownership to the entity in question, taking into account dilutive effect of the interests of others in such intermediary entities.

(jj) "Dispute" means any claim, demand, controversy, action or cause of action between the Developer and the City arising out of or relating to the Project, this Agreement or the transactions contemplated hereby, including as a result of any Event of Default or concerning the construction, validity, performance, and interpretation of any provision of this Agreement.

(kk) "Early Opening Component" means the components of the Project set forth in Exhibit D attached hereto of this Agreement.

(ll) "Early Opening Operations Commencement" means the completion of the Work for the Early Opening Component, as evidenced by the issuance of a certificate of occupancy (final or temporary) for all portions of the Early Opening Component, and that portions of the Project applicable to Early Opening Component, including, without limitation, the Early Opening Transportation Improvements are complete, operational, and open for business to the general public.

(mm) "Early Opening Operations Commencement Date" means the date occurring no later than twelve (12) to fourteen (14) months after the Construction Commencement Date.

(nn) "Early Opening Transportation Improvements" means the transportation improvements identified in Exhibit E attached hereto to be completed prior to the Early Opening Operations Commencement Date.

(oo) "Effective Date" shall have the meaning ascribed to it in the preamble of this Agreement.

(pp) "Election" means the election on the ballot question as required by Section 15(13) of the Act.

(qq) "Event of Default" shall have the meaning ascribed to it in Section VIII.A. of this Agreement.

(rr) "Excise Tax" shall have the meaning ascribed to it in Exhibit K-2 of this Agreement.

(ss) "Financing" means the act, process or an instance of obtaining specifically designated funds for the Project, whether secured or unsecured, including: (i) issuing securities; (ii) drawing upon any existing or new credit facility; or (iii) contributions to capital by any Person. The Parties acknowledge and agree that this definition does not include capital contributions from any members of the Developer which may have originated from the issuance of securities by the Developer to such members, contributions to the capital of the Developer or any draws upon existing or new credit facilities of such members, so long as such capital contributions, contributions to capital and draws on credit facilities are not secured by liens or encumbrances upon any portion of the Property or the Project.

(tt) "Finance Affiliate" means any Affiliate involved in Financing all or any portion of the Project.

(uu) "Finish Work" refers to the finishes which create the internal and external appearance of the Project.

(vv) "First Class Project Standards" means, at a minimum, a Project that complies with the terms and conditions of all Approvals and Governmental Requirements of the City and the BRA, that demonstrates the creative designs and overall concept excellence and compatibility with its surroundings, as set forth in the Project plans approved by the City and the BRA prior to the Construction Commencement Date, and contains Gaming Areas, hotels and other components and amenities that meet the general standards of quality for construction, maintenance, operations and customer service in no event any lesser quality than the Caesars Palace resort in Las Vegas, Nevada as of the Effective Date.

(ww) "Force Majeure" shall have the meaning ascribed to it in Article XV of this Agreement.

(xx) "Full Build-Out Component" means the components of the Project set forth in Exhibit F attached hereto and all other components of the Project not included in Early Opening Component with the exception of the second hotel.

(yy) "Full Build-Out Operations Commencement" means the completion of the Work for the Full Build-Out Component, as evidenced by the issuance of a certificate of occupancy (final or temporary) for all portions of the Full Build-Out Component, and that all portions of the Project applicable to the Full Build-Out Component, including, without limitation, the Full Build-Out Transportation Improvements, are complete, operational, and open for business to the general public.

(zz) "Full Build-Out Operations Commencement Date" or "FBOOCD" means the date occurring no later than twenty-four (24) to twenty-six (26) months after the Construction Commencement Date.

(aaa) "Full Build-Out Transportation Improvements" means the transportation improvements identified in Exhibit E to be completed prior to the Full Build-Out Operations Commencement Date.

(bbb) "GAAP" means generally accepted accounting principles set forth in the opinions and pronouncements of the Accounting Principles Board and the American Institute of Certified Public Accountants and statements and pronouncements of the Financial Accounting Standards Board or in such other statements by such other entities as may be approved by a significant segment of the accounting profession for use in the United States, which are applicable to the circumstances as of the date of determination.

(ccc) "Gaming" shall have the same definition as in the Act, or any after enacted law which allows for other forms of gaming such as internet based gaming or sports betting; provided, however, that Gaming shall not include pari-mutuel wagering such as is currently authorized at the Property under M.G.L. c. 128A and c. 128C notwithstanding the possibility that those chapters may be amended or reenacted in the future.

(ddd) "Gaming Accountability Office" shall have the meaning ascribed to it in Section III.F. of this Agreement.

(eee) "Gaming Area" means the spaces where Gaming occurs.

(fff) "Gaming Authority" means all agencies, authorities, and instrumentalities of the City, Commonwealth, or the United States, or any subdivision thereof, having jurisdiction over the Gaming or related activities at the Casino, including, without limitation, the Commission or its successor and the Gaming Accountability Office or its successor.

(ggg) "Governmental Authority" means any federal, state, county or municipal governmental authority, including, without limitation, all executive, legislative, judicial and administrative departments and bodies thereof (including any Gaming Authority) and their successors or assigns having jurisdiction over the Developer and/or the Project.

(hhh) "Governmental Requirements" means the Act and all laws, ordinances, statutes, regulations, executive orders, rules, policies, zoning requirements, Approvals and agreements of any Governmental Authority that are applicable to the Project.

(iii) "Gross Revenue" or "Gross Gaming Revenue" shall have the same meaning as given to such term in the Act, but shall also specifically include, to the extent permitted by the Commonwealth at any time in the future, gross revenues attributable to the Developer's Category 1 License or the Project and received by the Developer or its Affiliates from internet-based gaming, sports betting or any other forms of gaming authorized by laws enacted after the Effective Date; provided, however, that Gaming shall not include pari-mutuel wagering such as is currently authorized at the Property under M.G.L. c. 128A and c. 128C notwithstanding the possibility that those chapters may be amended or reenacted in the future.

(jjj) "Host Community Agreement" shall have the meaning ascribed to it in the recitals of this Agreement.

(kkk) "Host Community Agreement Letter of Credit" shall have the meaning ascribed to it in Article IX of this Agreement.

(lll) "Letter of Credit Standards" shall have the meaning ascribed to it in Article IX of this Agreement.

(mmm) "Letters of Credit" shall have the meaning ascribed to it in Article IX of this Agreement.

(nnn) "Limited Preparatory Work" shall mean Work undertaken for the purpose of facilitating the Developer's efforts to complete construction of the Project at the earliest possible date and thereby limit the Project's construction impacts on the community that is (a) Work in the nature of construction staging and mobilization, (b) Work undertaken to maintain or improve the existing racing facility (but not grandstand renovations), (c) Work that is solely interior demolition, abatement or other such interior preparatory Work, (d) Work that is demolition of the minor satellite administrative building in the parking lot of the Property, (e) to the extent approved by the City in its sole discretion, Work that is site preparatory work, or (f) any other early Work that precedes groundbreaking, demolition or foundation work at the Property that is otherwise approved by the City in its sole discretion.

(ooo) "Major Condemnation" means a Condemnation either of (i) the entire Project or (ii) a portion of the Project if, as a result of the Condemnation, the Parties mutually agree that it would be impossible or unfeasible to continue to operate the Project consistent with the First Class Project Standards even after making all reasonable repairs and restorations.

(ppp) "Material Adverse Effect" means any change, effect, occurrence or circumstances (each, an "Event" and collectively, "Events") that is outside of the Developer's reasonable control and, individually or in the aggregate with other Events, is or would reasonably be expected to be materially adverse to the condition (financial or otherwise), business, operations, prospects, properties, assets, cash flows or results of operations of the Project or the Developer, taken as a whole; provided, however, that none of the following should be taken into account in determining whether a Material Adverse Effect has occurred or would reasonably be expected to occur: (i) any Event in the United States or global economy generally, including Events related to world financial or lending markets, or change affecting generally the industry in which the Developer operates; (ii) any changes or proposed changes in GAAP or any applicable law; and (iii) the Developer's lack of funds, except in the case of clauses (i), (ii) or (iii) to the extent such Event(s) affect the Developer, taken as a whole, in a disproportionate manner as compared to similarly situated companies.

(qqq) "Material Project Change" means any changes to the Project that would, in the aggregate, substantially adversely increase the overall Community Impacts generated by the Project.

(rrr) "Mayor" means the Mayor of the City.

(sss) "Measurement Month" shall have the meaning ascribed to it in Exhibit K-2 of this Agreement.

(ttt) "Minor Condemnation" means any Condemnation that is not a Major Condemnation.

(uuu) "Monetary Defaults" shall have the meaning ascribed to it in Exhibit Q of this Agreement.

(vvv) "Mortgage" means a mortgage or other security instrument on all or any part of the Developer's interest in the Project.

(www) "Mortgage Default" shall have the meaning ascribed to it in Exhibit Q of this Agreement.

(xxx) "Mortgagee" means the holder or holders (including an Authorized Lender) from time to time of a Mortgage.

(yyy) "Nominee" is defined in Section III.T. of this Agreement.

(zzz) "Non-Monetary Defaults" shall have the meaning ascribed to it in Exhibit Q of this Agreement.

(aaaa) "Operational Limitations" means (a) the requirements and limitations on the Developer as set forth in this Agreement, (b) any State Direction, and (c) events of Force Majeure.

(bbbb) "Operator" shall mean any Person engaged, hired or retained by Sterling Suffolk or its permitted successors and assigns to manage and/or operate the Gaming at the Property, including, without limitation, the Casino, and such permitted successors and assigns of the Operator. As of the execution of this Agreement, the Operator is Caesars Massachusetts Management Company, LLC.

(cccc) "Parties" means the City and the Developer.

(dddd) "Person" means an individual, corporation, partnership, limited liability company, association or other entity, a trust, an unincorporated organization, or a governmental unit, subdivision, agency or instrumentality.

(eeee) "Project" shall have the meaning ascribed to it in the recitals of this Agreement.

(ffff) "Property" means the land, together with the improvements thereon, located in both the City and in Revere, as more particularly described in Exhibit G attached hereto.

(gggg) "Restricted Area" means a geographic area encompassed by a circle having a radius of fifty (50) miles with 525 William F. McClellan Highway, East Boston, Massachusetts as its center.

(hhhh) "Restricted Party" means any Person who owns a Direct or Indirect Interest in the Developer other than any Person (a) whose ownership of Developer arises from ownership of a Direct or Indirect Interest in a publicly-traded company or Caesars Entertainment Corporation, (b) who owns five percent (5%) or less of a Direct or Indirect Interest in the Developer, or (c) who owns five percent (5%) or less of a Direct or Indirect Interest in a casino facility within the Restricted Area.

(iiii) "Restore" or "Restoration" shall have the meanings ascribed to it in Section XIII.A. of this Agreement.

(jjjj) "Revere" shall have the meaning ascribed to it in the recitals of this Agreement.

(kkkk) "RFA-2" shall have the meaning ascribed to it in 205 CMR 110.00.

(llll) "RFA-2 Response" shall have the meaning ascribed to them in Section X.B.1. of this Agreement.

(mmmm) "Second Hotel Operations Commencement Date" means the date which is no more than sixty (60) months from the Construction Commencement Date, at which date the second hotel will have been completed and open for operation to the general public.

(nnnn) "State Direction" means all applicable Governmental Requirements given to the Developer by the Commonwealth, or any agency, authority or commission of the Commonwealth, including, without limitation, any written requirement or direction of such Governmental Requirements given to the Developer.

(oooo) "Sterling Suffolk" shall have the meaning ascribed to it in the preamble of this Agreement.

(pppp) "Surrounding Communities" shall have the same meaning as defined in the Act.

(qqqq) "Term" shall have the meaning ascribed to it in Section II.B. of this Agreement.

(rrrr) "Transfer" means (i) any direct or indirect sale (including agreements to sell on an installment basis), assignment, transfer, pledge, alienation, hypothecation, merger, consolidation, reorganization, liquidation, receivership, or any other disposition by operation of law or otherwise of a real or intangible property interest or ownership interest in an entity, or (ii) the creation or issuance of new or additional Direct or Indirect Interests in the ownership of any entity. Notwithstanding the foregoing, Transfer shall not include any Transfer of a Direct or Indirect Interest in a publicly-traded company.

(ssss) "Upfront Community Impact Fee" shall have the meaning ascribed to it in Section IV.B. As noted herein, the Upfront Community Impact Fee shall be made payable to the City in accordance with the terms of the 6A Agreement, to the extent the 121A Approvals are granted.

(tttt) "Work" means demolition and site preparation work at the Project Site, and construction of the improvements constituting the Project in accordance with the construction documents for the Project, including Finish Work, and includes labor, materials and equipment to be furnished by a contractor or subcontractor.

II. GENERAL PROVISIONS

A. Commission Requirements. This Agreement includes and meets the requirements for a Host Community Agreement under the Act and affirmatively and comprehensively addresses such requirements, including, without limitation, as follows:

This Agreement includes a community impact fee (as more particularly set forth in Article IV of this Agreement) and stipulations and responsibilities between the City, as a host community, and the Developer, including stipulations and mitigation of known impacts from the development and operation of the Project, including, without limitation, the gaming establishment (as defined in the Act) as more particularly set forth in Article III and Article IV of this Agreement, among other locations), all as required by Section 15(8), Section 15(14) and Section 18(14) of the Act.

The Developer will comply with state and local building codes and local ordinances and bylaws, including M.G.L. c. 30, §§ 61-62H as required by Section 15(12) of the Act, all as more particularly set forth in Section III.A., Section III.J., Section III.K., Section III.L., Section III.M., Section III.V., Section III.W., Exhibit C, Exhibit E, Exhibit H, Exhibit I-1, Exhibit I-2, Exhibit I-3 and Exhibit J of this Agreement, among other locations.

The Developer is required to promote local businesses in the City and develop cross-marketing strategies with local restaurants, small businesses, hotels, retail outlets and impacted live entertainment venues as required by Section 18(2) of the Act, as more particularly set forth in Section III.N. of this Agreement.

The Developer is required to construct a Project of high caliber with a variety of quality amenities that operates in partnership with local hotels and dining, retail and entertainment facilities as required by Section 18(5) of the Act, all as more particularly set forth in Section III.A., Section III.C., and Section III.N. and Exhibit H of this Agreement, among other locations.

The Developer and the City will take measures, in addition to those required under the Act, to address problem gaming as required by Section 18(6) of the Act, all as more particularly set forth in Section IV.F.8. and Section IV.J. of this Agreement.

The Project will meet or exceed the sustainable development principles set forth in Section 18(8) of the Act, as more particularly set forth in Section III.C. and Exhibit H of this Agreement.

The Developer will establish, fund and maintain human resource hiring and training practices that promote the development of a skilled and diverse workforce and access to promotion opportunity as set forth in Section 18(9) of the Act, as more particularly set forth in Section III.M. and Exhibit I-1, Exhibit I-2 and Exhibit I-3 of this Agreement.

The Developer will use best efforts to contract with local businesses for the provision of goods and services to the Project as required by Section 18(10) of the Act, as more particularly set forth in Section III.M. of this Agreement.

The Developer will provide a high number of quality jobs at the Project as required by Section 18(12) of the Act, as more particularly set forth in Section III.M. and Exhibit I-1, Exhibit I-2 and Exhibit I-3 of this Agreement.

The Developer will implement a marketing program for the utilization of: (i) minority business enterprises, women business enterprises and veteran business enterprises to participate as contractors in the design of the Project; (ii) minority business enterprises, women business enterprises and veteran business enterprises to participate as contractors in the construction of the Project; and (iii) minority business enterprises, women business enterprises and veteran business enterprises to participate as vendors in the provision of goods and services procured by the gaming establishment and any businesses operated as part of the gaming establishment as required by Section 18(16) of the Act, all as more particularly set forth in Section III.M., Section III.N. and Exhibit I-1 of this Agreement.

The Developer will implement a workforce development plan as required by Section 18(17) of the Act, as more particularly set forth in Section III.M and Exhibit I-1, Exhibit I-2 and Exhibit I-3 of this Agreement.

The Developer will ensure that any Operator shall comply with the Developer's obligations under this Agreement.

B. Term. The term of this Agreement shall commence on the Effective Date and shall continue until the expiration of the initial Category 1 License issued to the Developer by the Commission unless sooner terminated pursuant to the terms herein (the "Term"). The Parties acknowledge and agree that in the event that the Commission elects to renew or extend the Category 1 License beyond the initial fifteen (15) year term, the terms of this Agreement shall not automatically extend through such renewal or extended Category 1 License term. The Parties acknowledge and agree to meet at least twenty-four (24) months prior to the expiration of the Term to negotiate in good faith on a renewal or an extension of the terms of this Agreement. If the Parties are unable to reach agreement on the terms of such renewal or extension prior to the expiration of the Term, then the terms of this Agreement shall continue until such renewal or extension has been entered into by the Parties; provided, however, that during such interim period following the expiration of the Term, the Annual Host Community Agreement Fee due shall be adjusted to reflect any increase in the cost of living based upon the CPI, calculated as the average annual increase over the twelve (12) months prior to the expiration of the Term. CPI adjustments to the monthly payments of the Annual Host Community Agreement Fee shall not

be credited as prior month payments in the calculation of monthly payments in Exhibit K-1 or Exhibit K-2. To the extent the City is found to have acted in bad faith in the negotiation of a renewal or extension of the terms of this Agreement by a final, unappealable decision of a court of competent jurisdiction, the Developer shall be entitled to receive a credit on future payments due to the City equal to the actual amount paid by the Developer to the City as a result of the CPI increase.

III. THE PROJECT

A. Description of Project. The Developer shall promptly apply for, diligently pursue and obtain all Approvals necessary to design, develop, construct and operate the Project, including, without limitation, Approvals under Articles 37, 53 and 80 of the Boston Zoning Code. Until all such Approvals are obtained, the Developer shall provide the City, on the first business day of each calendar month following the execution of this Agreement, a written update on the status of all such Approvals. If any Approvals are denied or unreasonably delayed, the Developer shall provide prompt written notice thereof to the City, together with the Developer's written explanation of the circumstances causing such delay or resulting in such denial and the Developer's plans to cause such delayed or denied Approval to promptly be issued. Upon obtaining such Approvals, the Developer shall promptly commence to develop and construct the Project in material compliance with the Approvals, including, without limitation, approvals from the BRA and diligently prosecute such development and construction to completion before the Early Opening Operations Commencement Date and Full Build-Out Operations Commencement Date, as applicable. So long as Gaming is permitted by law to be conducted at the Project, the primary business to be operated at the Project shall be Gaming. The Developer shall comply with all applicable Governmental Requirements of the City and the BRA. This obligation shall include all Governmental Requirements adopted after the Effective Date which are of general application to all Persons.

As a precondition to the issuance of a building permit for any portion or component of the Project, the Developer shall deliver to the City (i) a copy of the executed construction contract between the Developer and its general contractor for the construction of such portion or component of the Project and (ii) copies of the payment and performance bonds obtained pursuant to the construction contract. The Developer shall ensure that such payment and performance bonds are maintained until, at a minimum, a final certificate of occupancy is issued by the City for such portion or component of the Project. In addition, the Developer shall provide the City with copies of any notices of default sent or received by the Developer under such construction contracts.

The Developer acknowledges and agrees that the primary Gaming Area on the Property shall be within the City at all times. Beginning at the Early Opening Operations Commencement Date, the Developer agrees to maintain and operate a Gaming Area with between 2,500 and 3,500 gaming positions (consisting of an evolving combination of slot machines and table games) on the portion of the Property located within the City. After the Full Build-Out Operations Commencement Date and throughout the remainder of the Term of this Agreement, the Developer agrees to maintain and operate between 150,000 and 250,000 square feet of Gaming Area with between 4,000 and 6,600 gaming positions (consisting of an evolving combination of slot machines and table games) and a World Series of Poker™ room or rooms on

the portion of the Property located within the City at all times. In addition, the Developer agrees that at all times the main entryway to the Project and the so-called "front door" of the Project and the Gaming Areas shall be within the City.

To the extent that future development occurs on the Property that is not included within the Project because such development will cause additional Community Impacts and/or use City infrastructure, including, without limitation, roadways, water, sewer and other utilities, the Parties acknowledge and agree that such development is not permitted to occur until the Parties amend this Agreement to address the impacts of such additional development, wherever located, on the City and its residents, pursuant to the reopener provisions set forth in Section XVI of this Agreement.

B. Performance of Work. The Developer shall ensure that all Work is performed in a good and workmanlike manner and in accordance with all Governmental Requirements and First Class Project Standards. Without limiting the generality of the foregoing sentence, the Developer shall ensure that all materials used in the construction of the Project shall be of first class quality, and the quality of the Finish Work shall meet or exceed First Class Project Standards.

C. Sustainability. The Developer shall construct, operate and maintain the Project utilizing sustainable development principles in accordance with Section 18(8) of the Act, Governmental Requirements, including Governmental Requirements generally applicable to all Persons that are adopted subsequent to the Effective Date, and all requirements imposed by the City permitting agencies in any Approvals.

In addition, the Developer agrees to implement all of the sustainability initiatives for the Project set forth in Exhibit H attached hereto.

D. Duty to Complete. The Developer shall complete the Early Opening Component and achieve Early Opening Operations Commencement not later than the Early Opening Operations Commencement Date and complete the Full Build-Out Component and achieve Full Build-Out Operations Commencement not later than the Full Build-Out Operations Commencement Date. In addition, the Developer shall complete and operate the second hotel on or before the Second Hotel Operations Commencement Date. Upon the occurrence of an event of Force Majeure, the Early Opening Operations Commencement Date, Full Build-Out Operations Commencement Date and/or the Second Hotel Operations Commencement Date shall each be extended on a day-for-day basis but only for so long as the event of Force Majeure is in effect, plus such period of time not to exceed sixty (60) days or such additional time as may be granted by the City in its reasonable discretion, in each case, as the Developer may require under the circumstances to remobilize its design and construction team, including its architect, general contractor, subcontractors and vendors of goods and services.

E. Operations.

1. The Developer agrees to diligently operate and maintain the Project and all other support facilities for the Project owned or Controlled by the Developer in accordance with all Governmental Requirements and First Class Project Standards and in compliance with this Agreement.

2. The Developer covenants that, at all times following the Early Opening Operations Commencement Date, it will, directly or indirectly: (i) continuously operate and keep open the Gaming Areas for the maximum hours permitted under Governmental Requirements and in accordance with City ordinances; (ii) continuously operate and keep open for business to the general public twenty-four (24) hours each day, every day of the calendar year, the parking component and upon their opening (at the Full Build-Out Operations Commencement Date for the first hotel and within sixty (60) months after the Construction Commencement Date for the second hotel) the hotel rooms and related hotel components; and (iii) operate and keep open for business to the general public all components (other than hotel components, parking components and Gaming Areas) in accordance with commercially reasonable hours of operation. Notwithstanding the foregoing, the Developer shall have the right from time to time in the ordinary course of business and without advance notice to City, to close portions of any component of the Project for (x) such reasonable periods of time as may be required for repairs, alterations, maintenance, remodeling, or for any reconstruction, or (y) such periods of time as may be directed by a Governmental Authority; provided, however, no such direction shall relieve the Developer of any liability as a result of such closure to the extent caused by an act or omission of the Developer in contravention of this Agreement.

3. Throughout the Term of this Agreement, the Developer shall employ one or more full-time employees to promote awareness of employment and business opportunities at the Project for City residents and businesses, including, without limitation, the job opportunities and local business, purchasing and economic development initiatives set forth below, as well as to undertake outreach to neighborhood groups in East Boston.

F. Gaming Accountability Office. The City will create the City of Boston Office of Gaming Accountability (the "Gaming Accountability Office"), a City department created by the Mayor to administer this Agreement and work closely with the Commission. The Gaming Accountability Office shall monitor the Developer's compliance with the terms of this Agreement, monitor all Gaming activities at the Property on behalf of the City, and if necessary, shall, with the assistance of the City's Corporation Counsel, notify the Developer of its failure to comply with the terms of this Agreement and pursue enforcement actions against the Developer, if necessary. The Gaming Accountability Office shall monitor, review and respond to input and participation from the community. Moreover, the Gaming Accountability Office shall also assist the City and the Community Impact Trust in the administration and disbursement of funds received by the Community Impact Trust under this Agreement, including, without limitation, the presentation of funding requests on an annual basis to the Community Impact Trust.

G. Construction Impact Working Group. There shall be a special working group (the "Construction Impact Working Group") to oversee and monitor the direct and indirect impacts of the Project on the City and the unique, particular and disproportionate impacts on the East Boston community during construction to reasonably minimize such impacts and to ensure compliance with all obligations under this Agreement by the Developer. This special working group shall be comprised of (i) representatives, designated by the Mayor, of the Gaming Accountability Office, the BRA, the City's Department of Transportation, the City's Assessing Department, the Boston Police Department, the City's Office of Neighborhood Services, the City's Department of Environmental and Energy Services, the City's Department of Neighborhood Development, the Boston Fire Department and the City's Inspectional Services Department, (ii) the duly-elected City Councilor for District One or his or her designee, (iii) the duly-elected State Representative for First Suffolk District or his or her designee, and (iv) the duly-elected State Senator from the First Suffolk District or his or her designee. The representative from the Gaming Accountability Office shall serve as chairperson of such special working group, call meetings as necessary and establish all procedures to carry-out the duties and responsibilities of this special working group.

H. Property Taxes. The Developer shall pay all real and personal property taxes assessed by the City and due and payable for the portion of the Property within the City on or before the date when due; provided, however, in the event that any taxes are assessed in addition to any obligations under the 121A Approvals, the Developer shall have the right to contest in good faith the assessment of any such taxes. The Developer shall make payments to the City as set forth in the 121A Approvals in the event that the Developer submits and the City and the BRA approves the 121A Approvals, including the 6A Agreement. To the extent that any real or personal property taxes related to the portion of the Property within the City or the Project are assessed by the City in addition to any amounts due under the 121A Approvals, the amount of any Annual Host Community Agreement Fees due from the Developer shall be reduced by the amount of such real and personal property taxes paid.

I. Motor Vehicle Excise Taxes. The Developer shall principally garage all vehicles associated with the Project on the portion of the Property within the City and pay excise taxes to the City consistent with applicable law on all vehicles owned by the Developer and used in connection with the Project on or before the date when due.

J. Approvals Related to Alcoholic Beverages and Entertainment. Approvals related to both alcoholic beverages and entertainment are to be obtained by the Developer from the appropriate governmental bodies, as provided by applicable law. The Developer shall notify the City and provide copies of any written complaints received by the Developer regarding the sale or consumption of alcohol at the Project.

K. Permit Fees. The Developer agrees to pay all the City and the BRA's permit, license and approval fees (including, without limitation, the Development Impact Project Exaction discussed in Section IV.G. below) for all aspects of the Project, as well as the reasonable, actual costs of all outside consultants retained by the City and the BRA to review the Developer's applications and assist in the preparation of such permits, licenses and approvals, such costs to be considered Development Process Cost Fees.

L. Transportation Improvements. The Developer shall implement and fund all traffic and public transportation improvements set forth in Exhibit E attached hereto, which include, without limitation, the Early Opening Transportation Improvements and Full Build-Out Transportation Improvements. The Parties acknowledge and agree that the Developer shall spend a minimum of Forty-Five Million Dollars ($45,000,000.00) on the transportation improvements set forth in Section II of Exhibit E, such costs to be exclusive of land acquisition or right of way costs. As more particularly set forth herein and in Exhibit E, the Early Opening Transportation Improvements must be completed and operational prior to the Early Opening Operations Commencement Date, and the Full Build-Out Transportation Improvements must be completed prior to the Full Build-Out Operations Commencement Date. In addition, the Developer shall comply with all requirements and obligations set forth in the Transportation Access Plan Agreement to be entered into by and between the Developer and the City's Transportation Department pursuant to Article 80 of the Boston Zoning Code.

M. Quality Job Creation/Employment. The Project will result in at least two thousand five hundred (2,500) construction jobs during construction, and at least eight hundred (800) permanent jobs during the year prior to the Early Opening Operations Commencement Date, at least two thousand two hundred twenty-five (2,225) permanent jobs as of Early Opening Operations Commencement Date, and at least four thousand (4,000) permanent jobs as of the Full Build-Out Operations Commencement Date and in every Casino Year thereafter.

The Developer agrees to comply with the job creation and employment commitments listed in Exhibit I-1, as well as with all applicable laws and regulations of Government Authorities regarding construction and permanent employment hiring and job preference requirements, including, without limitation, the Boston Residents Jobs Policy (Chapter 30 of the City Ordinances of 1983, as extended by the Mayor by Executive Order on July 12, 1985, entitled "Extending The Boston Residents Jobs Policy" and adopted as policy by the BRA by vote on July 25, 1985), the requirements of the Boston Employment Commission, established by Chapter 12 of the City's Ordinances of 1986, as amended by Chapter 17 of the City's Ordinances of 1986), as the same may be amended or modified, the Boston Residents Construction Employment Plan attached as Exhibit I-2 and the Boston Residents Employment Agreement attached hereto as Exhibit I-3.

In addition to the above, as more particularly discussed in Section IV.G. below, as part of the BRA Approvals, the Developer will be paying a Development Impact Project Exaction that will be used, in part, to fund job creation in the City.

N. Local Businesses, Purchasing and Economic Development. Following the first anniversary of the Full Build-Out Operations Commencement Date, the Developer agrees to use best efforts to purchase a minimum of Fifty Million Dollars ($50,000,000.00) in goods and services from vendors and companies located in the City, provided further than in any event the Developer shall purchase no less than Five Million Dollars ($5,000,000.00) in goods and services from vendors and companies with a principal place of business in East Boston, exclusive of Logan Airport. The Developer shall provide vendor fairs that provide City businesses with information concerning providing goods and services to the Project. The Developer shall ensure that local businesses will have the reasonable opportunity to open satellite businesses within the Project, including, without limitation, using best efforts to contract

with businesses or restaurants based within East Boston to operate within the Project, with a goal of at least five (5) such businesses or restaurants. Moreover, the Developer shall ensure that City businesses will be able to benefit from partnership programs that incentivize employees and patrons of the Project to utilize City businesses, including through the Operator's rewards program. The Developer shall also use best efforts to purchase and display art created by City residents. The Developer's obligations under this section shall be subject to the availability of goods and services reaching the First Class Project Standard and the availability of local and regional vendors satisfying the licensing and suitability requirements of the Gaming Authorities.

In addition, the Developer will create and implement a marketing program for the utilization of minority business enterprises, women business enterprises and veteran business enterprises to participate as vendors in the provision of goods and services procured by the Developer and any businesses operated as part of the Project.

The Developer will provide the City with (i) its economic development plan, which outlines how the Developer will collaborate, promote and cross-market with the Mayor's Office of Arts, Tourism and Special Events as well as the Massachusetts Cultural Council, Massachusetts Office of Travel and Tourism, Massachusetts Tourism Fund and related industries as well as collaborate, promote and cross-market with restaurants, small businesses, hotels, retail outlets and impacted live entertainment venues in the City (as required by Section 18(2) of the Act), and (ii) its marketing plans (both domestically and internationally) to draw new and existing out-of-state and international customers of the Operator to the Project, the City and the region.

O. Police. Pursuant to the requirements of Section 6(f) of the Act, the City's Police Department, as the law enforcement agency of the host community, shall enter into a memorandum of agreement with the department of state police which shall include, but not be limited to, procedures involving: (i) assignment of police officers of the host community to the gaming enforcement unit of the state police; (ii) first responder calls from the gaming establishment; (iii) emergencies occurring within the gaming establishment, including the gaming area; and (iv) criminal investigations involving employees or patrons of a gaming establishment. It is the intent of the Parties that, with the exception of criminal activity relating to the operation of a gaming establishment or relating to games or gaming that occur inside a gaming establishment (as discussed in Section 6(f) of the Act), the Boston Police Department shall continue to have the same primary jurisdiction it currently has over the portion of the Property within the City, including being the first responder to all calls from the portion of the Property within the City, handling all emergencies occurring within the portion of the Property in the City, including the Gaming Area, and handling all criminal investigations involving employees or patrons at any portion of the Property within the City. In addition, the Developer shall provide the City's Police Department with any video and technical assistance (including, without limitation, any video enhancement capability the Developer may have) and shall work with the City's Police Department during construction of the Project to place cameras in locations at the Property that the City's Police Department deems necessary to preserve and protect public safety.

P. Public Safety. The Developer acknowledges and agrees that so long as the Project is operational, in an effort to reduce the impact of the Project on the public safety services of the City and the City's Public Health Commission, (i) the Developer shall develop and implement a plan to provide on-site security, fire and life safety, and on-site emergency medical technicians as well as develop and implement an emergency management plan and an emergency response plan (as required by Section 25(j) of the Act), all as acceptable to the City's Police Commissioner, Fire Commissioner, Chief of the Emergency Medical Services Department, Director of the Office of Emergency Management, and the Executive Director of the Public Health Commission, or their designees, and (ii) all on-site security, fire and life safety, emergency medical technicians, ambulance services and emergency management services shall work closely with the corresponding City department, agency or office.

Q. Horse Racing. As required by Section 24 of the Act, the Developer, as the holder of a live racing license under M.G.L. c. 128A, shall maintain the existing racing facility on the Property, subject to the permitted increases in the number of live racing days. The Developer acknowledges and agrees that the Developer will seek the approval of the City, prior to seeking any reduction in the number of live racing days from the Commission.

R. Purchase of Slot Machines. Subject to the Developer's obligation to maintain the First Class Project Standard and to the extent required by Section 18(15) of the Act or the Commission, the Developer agrees to purchase, whenever possible, domestically manufactured slot machines for installation in the Casino.

S. State Lottery. The Developer agrees to comply with all provisions of Section 15(1) of the Act and any rules and regulations of the Commission pertaining thereto.

T. Financing. The Developer shall only be permitted to obtain Financing from an Authorized Lender. If any Direct or Indirect Interest of the Developer shall be transferred by reason of any foreclosure, deed in lieu of foreclosure or any other proceeding for enforcement of the Mortgage or any other financing document, the provisions of this Agreement shall be binding on the Mortgagee, any Nominee of the Mortgagee or any third party who acquires the Property at a foreclosure sale, and the Mortgagee, any Nominee of the Mortgagee or any subsequent third party who acquires the Property at a foreclosure sale or by a transfer in lieu thereof shall automatically agree to assume the obligations of Developer hereunder except as provided for in this Section and in Exhibit Q. As used in this Agreement, "Nominee" shall mean a Person who is designated by a Mortgagee to act in place of the Mortgagee solely for the purpose of holding title to the Project and performing the obligations of the Developer hereunder. Notwithstanding the foregoing, the City shall not have the right to terminate this Agreement as a result of a Mortgagee failing to assume the obligations of the Developer hereunder unless Mortgagee or its Nominee fails to do so within three (3) months following the Mortgagee's acquisition of the Project, it being acknowledged that Mortgagee may intend to transfer its interest in the Project to a Nominee and such Nominee shall assume the obligations of the Developer hereunder.

In no event may the Developer or any Finance Affiliate represent that the City is or in any way may be liable for the obligations of the Developer or any Finance Affiliate in connection with (i) any financing agreement or (ii) any private offering of securities. The Developer agrees to indemnify, defend and hold the City and its respective officers, directors,

agents and employees free and harmless from any and all liabilities, costs, damages, claims or expenses arising out of or related to the breach of its obligations under this Section III.T.

After the Developer has notified the City of the existence of any Financing (together with Mortgagee's address and a contact party) pursuant to Exhibit Q, then the City, upon serving the Developer with any notice of default or any other notice under the provisions of or with respect to the Agreement, at the same time shall send to the Mortgagee a duplicate copy of such notice at the address designated by such Mortgagee or the Developer pursuant to Exhibit Q by certified or registered mail, postage and registration charges prepaid, by overnight delivery service with receipt, by hand delivery, or by email with an original to follow by any of the other permitted delivery methods set forth herein. No such notice of default to the Developer shall be effective unless such duplicate copy has been sent to the Mortgagee. Any Mortgagee shall have the right to cure any default by the Developer under this Agreement within the time period prescribed by Exhibit Q to effectuate any such cure, and the City agrees to accept any performance by the Mortgagee of any obligation of the Developer under this Agreement as if the same had been performed by the Developer.

Notwithstanding anything contained herein to the contrary, in connection with any Financing, the provisions of Exhibit Q attached hereto and incorporated herein by reference shall apply.

U. Radius Restriction. Neither Developer nor any Restricted Party shall directly or indirectly: (i) manage, operate or own any equity or debt interest in any casino facility within the Restricted Area other than the Project, or (ii) make application for any franchise, permit or license to manage or operate any casino facility within the Restricted Area other than the Project. This restriction shall expire on the fifteenth (15th) anniversary of the issuance of the Category 1 License to the Developer by the Commission (unless extended by the Parties pursuant to a renewal or extension of this Agreement as more particularly set forth in Section II.B. of this Agreement). The provisions of this Section shall survive any early termination of this Agreement, subject to Section XVII.S. of this Agreement.

V. Smoke Free Environment. The Developer shall ensure compliance by itself, its Authorized Representatives and its customers and invitees with the provisions of the Act, the Boston Public Health Commission policies and City Board of Health's Clean Air Works Workplace Smoking and E-Cigarette Use Regulations and M.G.L. c. 270, § 22, as the same may be supplemented and amended, which require the Project, including the Gaming Areas, to be smoke-free environments. In no event shall smoking be allowed in the Casino during the Term of this Agreement.

W. Construction Management Plan. The Developer shall develop and implement a construction management plan which details the construction schedule for the Early Opening Component and Full Build-Out Component of the Project, provides for continuous pedestrian and vehicular access to and through the Property throughout construction, establishes traffic management and parking policies during construction, prohibits construction vehicles from using local residential roads, and provides a hotline for residents to call with construction complaints. The Developer shall promptly notify the Gaming Accountability Office of all complaints received. This hotline shall be staffed appropriately to ensure that a caller is able to speak to a

person in addition to leaving a message. A draft Construction Management Plan is attached hereto as Exhibit J. A final plan must be approved by the City before construction commences. The Developer shall post a copy of the Construction Management Plan on its Project website and send a copy of the Construction Management Plan to the East Boston Branch of the Boston Public Library.

X. Increases in Car Insurance Rates. The Developer, in coordination with the Gaming Accountability Office, shall use best efforts to work with the Commonwealth's Division of Insurance to monitor, reduce or eliminate increases to car insurance rates within East Boston that are proposed as a result of this Project, including, without limitation, a safe driver educational program for all employees and the promotion of safe, unimpaired driving for all guests and patrons.

Y. Vehicles for Hire. Due to increase in use of and demand for taxi cabs and other vehicles for hire to serve the Project, the Developer shall work with the City to facilitate and mitigate the use and impact of such vehicles on the East Boston community. The City will monitor and enforce rules, regulations and operation of such vehicles.

Z. Guaranteed Ride Home Program. The Developer shall establish a guaranteed ride home program funded and implemented by the Developer to provide safe rides home for patrons whose driving may be impaired. The Guaranteed Ride Home Program shall include advertising and informing patrons of the existence of the program and training of employees at the Project with respect to the program In addition, the Developer shall implement a guaranteed ride home program for all employees as part of the Developer's Transportation Demand Management program to promote travel by alternative modes.

AA. Operational Limitations. Notwithstanding anything to the contrary in this Agreement, the Developer's obligations under this Article III shall be subject to and consistent with the Operational Limitations.

IV. MITIGATION COMMITMENTS

A. Acknowledgment of Community Impacts. The Developer recognizes and acknowledges that the construction and operation of the Project will cause Community Impacts on the City, and in particular, the East Boston community which will face a disproportionately greater impact by the Project than any other part of the City. Further, the Developer recognizes and acknowledges that the Project will require that the City, the City's Public Health Commission and other governmental units of the City provide initial and continuing mitigation of such Community Impacts so that City residents, including the additional temporary and permanent workforce and the increased number of expected visitors and increased tourism to the City related to the Project, will receive substantially the same health, safety, welfare and educational services as currently are provided to City residents and visitors. In order to mitigate the Community Impacts, the Developer agrees to provide an Upfront Community Impact Fee (described below in Section IV.B.) and an Annual Host Community Agreement Fee (described below in Section IV.C.). If the 121A Approvals are granted, in addition to the payment of the Upfront Community Impact Fee and Annual Host Community Agreement Fee, the 6A Agreement shall also include provisions for the payment of the Excise Tax.

B. Upfront Community Impact Fee. After the Commission's awarding of a Category 1 License to the Developer, the Developer agrees to pay the City Thirty Three Million Four Hundred Thousand Dollars ($33,400,000.00) (the "Upfront Community Impact Fee") payable in accordance with the provisions of the 6A Agreement if the 121A Approvals are granted. The Upfront Community Impact Fee shall be paid to the City in four equal installments of Eight Million Three Hundred Fifty Thousand Dollars ($8,350,000.00). The first installment shall be paid within thirty-five (35) days after the issuance to the Developer by the Commission of a Category 1 License. The second installment shall be paid on or before the Construction Commencement Date. The third installment shall be paid on or before the one (1) year anniversary of the payment of the second installment, and the fourth and final installment shall be paid on or before the two (2) year anniversary of the payment of the second installment. The Parties acknowledge and agree that notwithstanding anything to the contrary, the entire Upfront Community Impact Fee shall be paid prior to the Full Build-Out Operations Commencement Date and the Developer shall not be entitled to receive a certificate of occupancy from the City's Inspectional Service Department for any portion of the Full Build-Out Component of the Project unless and until the Upfront Community Impact Fee has been paid in full.

C. Annual Host Community Agreement Fee. During each year of the Term, the Developer shall pay an annual fee to the City (the "Annual Host Community Agreement Fee"). If the 121A Approvals are granted, the Annual Host Community Agreement Fee shall be payable in accordance with the 6A Agreement. The Annual Host Community Agreement Fee shall be in an amount as more particularly set forth in Exhibit K-1 attached hereto. As more particularly set forth in Exhibit K-1 and, if applicable, the 6A Agreement, the Annual Host Community Agreement Fee includes a base fee (the "Base Annual Host Community Agreement Fee") and, in certain instances, a percentage of Gross Gaming Revenues (the "Additional Annual Host Community Agreement Fee"). Such payments shall be made monthly. The method of making such payments of the Annual Host Community Agreement Fee by the Developer to the City is set forth in Exhibit K-2 attached hereto.

D. Payment of Upfront Community Impact Fee and Annual Host Community Agreement Fee. The payments by the Developer to the City of the Upfront Community Impact Fee and Annual Host Community Agreement Fee shall be paid by certified check or secure electronic funds transfer to the City.

Upon receipt of each payment of the Upfront Community Impact Fee, the entire payment shall be transferred by the City to either (a) a City-controlled bank account to be administered by the City of Boston Community Impact Trust, or (b) a special fund or such other appropriate vehicle to be established by the City in its sole discretion (collectively, the "Community Impact Trust"). The Community Impact Trust shall be administered by three Trustees. The Trustees shall be the Collector/Treasurer for the City, the Supervisor of Budgets for the City and the City Auditor for the City. The Director of the Gaming Accountability Office or his or her designee shall be an ex officio non-voting Trustee of the Trust. The Trustees shall administer the Community Impact Trust, including, but not limited to, the disbursement of funds placed in the Community Impact Trust to mitigate the Community Impacts from the Project, as further discussed below.

In the event the 121A Approvals are granted, upon receipt of an Annual Host Community Agreement Fee payment, the funds received by the City shall be transferred by the City in accordance with the 6A Agreement as follows:

1. The City shall transfer to the Community Impact Trust an amount equal to the amount set forth in Exhibit K-1 attached hereto in the column labeled "Amount to Be Transferred therefrom to Community Impact Trust Each Year."

2. The balance of the Annual Host Community Agreement Fee received by the City shall be transferred to the general fund of the City to be used by the City in accordance with the City's appropriation process.

E. Use of Upfront Community Impact Fee by the Community Impact Trust. In order to mitigate the unique, particular and unduly burdensome Community Impacts to the East Boston community during the construction period of the Project and thereafter, the Community Impact Trust will use the Upfront Community Impact Fee for the following purposes:

1. Improvements to the Mario Umana Middle School Academy located at 312 Border Street, East Boston, Massachusetts to modernize facilities and to account for potential increases in school age population.

2. East Boston Neighborhood Business Program (NBP) for support and enhancement of businesses in the East Boston community, including, without limitation, economic support for local neighborhood businesses, neighborhood beautification of East Boston, increased marketing and promotion of local businesses, and to provide other assistance to such businesses.

3. Construction of a new combined youth and senior citizens center in the East Boston community, with input from the Boston Centers for Youth and Families, the City's Commission on Affairs of the Elderly, the City's Parks and Recreation Department and the community.

4. Improvements to Noyes Park located on Boardman Street in East Boston through a public process with the City's Parks and Recreation Department.

5. Improvements to LoPresti Park located at 33 Summer Street in East Boston designed through a public process by the City's Parks and Recreation Department.

These funds will be used exclusively to mitigate Community Impacts to the East Boston community during the construction period of the Project.

F. Use of Portion of Annual Host Community Agreement Fee by the Community Impact Trust. The Parties intend that over the Term of this Agreement, funds will be disbursed by the Trustees for some or all of the following purposes to account for expected and unexpected impacts from the Project:

1. Public Safety, which funds may be used by the various public safety agencies in the following manner:

a) Boston Police Department: Funding of increased costs of routing 911 calls, costs in coordinating any efforts with the Massachusetts State Police under the memorandum of agreement referenced in Section III.O., and increased resources, costs, equipment and programs, including, without limitation, police personnel necessary due to the nature of the Project (patrol, detectives, K9 unit, narcotics, explosive ordnance unit, hazardous materials response unit, traffic), vehicles, additional cells, mobile computing devices, radios, other communications equipment and specialized officer training, which will, among other things, improve the health and safety of City residents and protect businesses and residences within the City.

b) Emergency Medical Services: Funding for the City's Public Health Commission to provide for emergency medical services and equipment, including, without limitation, full and part-time paramedics, life support equipment, radios and communications equipment, and, within East Boston, (i) the construction of a new advanced life support ambulance bay, (ii) the purchase of a new advanced life support ambulance to serve East Boston and the replacement of such ambulance as needed, and (iii) the staffing and maintenance of the ambulance bay and ambulance, all of which will, among other things, improve the health and safety of City residents and protect businesses and residences within the City.

c) Boston Fire Department: Funding of additional fire personnel and additional fire vehicles and equipment to increase both fire protection and fire inspections in the City, which will, among other things, improve the health and safety of City residents and protect businesses and residences within the City.

2. Vehicles for Hire: Due to an anticipated increase in the use of taxi cabs and vehicles for hire for the Project and the Project's 24-hour a day operation, increases in staffing may be necessary to both the uniformed and administrative personnel in the regulation of vehicles for hire by the City.

3. Small and Local Business Assistance: Funding of (a) the ongoing costs of the East Boston Neighborhood Business Program for support and enhancement of businesses in the East Boston community, including, without limitation, economic support for local neighborhood businesses, neighborhood beautification of East Boston, increased marketing and promotion of local businesses, and to provide other assistance to such businesses, and (b) the City's Department of Neighborhood Development, Office of Business Development to support existing funding programs for small and local businesses and to provide entrepreneurs and existing businesses in the City with access

to financial and technical resources, both of which will, among other things, protect and grow businesses within the City.

4. Education: In addition to those funded by the Developer, funding of (a) hospitality, entertainment and other job training programs in the public and vocational schools, particularly in partnerships with community colleges, (b) monitoring the Developer's obligations for education and job-training at vocational schools, (c) after-school programs, (d) compulsive gaming awareness programs in the public schools, and (e) capital improvements and operating costs of public schools in the district due to the potential increase in school-age population as a result of the Project.

5. Community Programs: Funding for programming, services, personnel, facilities, maintenance and equipment for the new combined youth and senior citizens center being constructed in the East Boston community and the Boston Centers for Youth and Family Paris Street Community Center and Pool, as well as funding for reduced or tuition-free programs for low-income residents at these facilities and funding for English as a second language programs, which will, among other things, respond to the needs of children and elderly in the community due to increases in population expected from the Project.

6. Transportation Department: Funding of a wayfinding signage program, targeted parking enforcement and towing with increased parking enforcement officers, vehicles and equipment, installation and maintenance of pavement markings, additional staff people in the traffic management center, interconnections of signals and cameras to the traffic management center, retiming of certain traffic signals on a rotating basis, annual traffic signal and control box upgrades, increased traffic maintenance staff, expansion of the bike share program, expansion of the bike network through dedicated or shared bike lanes, rideshare program and electric vehicle charging stations in the City, and expansion of water transportation service programs connecting key transportation hubs along the City's waterways, all to address increased costs to the City's Transportation Department as a result of the Project.

7. Parks, Neighborhood Beautification, Improvements and Maintenance: Funding for (a) the ongoing maintenance of improvements at City parks in East Boston, including Noyes and LoPresti Park, (b) the following within the East Boston community: year-round street sweeping, hand sweeping, planters and plantings, new trash and recycling receptacles, increased Department of Public Works and Inspection Services Department inspections of buildings, snow removal, anti-littering programs and the City's green ticketing program, (c) operational needs of the East Boston Neighborhood Business Program, (d) trees in City parks, streets and open spaces, (e) the interconnection of public green spaces throughout the City, all to address increased tourism and vehicular, bicycle and pedestrian use in Boston and in particular, East Boston.

8. Public Health Commission: Funding to supplement, as necessary, existing Commonwealth and City Board of Health and City Public Health Commission programs for (a) preventive programs for children, adolescents and young adults, including, without limitation, curriculum for health education, gaming addiction and prevention, and an

outreach program to parents to inform them of the risks of youth gambling, (b) problem gaming prevention strategies for college students that parallel other programs used to address substance abuse, (c) compulsive and problem gaming awareness, prevention and treatment efforts, (d) community awareness of problem gaming through signs, brochures, posters, websites and other advertising, (e) anti-smoking education, awareness and enforcement, and (f) programs addressing other addictive behavior, drug treatment, alcohol treatment and mental health services.

9. Environmental Impacts: Funding for the City's Environment Department, City's Environment and Energy Services Cabinet, Inspectional Services Department or any successor department (a) to monitor the Developer's compliance with Governmental Requirements and the sustainability and green environmental practices set forth in this Agreement, including the addition of personnel, if necessary, and (b) for personnel and equipment to enforce building, health, sanitation, code enforcement, trash and recycling storage and pick up and rodent control.

10. Boston Housing Authority: Funding of up to Twenty Million Dollars ($20,000,000.00) over the Term of this Agreement for the revitalization of Boston Housing Authority's Orient Heights housing development that abuts the Property.

11. Mayor's Office of Arts, Tourism and Special Events: Funding to foster the growth of the cultural community, promote public participation in the arts and public celebrations, especially in East Boston, and advance cultural tourism in the City, due to increased tourism and special events expected as a result of the Project.

Notwithstanding the foregoing, not less than fifty percent (50%) of the amount contributed to the Community Impact Trust over the Term of this Agreement shall be dedicated and used to fund the mitigation of Community Impacts in the East Boston community.

G. Development Impact Project Exaction. In addition to the Upfront Community Impact Fee and the Annual Host Community Agreement Fee, the Project will also require that the Developer pay a Development Impact Project Exaction, as such term is defined in Article 80B-7 of the City's Zoning Code, as part of the Developer's Approvals from the BRA under Article 80B of the City's Zoning Code, which exaction will provide funds to the Neighborhood Housing Trust to fund affordable housing and the Neighborhood Jobs Trust to fund job creation within the City. Based upon information provided by the Developer, the Developer anticipates that the aggregate Development Impact Project Exaction to be paid by the Developer will be in excess of Eight Million Dollars ($8,000,000.00).

H. Horse Racing Related Revenues. Nothing in this Agreement shall limit, impact or waive the City's right to receive the local share of racing taxes currently collected by the Commonwealth pursuant to M.G.L. c. 58, § 18D, as the same may be amended.

I. Utilities. The Developer recognizes that the Project may require upgrades to certain portions of the City or third party utility companies' infrastructure and, accordingly, the Developer agrees as follows:

1. Electricity. The Developer shall, at no expense to the City, cause to be provided any upgrades or cause to be constructed any new electrical facilities required to provide the necessary electric power service to the Project.

2. Natural Gas. The Developer shall, at no expense to the City, cause to be provided any upgrades or cause to be constructed any new gas transmission facilities required to provide the necessary natural gas service to the Project.

3. Water and Wastewater. The Developer shall pay all customary connection fees, inflow and infiltration charges, monthly service charges, monthly usage fees and permit fees to the Boston Water and Sewer Commission and shall construct, improve or modify, or pay all actual costs incurred by the City and/or the Boston Water and Sewer Commission to construct, improve or modify, water and wastewater infrastructure necessary to service the Project. The Developer shall be responsible for the actual costs to maintain and repair any water or wastewater infrastructure that solely serves the Project. In addition, the Developer shall be required to abide by the terms and conditions of any Approvals from the Boston Water and Sewer Commission or other agreements entered into between the Developer and the Boston Water and Sewer Commission, including the payment of any additional customary fees required under such Approvals or other agreements.

J. Compulsive Gambling Resources. The Developer will implement a responsible gaming plan at the Property to make sure that those people who cannot game responsibly get the help they need and to make sure that people who can game responsibly understand the importance of gaming responsibly. The Developer shall mitigate the potential negative public health consequences associated with the Project and the operation of the Casino.

The Developer will accomplish the responsible gaming goals for the Project by, among other things: (i) complying in every respect with all responsible gaming provisions in the Act and all responsible gaming provisions subsequently adopted by the Commission or adopted by the City or its departments or agencies, including the City's Board of Health, City's Public Health Commission and the Gaming Accountability Office; (ii) ensuring that all patrons in the Gaming Areas are twenty-one (21) years of age or over, as required by Section 25(h) of the Act; (iii) educating its employees through formal training programs about the importance of responsible gaming and underage gambling and the policies and procedures of Developer's responsible gaming programs; (iv) providing information to patrons about the odds of games, signs and symptoms of compulsive gaming and how to make responsible gaming decisions; (v) promoting responsible gaming in daily operations; and (vi) supporting public awareness of responsible gaming, including, at a minimum, working with the National Council on Problem Gambling, Inc., its local councils and other service agencies in and around the City and region on a continuing basis to promote a better understanding of responsible gaming and underage gambling and supporting research on responsible gaming and underage gambling issues through on-going financial contributions.

The Developer shall implement a "self-restriction" program that allows anyone to request not to receive direct marketing by the Developer's owned, managed, or operated properties, as well as to be denied credit and check cashing privileges at the Casino. Forms to request self-restriction or self-exclusion shall be readily available to all customers and individuals who visit the Property.

The Developer will join and actively participate in the Massachusetts Partnership for Responsible Gaming and actively work with the City's Public Health Commission and the City's Board of Health for the express purpose of assisting the City to address issues of treatment for compulsive behavior, especially problem gaming in the City. Developer's obligations under this Section IV.J shall not be inconsistent with any State Direction.

K. Payment of the Development Process Cost Fees and Development Dispute Cost Fees. The Developer shall reimburse the City for all due and unpaid Development Process Cost Fees and Development Dispute Cost Fees upon receipt of an invoice from the City. The invoice for the initial Development Process Cost Fees or Development Dispute Cost Fees shall be issued by the City approximately thirty (30) to sixty (60) days after the Effective Date. For subsequent Development Process Cost Fees and Development Dispute Cost Fees, the City shall invoice the Developer from time to time, but not more frequently than monthly, for such fees incurred since the prior invoice. The Developer shall pay such invoiced fees within thirty (30) days from the date of the invoice in accordance with the instructions provided in the invoice. The invoice provided by the City shall include a summary of the charges and such reasonable detail as the City believes is necessary and as may reasonably be requested by the Developer to inform the Developer of the nature of the costs and expenses, subject to any applicable privilege and confidentiality restrictions. As more particularly set forth in Section XVII.S., the Developer's obligation to pay the Development Process Cost Fees and Development Dispute Cost Fees incurred by the City prior to the termination of this Agreement shall survive termination of the Agreement.

V. OBLIGATIONS OF THE CITY

In consideration of the mitigation measures to be undertaken by or paid for by the Developer for the impacts to the City and, in particular on the East Boston community, and in further recognition of the benefits the Project will bring to East Boston and the City as a whole, the City and the BRA, as applicable, shall do the following:

A. The BRA and/or the Developer will prepare and submit to the City's Zoning Commission changes to the Boston Zoning Code to permit the Developer's proposed Gaming use at the Property.

B. The City and the BRA will accept and process applications for Approvals submitted by the Developer for the Project, including, without limitation, zoning and land use approvals and the 121A Approvals.

C. The City will establish the Community Impact Trust or another appropriate vehicle at its discretion to hold and administer the Upfront Community Impact Fee and a portion of the Annual Host Community Agreement Fee.

D. Upon execution of this Agreement, the City will make the signed Agreement public with a concise summary, approved by the City's Corporation Counsel, in a periodical of general circulation and on the official website of the City not later than seven (7) days after execution until the Election has been certified, all as required by Section 15(13) of the Act.

E. The City will certify the results of the Election as required by Section 15(13) of the Act.

VI. RIGHT OF ACCESS

Subject to any restrictions imposed upon the Developer by State Direction, the Developer hereby grants the City and the City's Authorized Representatives, including, without limitation, the Gaming Accountability Office, the right to enter upon the Property at all reasonable times for the purpose of enforcing the provisions of this Agreement, for inspecting the Project, and for reconstructing, maintaining, repairing, or servicing any facility or element located on the Property which may be owned by the City or its Authorized Representatives. In each instance of entry, the City or its Authorized Representatives shall use diligent efforts to minimize the disruption to the Developer's operations.

VII. TRANSFERS AND ASSIGNMENT

Except with respect to Financings undertaken pursuant to the terms of this Agreement, the Developer hereby covenants and agrees with the City that it will not voluntarily Transfer its Direct or Indirect Interest in the Project without the express consent and approval of the City and the BRA, if the 121A Approvals are granted. However, in no event shall the foregoing covenant and agreement be applicable to Transfers of a Direct or Indirect Interest in the Project to an Affiliate. All Transfers to Affiliates shall be effective upon the filing of written notice of such transfer or assignment with the City (such notice to include a disclosure of those having beneficial interests in the Affiliate). The written consent of the City and the BRA to the extent the 121A Approvals are granted, whenever required by the terms of this Section, shall be granted, withheld or conditioned in the City and the BRA's sole discretion. To assist the City and the BRA in its review of a proposed Transfer that requires the City and the BRA's consent, the Developer shall provide the City and the BRA with written evidence of the proposed transferee or assignee's qualifications to own and/or operate the Project, evidence of the transferee or assignee's financial status, and such other information as may be requested by the City or the BRA. Any transferee, assignee or any Person succeeding to the rights, obligations and interest of the Developer in the Project by operation of law, or insolvency or otherwise shall, at the option of the City, be deemed to have agreed to be bound by the terms, covenants and conditions of this Agreement.

VIII. DEFAULT

A. Events of Default. Subject to the Operational Limitations and all Governmental Requirements, the occurrence of any of the following shall constitute an "Event of Default" under this Agreement:

1. If the Developer fails to make any payments of the Upfront Community Impact Fee or Annual Host Community Agreement Fee required to be made by the Developer hereunder as and when due;

2. If the Developer fails to make any payments other than the Upfront Community Impact Fee or Annual Host Community Agreement Fee required to be made by the Developer hereunder and such failure continues for five (5) business days after the Developer's receipt of a written notice of default with respect thereto from the City;

3. If the Developer shall make a general assignment for the benefit of creditors or shall admit in writing its inability to pay its debts as they become due;

4. If the Developer shall file a voluntary petition under any title of the United States Bankruptcy Code, as amended from time to time, or if such petition is filed against the Developer and an order for relief is entered, or if the Developer shall file any petition or answer seeking, consenting to or acquiescing in any reorganization, arrangement, composition, readjustment, liquidation, dissolution or similar relief under any present or any future federal bankruptcy code or any other present or future applicable federal, state or similar statute or law, or shall seek or consent to or acquiesce to or suffer the appointment of any trustee, receiver, custodian, assignee, liquidator or similar official of the Developer, or of all or any substantial part of its properties or of the Project or any interest therein of the Developer;

5. If within ninety (90) days after the commencement of any proceeding against the Developer seeking any reorganization, arrangement, composition, readjustment, liquidation, dissolution or similar relief under the present or any future federal bankruptcy code or any other present or future applicable federal, state or similar statute or law, such proceeding shall not have been dismissed; or if within ninety (90) days after the appointment, without the consent or acquiescence of the Developer of any trustee, receiver, custodian, assignee, liquidator or other similar official of the Developer or of all or any substantial part of its properties or of the Project or any interest therein of the Developer, such appointment shall have not been vacated or stayed on appeal or otherwise, or if within ninety (90) days after the expiration of any such stay, such appointment shall not have been vacated;

6. If the Developer fails to maintain in full force and effect the Letters of Credit;

7. If the Developer fails to Restore the Property pursuant to the terms of Article XIII;

8. If any representation or warranty made by the Developer hereunder shall prove to have been false or misleading in any material respect as of the time made or furnished; provided, however, that if the condition causing the representation or warranty to be false is susceptible of being cured, the same shall be an Event of Default hereunder only if such condition is not cured within thirty (30) days after written notice to the Developer from the City, and, provided further, that if the condition causing the

representation or warranty to be false is susceptible of cure but cannot reasonably be cured within such thirty (30) day period and the Developer shall have commenced to cure such condition within such thirty (30) day period and thereafter diligently and expeditiously proceeds to cure the same, such thirty (30) day period shall be extended for such time as is reasonably necessary (not to exceed sixty (60) days after the Developer's receipt of the above-described notice from the City) for the Developer in the exercise of due diligence to cure such condition;

9. If the Developer breaches a Covenant set forth in Article X below, and such breach is not cured within thirty (30) days after written notice to the Developer from the City, or, if such breach cannot reasonably be cured within such thirty (30) day period and the Developer shall have commenced to cure such breach within such thirty (30) day period and thereafter diligently and expeditiously proceeds to cure the same, such thirty (30) day period shall be extended for such time as is reasonably necessary (not to exceed sixty (60) days after the Developer's receipt of the above-described notice from the City) for the Developer in the exercise of due diligence to cure such breach;

10. If the Developer transfers or assigns this Agreement, except in accordance with the provisions of Article VII above;

11. If a default shall occur, which has not been cured within any applicable cure period otherwise expressly provided elsewhere in this Agreement;

12. If the Developer fails to maintain in full force and effect policies of insurance meeting the requirements of Article XII below and in such event the Developer fails to remedy such default within five (5) business days after the Developer's receipt of written notice of default with respect thereto from City;

13. If the Developer fails to complete the Early Opening Component and the Early Opening Transportation Improvements by the date that is thirty (30) days after the Early Opening Operations Commencement Date and/or fails to achieve Early Opening Operations Commencement by the date that is thirty (30) days after the Early Opening Operations Commencement Date;

14. If the Developer fails to complete the Full Build-Out Component and the Full Build-Out Transportation Improvements by the date that is thirty (30) days after the Full Build-Out Opening Operations Commencement Date and/or fails to achieve Full Build-Out Operations Commencement by the date that is thirty (30) days after the Full Build-Out Operations Commencement Date;

15. If the Developer fails to complete and operate or have completed or operated on its behalf, a second hotel on the portion of the Property on or before the Second Hotel Operations Commencement Date;

16. If the construction of the Project (inclusive of offsite activities) at any time is discontinued or suspended for a period of thirty (30) consecutive calendar days, subject to Force Majeure, and is not restarted prior to the Developer's receipt of written notice of default hereunder; and

17. If the Developer shall default in the performance of any (a) Governmental Requirement; or (b) commitment, agreement, term or condition of this Agreement, and in such event if the Developer shall fail to remedy any such default within sixty (60) days after receipt of written notice of default with respect thereto; provided, however, that if any such default is reasonably susceptible of being cured within ninety (90) days, but cannot with due diligence be cured by the Developer within thirty (60) days, and if the Developer commences to cure the default within sixty (60) days and diligently prosecutes the cure to completion, then the Developer shall not during such period of diligently curing be in default hereunder as long as such default is completely cured within ninety (90) days of the first notice of such default to the Developer.

B. Remedies. Upon an Event of Default, subject to the limitations if Section VIII.C., the City shall have the right if it so elects (subject to the Dispute resolution provisions in Section XVII.K. hereof, if applicable) to (i) exercise any and all remedies available at law or in equity, provided that any monetary damages resulting therefrom shall solely be the responsibility of Sterling Suffolk and its successors and assigns, (ii) receive liquidated damages as set forth in Section VIII.D. hereof, (iii) draw on the Letters of Credit, and/or (iv) institute and prosecute proceedings to enforce in whole or in part specific performance of this Agreement by the Developer, to enjoin or restrain the Developer from commencing or continuing said breach, and/or to cause by injunction the Developer to correct and cure said breach or threatened breach, provided that any monetary damages resulting therefrom shall solely be the responsibility of Sterling Suffolk and its successors and assigns. None of the remedies enumerated herein are exclusive, except for the City's rights to receive liquidated damages under the provisions of Section VIII.D. hereof which liquidated damages may be satisfied by drawing on the Letters of Credit as set forth in Section VII.D., and except as limited by Section VIII.C., nothing in this Agreement shall be construed as prohibiting the City from pursuing any other remedies at law, in equity or otherwise available to the City.

C. Termination. Except for the provisions that by their terms survive and subject to the provisions of Section XVII.S. of this Agreement, this Agreement shall terminate upon the occurrence of any of the following events and with immediate effect:

1. The Developer in its entirety is found not qualified by the Commission to proceed to the RFA-2 phase of the selection process;

2. The Developer fails to receive the affirmative vote in the Election required under the Act;

3. The Category 1 License for Region A (as such term is defined in the Act) is awarded to a party other than the Developer, and (i) such other party has both paid the Category 1 License fee pursuant to Section 10(d) of the Act and submitted the construction deposit or bond required pursuant to Section 10(a) of the Act, and (ii) such award is not subject to any pending appeal, further review, or revocation proceedings;

4. The Developer's Category 1 License is revoked by a final, non-appealable order of the Commission; or

5. The expiration of the Term of this Agreement or the nonrenewal of the Category 1 License awarded to the Developer.

These termination events are in addition to any other rights of the City or the Developer to terminate this Agreement otherwise available under law.

D. Liquidated Damages. The City and the Developer agree that because of the difficulty and/or impossibility of determining the City's damages upon the occurrence of an Event of Default pursuant to Section VIII.A. above by way of detriment to the public benefit and welfare of the City through lost employment opportunities, lost tourism and loss of revenue, both directly and indirectly, the Developer shall pay the City, during the Damage Period, as hereinafter defined, and the City shall accept as an exclusive remedy, as liquidated damages and as a reasonable forecast of such potential damages, and not as penalties, the following sums:

1. For an Event of Default under Section VIII.A.1 of this Agreement, the amount outstanding plus interest at a rate of eighteen percent (18%) per annum for the first thirty (30) days then the sum of Eighty-Eight Thousand Dollars ($88,000.00) per calendar day for each day in the Damage Period after the thirtieth (30th) day.

2. For an Event of Default under Section VIII.A.13, Section VIII.A.14 or Section VIII.A.15 of this Agreement; the sum of Fifty-Five Thousand Dollars ($55,000.00) per calendar day.

3. For all other Events of Default set forth in Section VIII.A. of this Agreement, the sum of up to Twenty-Five Thousand Dollars ($25,000.00) per calendar day, such amount to be set at the City's sole discretion.

The Developer agrees to waive any and all affirmative defenses that the amount of liquidated damages provided herein constitutes a penalty. For purposes of this Section, the "Damage Period" shall commence on the date the City delivers written notice to the Developer of its election to receive liquidated damages pursuant to this Section and shall continue until the date the Event of Default is cured. No liquidated damages under this Section shall be payable following the expiration of the Developer's Category 1 License at the end of the original fifteen (15) year term. To the extent the Developer fails to pay the liquidated damages due under this Section within five (5) days after a request by the City, notwithstanding anything to the contrary in this Agreement, the City shall be permitted to draw down on the applicable Letters of Credit to satisfy this payment obligation.

IX. LETTERS OF CREDIT

Pursuant to Section 10(a) of the Act and 205 CMR 122.05, if the Developer is issued a Category 1 License by the Commission, the Developer is required to either deposit ten percent (10%) of the Developer's proposed capital investment in the Project in an interest-bearing escrow account or, at the Commission's discretion, obtain a deposit bond insuring ten percent (10%) of the proposed capital investment. In the event the Developer is unable to complete the gaming establishment, the deposit or deposit bond would be forfeited to the Commonwealth in accordance with the Act.

In addition, to secure the Developer's obligations under this Agreement during the construction phase of the Project, including, without limitation, all payments to the City due before the Full Build-Out Operations Commencement Date and all liquidated damages that may be due hereunder, within thirty (30) days after the issuance of the Category 1 License to the Developer, the Developer shall deliver to the City an original irrevocable standby letter of credit issued by a major money center bank located within the United States reasonably acceptable to the City in the initial sum of Twenty Million Dollars ($20,000,000.00)(the "Construction Letter of Credit"). The Construction Letter of Credit shall be issued in accordance with, and subject to, the International Standby Practices (ISP98) International Chamber of Commerce Publication No. 590 and the rules of the Uniform Customs and Practice for Documentary Credits (1993 Revision), International Chamber of Commerce Publication No. 500, as most recently published and/or updated by the International Chamber of Commerce, or any successor code of standby letter of credit practices generally adopted by the issuing bank as may be in effect at the time of issuance (the "Letter of Credit Standards").

In addition, to secure the Developer's obligations under this Agreement, including, without limitation, payments of the Annual Host Community Agreement Fee, any liquidated damages due hereunder, and to pay for any losses incurred by the City as a result of an Event of Default by the Developer, prior to the issuance of and as a condition to the issuance of the final Certificate of Occupancy by the City's Inspectional Services Department for the Full Build-Out Component of the Project, (i) the Developer shall deliver to the City an original irrevocable standby letter of credit issued by a major money center bank located within the United States reasonably acceptable to the City in the initial sum of Twenty Million Dollars ($20,000,000.00) (the "Host Community Agreement Letter of Credit," and together with the Construction Letter of Credit, the "Letters of Credit"), and (ii) the Construction Letter of Credit shall promptly be returned by the City to the Developer or the Authorized Lender. For the purpose of clarity, the City shall not be permitted to draw on the Construction Letter of Credit once the City has received the Host Community Agreement Letter of Credit from the Developer. The Host Community Agreement Letter of Credit shall be issued in accordance with the Letter of Credit Standards.

The Letters of Credit shall be in form and substance acceptable to the City in accordance with the Letter of Credit Standards set forth above. The Letters of Credit shall automatically renew. The Developer shall be obligated to maintain the Host Community Agreement Letter of Credit for the Term of the Agreement.

During the Term, the Letters of Credit shall be renewed or replaced prior to expiry with either a renewal of the then current Letter(s) of Credit or with a replacement Letter(s) of Credit satisfying the other requirements of this Section, in either case extending the expiry Letter(s) of Credit for at least twelve (12) months. At least forty-five (45) days prior to the expiration of the then-current Letter(s) of Credit, the Developer shall notify the City in writing of its intention to deliver original renewal or replacement Letters of Credit. The Developer shall deliver original renewal or replacement Letter(s) of Credit to the City at least thirty (30) days prior to expiration of the then current Letter(s) of Credit. If a satisfactory renewal or replacement Letter(s) of Credit has not been delivered to the City at least thirty (30) days prior to the expiration of the then current Letter(s) of Credit, the City shall be entitled to draw on the then existing Letter(s) of Credit and shall hold the funds in escrow until such time as a replacement Letter(s) of Credit has

been provided to the City. The provisions of this Section shall survive the termination or expiration of this Agreement.

X. COVENANTS OF THE DEVELOPER

A. Affirmative Covenants of the Developer. The Developer covenants that throughout the Term, the Developer shall:

1. Do or cause to be done all things necessary to preserve, renew and keep in full force and effect its legal existence.

2. Do or cause to be done all things necessary to preserve, renew and keep in full force and effect the Approvals and the Category 1 License, and comply with all Governmental Requirements applicable to the operation of its business and other activities, in all material respects, whether now in effect or hereafter enacted.

3. Furnish to the City:

a) Within one hundred five (105) days after the end of each Casino Year of the Developer commencing with the Casino Year in which the Early Opening Operations Commencement Date occurs, annual financial statements, balance sheets and statements of operations, owners' equity and cash flows of the Developer and the Project showing the financial condition and operation of the Developer and the Project as of the close of such year and the results of operations during such year, all of the consolidated financial statements to be audited by a firm of independent certified public accountants of recognized national standing acceptable to the City and accompanied by an opinion of such accountants without material exceptions or qualifications.

b) Within forty-five (45) days after the end of each fiscal quarter of the Developer commencing with the fiscal quarter in which the Early Opening Operations Commencement Date occurs, financial statements (including balance sheets and statements of cash flow and operations) showing the financial condition and results of operations of the Developer and the Project as of the end of each such fiscal quarter and for the then elapsed portion of the current fiscal year, accompanied by a certificate of an officer of the Developer that such financial statements have been prepared in accordance with GAAP, consistently applied, to the extent applicable.

c) Promptly upon the receipt thereof, copies of all reports, if any, submitted to the Developer by independent certified public accountants in connection with each annual, interim or special audit or review of the financial statements of the Developer and the Project made by such accountants, including any comment letter submitted by such accountants to management in connection with such review.

d) Simultaneous with its submission to the Commission, accurate, complete and certified copies of reports submitted pursuant to Sections 21(a)(10), 21(a)(12), 21(a)(15), 21(a)(23), 21(a)(24), 23(a) and 28(b) of the Act.

e) Simultaneous with its submission, full and complete copies of any and all applications by the Developer for LEED certifications, as more particularly described in Exhibit H of this Agreement.

f) Simultaneous with its submission or receipt, full and complete copies of all applications, permits, approvals, licenses and correspondence regarding the sale or consumption of alcohol at the Project.

g) Within one hundred five (105) days of the end of each Casino Year, a statement as to whether the Developer is aware of any noncompliance with the radius restriction set forth in Section III.U.

h) Beginning at the Full Build-Out Operations Commencement Date and every two (2) years thereafter, the Developer shall deliver a report to the City and the Gaming Accountability Office that (i) evaluates the effectiveness of mitigation measures implemented by the Developer in any Approvals including, without limitation, a comparison of actual vehicle trips to and from the Project compared to projected vehicle trips and the effectiveness of the transportation improvements listed in Exhibit E, (ii) provides information regarding and evaluates the effectiveness of environmental and sustainability measures and commitments made in this Agreement, including, without limitation, greenhouse gas emissions, energy use of the Project broken down by source, on-site energy generation, use of alternative transportation by employees, visitors and customers broken down by type of transportation used, water use and stormwater compliance initiatives, waste and recycling initiatives, local food provisions and all other provisions in Exhibit H, (iii) provides an assessment of the impacts of the Project on housing and school population, and (iv) details the Developer's compliance with all of its other obligations under this Agreement, including, without limitation, the required square footage of Gaming Areas set forth in Section III.A., the First Class Project Standards in Section III.B., the operations requirements in Section III.E., the minimum number of permanent and construction jobs and the average annual salary of employees identified in Section III.M. as well as the plans and commitments in Exhibit I-1, Exhibit I-2 and Exhibit I-3, the local business, purchasing and economic development requirements in Section III.N., the slot machine purchasing obligations in Section III.R., the smoke-free provisions in Section III.V. and the construction management plan in Section III.W.

i) From time to time, such other information regarding the compliance by the Developer with the terms of this Agreement or the affairs, operations or condition (financial or otherwise) of the Developer and the Project or as the City may reasonably request.

j) Prompt written notice of the following (but in no event later than five (5) business days following the actual knowledge thereof by the Developer):

(1) The issuance by any Governmental Authority of any injunction, order, decision, notice of violation or deficiency, asserting a violation of Governmental Requirements applicable to the Developer or the Project, together with copies of all relevant documentation;

(2) The issuance by any Mortgagee or other Person providing Financing to the Developer of a letter, notice or other document alleging a default, event of default or failure to comply with the terms of a Financing, together with copies of all relevant documentation;

(3) The notice, filing or commencement of or any threatened notice, filing or commencement of, any action, suit or proceeding by or against the Developer whether at law or in equity or by or before any court or any Governmental Authority that pertains in any way to the Project;

(4) Any default or Event of Default by the Developer under this Agreement, specifying the nature and extent of the default or Event of Default and the action (if any) that is proposed to be taken by the Developer;

(5) Any Transfer or proposed Transfer under Article VII; and

(6) Any development in the business or affairs of the Developer that could reasonably be expected to have a Material Adverse Effect.

4. Maintain financial records in accordance with GAAP, or the equivalent thereof, and permit an authorized representative designated by the City during normal business hours to visit, inspect and audit the properties and financial records and to make extracts from such financial records, all at the Developer's reasonable expense, and permit any authorized representative designated by the City to discuss the affairs, finances and conditions of the Developer with any executive officer or other manager or officer of the Developer or the Casino and the Developer's independent public accountants, all as such representative of the City shall reasonably deem appropriate.

5. Make or cause to be made, annual capital expenditures to the Project consistent with Section 21(a)(4) of the Act.

B. RFA-2 Response. The Developer shall:

1. Promptly, completely and accurately submit to the Commission its completed response to the Commission's RFA-2 (the "RFA-2 Response"), all other information as the Commission may from time to time require from the Developer in connection with its application for a Category 1 License, make all payments required under the Act to be made by an applicant for a Category 1 License and use its best efforts to satisfy all criteria necessary to be issued a Category 1 License by the Commission;

2. Furnish to the City a copy of the RFA-2 Response simultaneous with or immediately following its submission to the Commission and reasonably consult with the City in advance of such submission, as to its content;

3. Consult with the City prior to making any formal presentation to the Commission concerning its RFA-2 Response; and

4. Prior to the Commission issuing a Category 1 License to the Developer, keep the City informed as to all material contacts and communications between the Commission and its staff and the Developer so as to enable the City to evaluate the likelihood and timing of the Commission issuing a Category 1 License to the Developer.

C. Negative Covenant of the Developer. The Developer covenants that throughout the Term, the Developer shall not declare or pay and dividends, payments or distributions to any members or shareholders of the Developer upon the occurrence of an Event of Default under Sections VIII.A.1 through Section VIII.A.7, Section VIII.A.10, Section VIII.A.12 or Sections VIII.A.13 through Section VIII.A.16 until such Event of Default is cured.

D. Confidentiality of Deliveries. To the extent that the Act, other laws of the Commonwealth or any other Governmental Requirements, in the reasonable opinion of the City's Corporation Counsel, allow confidential treatment of items Developer is obligated to furnish to the City under Sections X.A.3(a), (b), (c), (d), (j)(1), (j)(2), (j)(3), (j)(5) and (j)(6) and Section X.B.2., the City agrees to keep such items confidential (for so long as they are entitled to confidential treatment) and shall not disclose them except (i) to such City officials and consultants on a need-to-know basis; and/or (ii) pursuant to a court order. Further, to the extent that the Developer requests confidential treatment of any documentation or information required to be provided to the City under this Agreement, and such documentation and information may be protected from disclosure by the City under applicable law, the City shall maintain such documentation and information confidential to the extent permitted by applicable law. The City may agree to undertake an in person review and inspection of any such confidential information as a means of reviewing the information provided by Developer in accordance with its obligations under this Article X.

XI. REPRESENTATIONS AND WARRANTIES

A. Representations and Warranties of the Developer. The Developer represents and warrants that:

1. The Developer is a duly formed limited liability company organized under the laws of the Commonwealth of Massachusetts and is in good standing and qualified to do business under the laws of the Commonwealth of Massachusetts;

2. The Developer has taken all actions required by law to approve the execution of this Agreement;

3. The Developer's entry into this Agreement and/or the performance of the Developer's obligations under this Agreement do not violate any contract, agreement or other legal obligation of the Developer;

4. The Developer's entry into this Agreement and/or the performance of the Developer's obligations under this Agreement do not constitute a violation of any state or federal statute or judicial decision to which the Developer is subject;

5. There are no pending lawsuits or other actions or proceedings which would prevent or impair the timely performance of the Developer's obligations under this Agreement;

6. The Developer has the legal right, power, and authority to enter into this Agreement and to consummate the obligations contemplated hereby, and the execution, delivery and performance of this Agreement have been duly authorized and no other action by the Developer is requisite to the valid and binding execution, delivery, and performance of this Agreement, except as otherwise expressly set forth herein, and this Agreement is enforceable against the Developer;

7. The individual executing this Agreement on behalf of the Developer is authorized to execute this Agreement on behalf of the Developer; and

8. This Agreement is binding on the Developer and is enforceable against the Developer in accordance with its terms, subject to applicable principles of contract, equity and insolvency laws.

B. Representations and Warranties of the City. The City represents and warrants that:

1. The City is a validly existing municipal corporation and has all requisite power and authority to enter into and perform its obligations under this Agreement, and all other agreements and undertakings to be entered into by the City in connection herewith;

2. This Agreement is binding on the City and is enforceable against the City in accordance with its terms, subject to applicable principles of equity and insolvency laws;

3. The City's entry into this Agreement and/or the performance of the City's obligations under this Agreement do not violate any contract, agreement or other legal obligation of the City;

4. The City's entry into this Agreement and/or the performance of the City's obligations under this Agreement do not constitute a violation of any state or federal statute or judicial decision to which the City is subject;

5. There are no pending lawsuits or other actions or proceedings which would prevent or impair the timely performance of the City's obligations under this Agreement; and

6. The individual executing this Agreement on behalf of the City is authorized to execute this Agreement on behalf of the City.

XII. INSURANCE AND INDEMNITIES

A. Insurance.

1. The Developer shall maintain in full force and effect the types and amounts of insurance as set forth below, and to the extent permissible under Governmental Requirements, the City shall be named as an additional insured under each policy. The Developer shall be responsible for all deductibles related to such insurance. In addition, the City may require commercially reasonable increases in all insurance coverage amounts from time to time as may be appropriate for projects of similar size and complexity.

Type of Coverage	**Requirements**
Commercial General Liability (occurrence form)	Coverage shall include products liability, completed operations, liquor liability, garagekeepers legal liability, damage to rented premises, personal and advertising injury and blanket contractual injury. The policy shall have limits of at least $1,000,000 per occurrence and $2,000,000 per location aggregate for property damage and bodily injury.
Automobile Liability Insurance	$1,000,000 combined single limit coverage each accident. This policy shall include coverage for loss due to bodily injury or death of any person, or property damage arising out of the ownership, maintenance, operation or use of any motor vehicle whether owned, non-owned, hired or leased.

Workers' Compensation Insurance	Limits as required by statue in the Commonwealth covering all of the Developer's personnel performing work or services in connection with the Project.
Employers' Liability Insurance	$1,000,000 each accident and each employee for disease.
Umbrella and/or Excess Liability Insurance	$300,000,000 each occurrence/aggregate.
Pollution Legal Liability Insurance	$5,000,000 each occurrence/aggregate. This policy shall provide coverage for third-party bodily injury, property damage, cleanup costs and defense costs that arise in connection with the Project.

2. Prior to undertaking any activities on the Property, the Developer and any of its Authorized Representatives shall first provide the City certificates of insurance evidencing all insurance policies that the Developer and its Authorized Representatives (including, without limitation, any architects, engineers, general contractors, subcontractors, and consultants) are required to carry hereunder. All such certificates of insurance shall confirm the specific coverage requirements stated above and shall unequivocally state that should any of the above-described policies lapse, be materially changed, or by cancelled before the expiration date thereof, the issuing insurer shall provide thirty (30) days written notice to the City.

3. All policies of insurance referred to herein shall be written in a form that is reasonably acceptable to the City (acting through the Mayor) and by companies that are authorized to do business in the Commonwealth and having a financial strength rating by A.M. Best Company, Inc. of not less than "A-" or its equivalent from another recognized rating agency. The City (acting through the Mayor), in its sole discretion, may waive or modify one or more of the foregoing insurance requirements if the same are not available on commercially reasonably terms. All policies of insurance shall provide that any act or negligence of the Developer shall not prejudice the rights of the City as a party insured under said policies. If requested by the City in writing, the Developer shall furnish the City with certified copies of the insurance policies required hereunder.

B. Policies Non-Cancelable. The Developer agrees that all policies of insurance referred to herein shall not be canceled or allowed to lapse nor shall any material change be made in any such policy which changes, restricts or reduces the insurance provided, nor shall there be a change in the name of the insured, without first giving thirty (30) days notice in writing to the City.

C. Keep in Good Standing. The Developer shall observe and comply with the requirements of all policies of public liability, fire and other policies of insurance at any time in force with respect to the Project and the Developer shall so perform and satisfy the requirements of the companies writing such policies.

D. Waiver of Subrogation. The Developer hereby waives all rights of recovery against the City and its Authorized Representatives on account of loss or damage to the Property, and to the extent that the Developer obtains an insurance policy for such loss or damage, the Developer shall cause such policy to be endorsed to waive the insurer's rights of subrogation against the City and its Authorized Representatives.

E. Indemnity. The Developer, at its sole cost and expense, shall defend and shall indemnify and hold harmless the City and its Authorized Representatives from and against all loss, cost, damage, and expense, including claims for bodily injury and property damage, which are incurred or suffered by any one or more of them (a) based upon or arising out of the gross negligence or willful misconduct of the Developer, or any of the Developer's Authorized Representatives in the performance of any activity, undertaking or obligation arising out of this Agreement, or (b) based upon or arising out of any breach of or default under this Agreement by the Developer; provided, however, that the Developer shall not be liable for any losses to the extent caused by the gross negligence or willful misconduct of any one or more of the City or its Authorized Representatives. The foregoing express obligation of indemnification shall not be construed to negate or abridge any other obligation of indemnification running to the City which would exist at common law or under other provisions of this Agreement, and the extent of the obligation of indemnification shall not be limited by any provision of insurance undertaken in accordance with this Agreement. This indemnification shall survive the termination of this Agreement.

XIII. DAMAGE OR DESTRUCTION; CONDEMNATION

A. Damage or Destruction. In the event of damage to or destruction of improvements at the Project or any part thereof by fire, casualty or otherwise, the Developer, at its sole expense and whether or not the insurance proceeds, if any, shall be sufficient therefor, shall promptly repair, restore, replace and rebuild (collectively, "Restore") the improvements, as nearly as possible to the same condition that existed prior to such damage or destruction using materials of an equal or superior quality to those existing in the improvements prior to such casualty. All work required to be performed in connection with such restoration and repair is hereinafter called the "Restoration." The Developer shall obtain a permanent certificate of occupancy as soon as practicable after the completion of such Restoration. If neither the Developer nor any Mortgagee shall commence the Restoration of the improvements or the portion thereof damaged or destroyed promptly following such damage or destruction and adjustment of its insurance proceeds, or, having so commenced such Restoration, shall fail to proceed to complete the same with reasonable diligence in accordance with the terms of this Agreement, the City may, but shall have no obligation to, complete such Restoration at the Developer's expense. Upon the City's election to so complete the Restoration, the Developer immediately shall permit the City to utilize all insurance proceeds which shall have been received by the Developer, minus those amounts, if any, which the Developer shall have applied to the Restoration, and if such sums are insufficient to complete the Restoration, the Developer,

on demand, shall pay the deficiency to the City. Each Restoration shall be done subject to the provisions of this Agreement.

B. Use of Insurance Proceeds.

1. Subject to the conditions set forth below, all proceeds of casualty insurance on the improvements shall be made available to pay for the cost of Restoration if any part of the improvements are damaged or destroyed in whole or in part by fire or other casualty.

2. Promptly following any damage or destruction to the improvements by fire, casualty or otherwise, the Developer shall:

a) give written notice of such damage or destruction to the City and each Mortgagee; and

b) deliver a written notice of the Developer's intent to complete the Restoration in a reasonable amount of time plus periods of time as performance by the Developer is prevented by Force Majeure events (other than financial inability) after occurrence of the fire or casualty.

3. The Developer agrees to provide monthly written updates to the City summarizing the progress of any Restoration, including but not limited, anticipated dates for the opening of the damaged areas to the public, to the extent applicable.

4. The Developer shall have no notification requirements to the City for any Restoration having a value less than Fifty Million Dollars ($50,000,000) in the aggregate.

C. No Termination. Except as expressly provided herein, no destruction of or damage to the Project, or any portion thereof or property therein by fire, flood or other casualty, whether such damage or destruction be partial or total, shall permit the Developer to terminate this Agreement or relieve the Developer from its obligations hereunder.

D. Condemnation. If a Major Condemnation occurs, this Agreement shall terminate, and no Party shall have any claims, rights, obligations, or liabilities towards any other Party arising after termination, other than as provided for herein. If a Minor Condemnation occurs or the use or occupancy of the Project or any part thereof is temporarily requisitioned by a civil or military governmental authority, then (a) this Agreement shall continue in full force and effect, and (b) the Developer shall promptly perform all Restoration required in order to repair any physical damage to the Project caused by the Condemnation, and to restore the Project, to the extent reasonably practicable, to its condition immediately before the Condemnation.

E. Subject to Financing. In connection with a Financing, the Parties agree that the terms and conditions of this Section XIII shall be complied with in accordance with the terms and conditions set forth in Exhibit Q.

XIV. ESTOPPELS

The City (acting through the Mayor) shall, with reasonable promptness, but in no event later than thirty (30) days after receipt of a written request therefor by the Developer, any mortgagee, lessee or purchaser of all or a portion of the Project, which request has been made in connection with the closing, sale, lease or financing of the Project or any portion thereof, provide a certificate in writing in the form attached hereto as Exhibit L stating that, to the City's actual knowledge, this Agreement is in full force and effect and unmodified, or stating in what respects the Agreement is no longer in force and effect or has been modified, and whether or not the City has actual knowledge of any default under this Agreement by the Developer and, if so, in what respects.

XV. FORCE MAJEURE

A. Definition of Force Majeure. An event of "Force Majeure" shall mean the following events or circumstances, to the extent they result in a delay beyond the reasonable control of the Developer or its Authorized Representatives or otherwise result in a Material Adverse Effect on the Developer's ability to satisfy its duties and obligations under this Agreement:

1. Strikes, lockouts, boycotts, labor disputes, inability to procure labor, equipment, facilities, materials, services or supplies attributable to market-wide shortages, failure or delay of utilities or utility providers, or explosions;

2. Acts of God, tornadoes, hurricanes, floods, sinkholes, fires and other casualties, landslides, earthquakes, epidemics, quarantine and/or pestilence;

3. Acts of a public enemy, acts of war, terrorism, effects of nuclear radiation, blockades, insurrections, public disturbances, riots, civil disturbances, or local, national or international calamities;

4. Any law, act or order of a Governmental Authority, including, without limitation, any stay, temporary restraining order, preliminary injunction or permanent injunction, or mandamus or similar order, and any litigation or administrative delay, in each case which impedes the ability of the Developer to complete the Project in accordance with this Agreement, unless based materially in whole or in part on the actions or failure to act of the Developer; and

5. The failure by, or unreasonable delay of, the City or Commonwealth or other Governmental Authority to issue any permits or Approvals necessary for Developer to develop, construct, open or operate the Project by the Early Opening Operations Commencement Date or Full Build-Out Operations Commencement Date unless such failure or delay is based materially in whole or in part on the actions or failure to act of Developer, its Affiliates or its Authorized Representatives.

The Developer's lack of funds shall not be considered an event of Force Majeure.

B. Notice. The Developer shall promptly notify the City in writing of the occurrence of an event of Force Majeure, of which it has knowledge, describe in reasonable detail the nature of the event and provide a good faith estimate of the duration of any delay expected in the Developer's performance obligations.

C. Excuse of Performance. Notwithstanding any other provision of this Agreement to the contrary, the Developer shall be entitled to an adjustment in the time for or excuse of the performance of any duty or obligation of the Developer under this Agreement for Force Majeure events, but only for the number of days due to and/or resulting as a consequence of such causes and only to the extent that such occurrences actually prevent or delay the performance of such duty or obligation or cause such performance to be commercially unreasonable.

XVI. REOPENERS

The Parties acknowledge and agree that in addition to the "triggering events" for reopening an agreement set forth in 205 CMR 127.02, the Parties have voluntarily agreed to reopen and negotiate an amendment to this Agreement, as permitted under 205 CMR 127.06, for the following reasons:

A. Class A Reopener: To effectuate any Material Project Changes or any changes to this Agreement that would reduce the amount of the Upfront Community Impact Fee or Annual Host Community Agreement Fee.

B. Class B Reopener: To effectuate any Material Project Changes or any changes to this Agreement, which, in the opinion of the City in consultation with the BRA, are not or have not been effectively mitigated by the Developer.

C. Class C Reopener: To effectuate any Material Project Changes or any changes to this Agreement, which, in the opinion of the City in consultation with the BRA and following a public process, are or have been effectively mitigated by the Developer; provided, however, that in no event is such change classified as a Class A Reopener.

D. Class D Reopener: To effectuate any Material Project Changes or any changes to this Agreement to reflect changes in law, regulations or interpretations by Governmental Authorities that are or have been effectively mitigated by the Developer; provided, however, that in no event is such change classified as a Class A Reopener.

E. Class E Reopener: To incorporate changes necessitated by the terms and conditions of Approvals, including, without limitation, BRA Approvals under Article 80B and Article 53 of the Boston Zoning Code that are or have been effectively mitigated by the Developer; provided, however, that in no event is such change classified as a Class A Reopener.

F. Class F Reopener: To correct non-material terms or typographical errors; provided, however, that in no event is such change classified as a Class A Reopener or Class B Reopener.

Notwithstanding the foregoing, in order to effectuate an amendment to this Agreement that includes either a Class A Reopener or Class B Reopener (i) the Parties and any parties who must execute limited joinders shall mutually negotiate an amendment to this Agreement, (ii) the amendment shall be executed by the Parties and all other parties who must execute limited joinders, (iii) the governing body of the City shall schedule a date certain to hold an election, all in the same manner as is required by Section 15(13) of the Act, (iv) the City will make the signed agreement public with a concise summary, approved by the City's Corporation Counsel, in a periodical of general circulation and on the official website of the City not later than seven (7) days after execution until the results of the election on the amendment have been certified, all in the same manner as is required by Section 15(13) of the Act, and (v) such amendment containing a Class A Reopener or Class B Reopener shall receive a certified and binding vote in favor of the amendment on a ballot question at the election.

Notwithstanding the foregoing, in order to effectuate an amendment to this Agreement that includes only a Class C Reopener, Class D Reopener, Class E Reopener or Class F Reopener, (i) the Parties and any parties who must execute limited joinders shall mutually negotiate an amendment to this Agreement and (ii) the amendment shall be executed by the Parties and all other parties who must execute limited joinders.

No proposed changes to the Project or the Agreement shall be effective unless and until the Parties have complied with the provisions of this Article XVI. The Parties shall continue to adhere to the terms and conditions of this Agreement pending the mutual execution and delivery of any amendment to this Agreement.

XVII. MISCELLANEOUS

A. Notices. Any notice hereunder shall be in writing and shall be deemed duly given if mailed by certified or registered mail, postage and registration charges prepaid, by overnight delivery service with receipt, or by hand delivery during normal business hours, to the Parties at the addresses set forth below (or such other addresses as a party may hereafter designate for itself by notice to the other party as required hereby):

If to the City:
Mayor
City of Boston
1 City Hall Square, Suite 500
Boston, MA 02201-2013

With copies to:
City of Boston
Office of Gaming Accountability
1 City Hall Square
Boston, MA 02201-2013

If to the Developer:
Sterling Suffolk Racecourse, LLC
525 William F. McClellan Highway
East Boston, MA 02128
Attention: Chair of the Board and COO

with copies to: DLA Piper LLP
33 Arch Street, 26th Floor
Boston, MA 02110-1447
Attention: Charles A. Baker III, Esq.

Any such notice shall be effective three (3) days after mailing if sent by certified or registered mail, one (1) day after mailing if sent by overnight delivery service, or on the day of delivery if sent by hand delivery or by email.

B. Conflict of Interests; Representatives and Agents Not Individually Liable. No member, official, employee, agent, or other authorized representative of the City shall have any personal interest, direct or indirect, in this Agreement, nor shall any such member, official, employee, agent, or representative participate in any decision relating to this Agreement which affects his or her personal interests or the interests of any corporation, partnership, or association in which he or she is, directly or indirectly, interested. No member, official, employee, agent, or other authorized representative of the City shall be personally liable to the Developer, or any successor in interest, in the event of any default or breach by the City or for any amount which may become due to the Developer or its successor or on any obligations under the terms of this Agreement. No stockholder, member, indirect or direct owner, director, manager, officer, employee, agent, or other authorized representative of the Developer shall be personally liable to the City, or any successor in interest, in the event of any default or breach by the Developer or for any amount which may become due to the City or its successor or on any obligations under the terms of this Agreement.

C. No Liability for Approvals and Inspections. No approval to be made by the City under this Agreement or any inspection of the Work by the City shall render the City liable for failure to discover any defects or non-conformance with this Agreement, or a violation of or noncompliance with any federal, Commonwealth or local statute, regulation, ordinance or code.

D. Time of the Essence. All times, wherever specified herein for the performance by the Developer of its obligations hereunder, are of the essence of this Agreement.

E. Cost of Investigation. If as a result of this Agreement, the City or any of its directors or officers, the Mayor, or any City Council members, or any employee, agent, or representative of the City is required to be licensed or approved by the Commission, the reasonable, actual costs of such licensing, approval or investigation shall be paid by the Developer within thirty (30) days following receipt of a written request by the City. Any such costs shall be considered Development Process Cost Fees.

F. Disclosure and Revenue Enforcement Statements. In compliance with the provisions of M.G.L. c. 7C, § 38 relative to the filing of disclosure statements, signed under the pains and penalties of perjury, by persons who have or will have a Direct or Indirect Interest in the Property, the Developer shall furnish to the City, prior to the City or the BRA taking any action with respect to any Approvals, evidence of the filing of a signed statement in the form attached hereto as Exhibit M with the Commissioner of the Commonwealth of Massachusetts Division of Capital Asset Management and Maintenance, and shall update the same annually on January 1 of each year and promptly following any permitted Transfer as provided in Article VII

hereof. Pursuant to M.G.L. c. 62C, § 49A, the Developer shall furnish to the City, simultaneously with the execution and delivery of this Agreement, a signed statement in the form attached hereto as Exhibit N as required by applicable law and shall update the same annually on January 1 of each year and promptly following any permitted Transfers as provided in Article VII hereof. In addition, the Developer shall file with the City copies of all disclosures required to be made under Approvals granted by the BRA, including Approvals under Article 80B of the Boston Zoning Code.

G. Actions by the Parties; Good Faith Cooperation. When the approval of either party is required to be obtained pursuant to this Agreement, such party shall be obligated to act reasonably and in good faith, and any such approval may not be unreasonably withheld, conditioned or delayed, except as specifically provided otherwise in this Agreement. In this Agreement, when City review and/or approval is required, it will be deemed to mean the applicable City department as directed by the Mayor, unless otherwise specifically set forth herein.

H. No Partnership. No relationship between the City and the Developer of partnership or joint venture is intended to be created hereby, and any such relationship is hereby disclaimed.

I. Applicable Law. This Agreement shall be governed by and construed in accordance with the laws of the Commonwealth of Massachusetts.

J. Jurisdiction; Venue.

1. For purposes of any suit, action or proceeding involving a dispute arising under or related to this Agreement, the Parties hereby expressly submit to the jurisdiction of the United States District Court for the District of Massachusetts or the Superior Court Department of Suffolk County and the Parties agree that such courts shall have exclusive jurisdiction over any suit, action or proceeding commenced by either or both of said Parties. In furtherance of such agreement, the Parties agree upon the request of the other to discontinue (or agree to the discontinuance of) any suit, action or proceeding pending in any other jurisdiction.

2. Each party hereby irrevocably waives any objection that it may now or hereafter have to the laying of venue of any suit, action or proceeding involving a dispute arising out of or relating to this Agreement brought in any federal or state court sitting in Suffolk County in the Commonwealth of Massachusetts and hereby further irrevocably waives any claim that any such suit, action or proceeding brought in any such court has been brought in an inconvenient forum.

K. Arbitration; Dispute Resolution.

1. Alternative Process. While the Commission's regulations at 205 CMR provide for arbitration in certain circumstances, pursuant to the terms of 205 CMR 127.02, the Parties hereby acknowledge and agree that all Disputes under this Agreement, including a

Dispute regarding the reopening of this Agreement, whether specified in 205 CMR 127.02 or voluntarily agreed to in this Agreement as provided for in 205 CMR 127.06, shall be settled as set forth herein and shall not be settled expressly as set forth in 205 CMR 127.00.

2. Dispute Resolution. With respect to any Dispute, the following procedures will be implemented before any Party pursues other available remedies, except that any Party may seek injunctive relief, from a court identified in Section XVII.J. hereof, where appropriate, in order to maintain the status quo while this procedure is being followed:

a) Negotiation Amongst Representatives. The Parties will hold a meeting promptly, attended by the Developer's Authorized Representative, the City Representative and such other Persons with decision making authority regarding the Dispute, to attempt in good faith to negotiate a resolution of the Dispute; provided, however, that no such meeting will be deemed to vitiate or reduce the obligations and liabilities of the Parties or be deemed a waiver by a Party of any remedies to which such Party would otherwise be entitled hereunder. Any such meeting will be held at the principal offices of the City unless otherwise agreed to by the Parties.

b) Litigation. If, within twenty-one (21) days after such meeting (or such later date mutually acceptable to the Parties), the Parties have not succeeded in negotiating a resolution of the Dispute, then such Dispute shall be settled by a suit or proceeding in federal or state court pursuant to the provisions of this Agreement, unless the Parties mutually agree in writing to arbitration consistent with the procedures set forth in 205 CMR 127.05.

L. Severability. If any term or provision of this Agreement, or the application thereof to any person or circumstance shall, to any extent, be invalid, inoperative, or unenforceable, the remainder of this Agreement, or the application of such term or provision to persons or circumstances other than those as to which it is held invalid, inoperative or unenforceable, shall not be affected thereby; it shall not be deemed that any such invalid, inoperative or unenforceable provision affects the consideration for this Agreement; and each term and provision of this Agreement shall be valid and enforceable to the fullest extent permitted by law.

M. Entire Agreement. This Agreement integrates all of the terms and conditions mentioned herein or incidental hereto, and supersedes all negotiations or previous agreements between the Parties with respect to all or any part of the subject matter hereof. All waivers of the provisions of this Agreement must be in writing and signed by the Mayor and the Developer.

N. Exhibits; Counting of Days; Rules of Construction. The obligations of the Parties as set forth in this Agreement are subject to compliance with the terms and conditions of the Exhibits attached hereto which are incorporated herein and shall be considered a part of this Agreement. The titles or headings to the various sections of this Agreement are for convenience

of reference only, do not define or limit the contents thereof, and should be ignored in any construction thereof. When used herein, the words "he" or "she" shall have the same meaning. Unless specifically noted to the contrary, the term "day" as used in this Agreement shall mean calendar day.

Each party has cooperated in the drafting and preparation of this Agreement. Accordingly, in any action to construe this Agreement, a party's participation in such drafting shall not cause any language to be construed against it.

O. Counterparts. This Agreement may be executed in multiple counterpart originals, each of which shall constitute one and the same instrument.

P. Successors and Assigns. The provisions of this Agreement shall be binding upon, and shall inure to the benefit of, the successors and assigns of the Developer and the public body or bodies succeeding to the interests of the City, and to any subsequent grantees of any portion of the Property.

Q. Non-Discrimination. The Developer shall comply with all federal, state and municipal laws, rules, regulations and policies promoting fair employment practices or prohibiting employment discrimination and unfair labor practices and shall not discriminate in the hiring of any applicant for employment nor shall any qualified employee be demoted, discharged or otherwise subject to discrimination in the tenure, position, promotional opportunities, wages, benefits or terms and conditions of their employment because of race, color, national origin, ancestry, age, sex, religion, disability, handicap, sexual orientation or for exercising any rights afforded by law.

R. Recording. The Parties shall cooperate in recording and filing a copy of a Notice of Agreement with the Suffolk County Registry of Deeds and Suffolk County Registry District of the Land Court in the form attached hereto as Exhibit O. Upon the termination of this Agreement pursuant to Section VIII.C., the Parties shall cooperate in recording and filing a customary form of a Notice of Termination Notice of Agreement with the Suffolk County Registry of Deeds and Suffolk County Registry District of the Land Court. The costs of recording the Notice of Agreement and Notice of Termination of Notice of Agreement shall be paid by the Developer.

S. Non-Survival Upon Termination Under Certain Provisions. If this Agreement is terminated pursuant to Section VIII.C.1, Section VIII.C.2 or Section VIII.C.3 of this Agreement, then both Parties are relieved from all obligations under this Agreement, excepting the Developer's obligations regarding payment of Development Process Cost Fees and Development Dispute Cost Fees set forth in Section IV.K. of this Agreement. This provision of this Section supersedes any other provisions of this Agreement contrary thereto.

T. Mortgagee Subordination. Sterling Suffolk agrees to obtain and record with the Suffolk County Registry of Deeds and file with the Suffolk County Registry District of the Land Court a subordination agreement from all Mortgagee(s) similar in form and substance to the form attached hereto as Exhibit P. The subordination shall be recorded and filed by Sterling Suffolk immediately following the recording and filing of the Notice of Agreement set forth in Section

XVII.R but in any event within thirty-five (35) days after the issuance of a Category 1 License to the Developer by the Commission, for any existing Mortgagee as of the date of the recording of the Notice of Agreement and for all subsequent Financings.

[SIGNATURES ON FOLLOWING PAGE]

EXECUTED as a sealed instrument the day and year first above written.

APPROVED AS TO FORM:

Corporation Counsel
City of Boston

CITY OF BOSTON:

By: _____
Thomas M. Menino, Mayor
Hereunto duly authorized

DEVELOPER:

STERLING SUFFOLK RACECOURSE, LLC

By: _____
Name: William J. Mulrow
Title: Chair of the Board
Hereunto duly authorized

LIMITED JOINDERS

The undersigned Operator, BRA and Boston Public Health Commission (collectively, the "Limited Joinder Parties") join in the foregoing Agreement solely for the purpose of agreeing to the provisions of the Agreement applicable to such Limited Joinder Party that are specifically identified under each Limited Joinder Party's signature line below. The Parties acknowledge and agree that neither the execution of this joinder by the Limited Joinder Parties nor the performance of an undertaking made herein shall subject the Limited Joinder Parties to any other provisions of this Agreement.

CAESARS MASSACHUSETTS MANAGEMENT COMPANY, LLC, solely in its capacity as Operator

By: Caesars Massachusetts Acquisition Company, LLC, its sole member

By: Caesars Entertainment Operating Company, Inc., its sole member

By: _____
John W. R. Payne
President, Central Markets and Partnership Development
Hereunto duly authorized
with respect to Article I, Section III.A., Section III.C., Section III.E., Section III.H. through Section III.J., Section III.M. through Section III.V., Section III.X. through Section III.AA., Section IV.H., Section IV.J., Article VI, Article VII, Section VIII.A.3 through Section VIII.A.5, Section VIII.A.8 through Section VIII.A.12, Section VIII.A.17, Section VIII.B.i, Section VIII.B.iv, Section X.A., Section XI.A.2 through Section XI.A.8, Article XII, Article XIII, Article XV, Article XVI, Section XVII.B., Section XVII.D., Section XVII.F., Section XVII.G., Section XVII.I. through Section XVII.K., Section XVII.P. and Section XVII.Q.

BOSTON REDEVELOPMENT AUTHORITY

By: _____
Name:
Title:
Hereunto duly authorized
with respect to Sections III.G., V.A., V.B., VII, Exhibit I-2 and Exhibit I-3

BOSTON PUBLIC HEALTH COMMISSION

By: Barbara Ferrer
Name:
Title:
Hereunto duly authorized
with respect to Sections III.P., III.V., IV.A., IV.F. and IV.T

EXHIBIT A

Site Plan of Property Showing Division Line Between East Boston and Revere and Project Site Plan



Epsilon

CAESARS ENTERTAINMENT

SUFFOLK DOWNS

Aerial Locus Map
FIGURE 1-2

CAESARS RESORT AT SUFFOLK DOWNS
Boston/Revere, Massachusetts

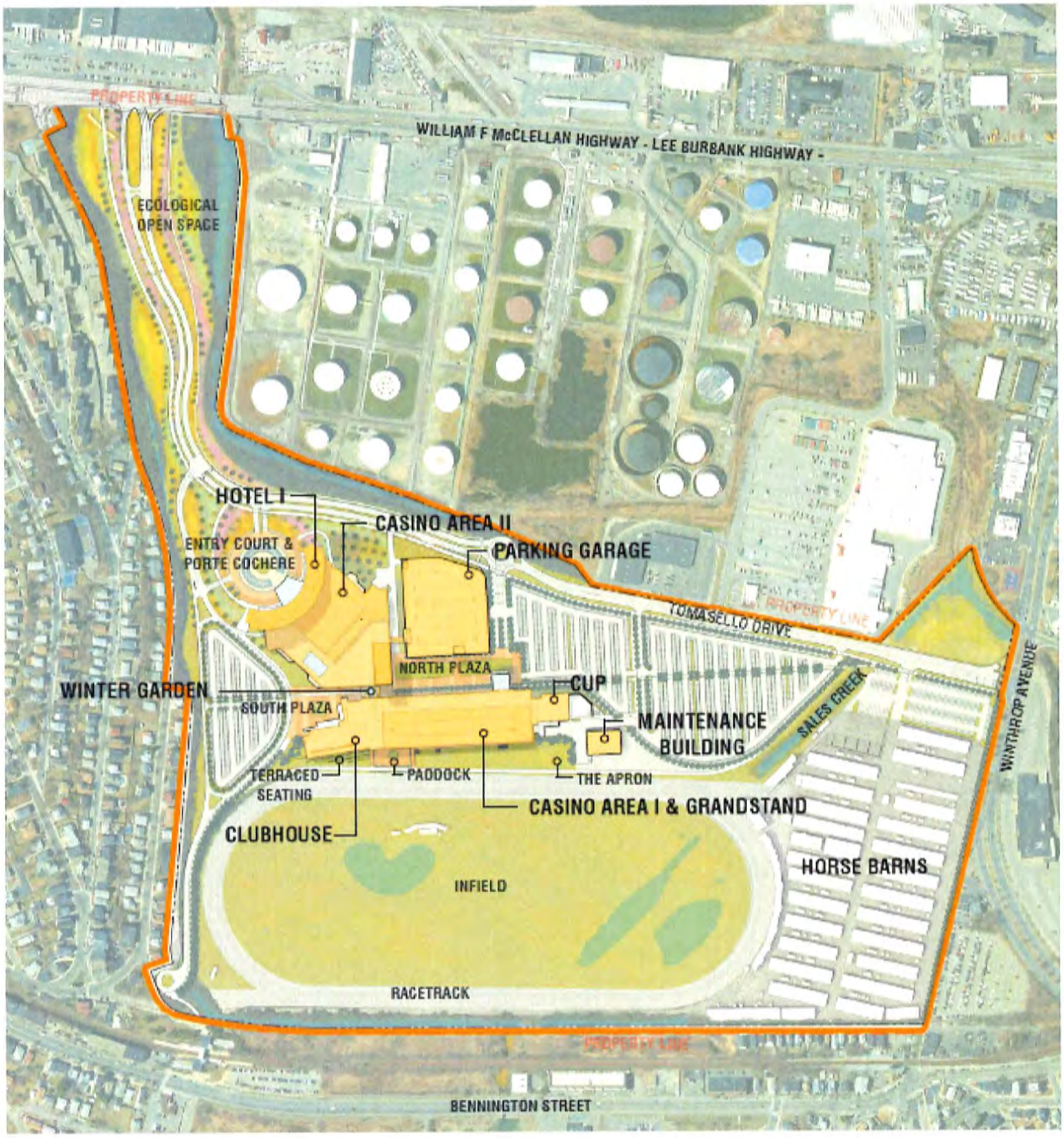

PROPERTY LINE
WILLIAM F McCLELLAN HIGHWAY - LEE BURBANK HIGHWAY -
ECOLOGICAL OPEN SPACE
HOTEL I
CASINO AREA II
ENTRY COURT & PORTE COCHERE
PARKING GARAGE
TOMASELLO DRIVE
PROPERTY LINE
NORTH PLAZA
WINTER GARDEN
SOUTH PLAZA
CUP
MAINTENANCE BUILDING
SALES CREEK
WINTHROP AVENUE
TERRACED SEATING
PADDOCK
THE APRON
CASINO AREA I & GRANDSTAND
CLUBHOUSE
HORSE BARNS
INFIELD
RACETRACK
PROPERTY LINE
BENNINGTON STREET

EXHIBIT B

Ward 1 Plan



EXHIBIT C

List of Approvals

Agency	*Permit, Review or Approval*
Federal	
U.S. Environmental Protection Agency	National Pollutant Discharge Elimination System (NPDES) Construction General Permit (if required)
Federal Aviation Administration (FAA)	Notice of Proposed Construction/Determination; Federal Airspace review
State	
Executive Office of Energy and Environmental Affairs	Massachusetts Environmental Policy Act Review (incl. Public Benefit review for landlocked tidelands)
Massachusetts Department of Environmental Protection (MassDEP)	Sewer Connection Permit Plan Approval or Environmental Results Program Certification (for stationary air pollutant sources) Demolition Permit Asbestos Removal Permit (if required) Superseding Order of Conditions (only upon appeal of local Order)
Massachusetts Office of Coastal Zone Management (CZM)	Federal Consistency Certification (if required)
Massachusetts Department of Transportation	Vehicular Access Permit(s) (Category III) Non-Vehicular Access Permit Air Space Review
Massachusetts Water Resources Authority (MWRA)	Sewer Use Discharge Permit (or waiver) Dewatering Permit (if required)
Massachusetts Gaming Commission	Category 1 Gaming License
Massachusetts Historical Commission	State Register Review
Massachusetts Department of Conservation and Recreation	Access Permit(s)
Municipal	
BOSTON	
City of Boston	Host Community Agreement
Boston Civic Design Commission	Project Review
Boston Conservation Commission	Order of Conditions
Boston Fire Department	Fuel Storage Permit
Boston Redevelopment Authority and if required Boston Zoning Commission, Boston Board of Appeal and Assessing Department	Applicable Zoning Relief and Project Review in accordance with the terms of Articles 6, 7, 37, 53 and 80 of the Boston Zoning Code. c.121A Approvals (if applicable)
Boston Water and Sewer Commission	Local Sewer Connection Permit and Site Plan Approval Drainage Discharge Permit, if required
Committee on Licenses	Flammable Storage License/Garage Permit
Inspectional Services Department	Building Permit

REVERE	
City of Revere	Host Community Agreement
Building Department	Building Permit
Revere City Council	Applicable Zoning Relief and Project Review to the extent required by the Revere Zoning Ordinance
Revere Conservation Commission	Flood Plain Approval Order of Conditions
Site Plan Review Committee	Site Plan Review
CHELSEA	
Chelsea Conservation Commission	Order of Conditions (off-site transportation infrastructure improvements)

EXHIBIT D

Description of Early Opening Component

Caesars Resort at Suffolk Downs is a redevelopment proposed on approximately 161 acres of land in East Boston and Revere with all major proposed construction occurring in Boston. The main access points to the site are from Route 1A to the west and Tomasello Drive as well as from Winthrop Avenue at the north end of the property. Two mass transit stops on the MBTA Blue Line (Suffolk Downs and Beachmont stations) currently serve the Project site. The property is currently home to Suffolk Downs, which opened in 1935 and remains New England's only operating thoroughbred racetrack.

Caesars Resort at Suffolk Downs provides a unique opportunity to create a world class entertainment complex located minutes from the heart of downtown Boston and Logan International Airport. The Project will be constructed in one continuous phase, although certain portions of the Resort—described as Early Opening below—will open to the public before the Full Build is complete. As described below, the Project program includes two distinct casino gaming areas (referred to herein as Casino Area I and Casino Area II), two hotels, multi-purpose meeting/entertainment space, dedicated structured parking as well as surface parking, fine dining, retail space, and bars.

Early Opening Project Narrative

The Early Opening portion of the project, consisting of Casino Area I, will be housed on the first floor of the existing, re-purposed grandstand, link, and clubhouse buildings on the Project site. In its current design, the first floor will be a gaming floor (i.e., slot machines and table games) that will include a restaurant, sports bar, and dedicated poker room.

The second floor of the grandstand building will be re-purposed to house a Streets of Boston restaurant pavilion and back-of-house support spaces with connections to the grandstand area for racing patrons. The second floor of the adjacent link building will be re-purposed to house gaming offices and additional back-of-house support spaces. A double-bay loading dock and employee service entrance will be located on the north side of the building. Just to the north, a central utility plant will provide utility services for the entire Resort.

The existing clubhouse, attached to the grandstand building via the link building, will undergo renovations and will continue to house the horse racing program on the second and third levels. Gaming and racing components will be operated jointly and will be fully accessible to patrons.

The Early Opening Component shall include, without limitation all of the following items:

The Early Opening Component shall include, without limitation, all of the following items as shown on the Site Plan attached hereto at Exhibit A:

1. Reconstruction of the existing grandstands and clubhouse at the Property into a Gaming Area between 75,000 and 125,000 square feet with between 2,500 and 3,500 gaming positions (consisting of an evolving combination of slot machines and table games including a World Series of Poker room.

2. Between 4,000 and 6,000 square feet of meeting and entertainment space;

3. Thoroughbred racing track and simulcast betting area;

4. Between 2,000 and 2,250 parking spaces for patrons;

5. Food and beverage outlets with between 700 and 1,200 seats, including at least 6 restaurants;

6. A central utility plant; and

7. Construction of a security gate along the MBTA trolley turn around at Waldemar Avenue as well security cameras and surveillance along the Waldemar Avenue boundary of the Property and the boundaries of the Property near the Suffolk Downs MBTA station, all with a connection feed to the City. The security gate cannot be a chainlink fence and must be capable of being electronically opened by the City and its emergency personnel.

EXHIBIT E

Transportation Improvements

I. General Provisions

Terms used in this Exhibit E and not otherwise defined shall have the meaning ascribed to them in the main body of this Agreement. For purposes of this Exhibit E, "Post Opening" shall mean a date that is not later than one (1) year from the Full Build-Out Operations Commencement Date and the "Revere HCA" shall mean the Host Community Agreement entered into between Revere and the Developer.

The improvements itemized in this Exhibit E are proposed to address specific issues that have been raised by the community, the City and Revere, or by the Developer as either responding to current needs in the community or mitigating particular impacts expected on account of the Project. At this preliminary stage in the development of the Project, they are conceptual and remain subject to review by the various Governmental Authorities with jurisdiction over the improvement. Notwithstanding the preliminary nature of these improvements, the Parties have used their best judgment in articulating the specific improvements that are proposed at each location. The City and the Developer acknowledge that changes to the concepts are inevitable as design advances into the construction phase. However, the City shall approve design changes only if the modified design, in the sole discretion of the City, addresses the concern relating to the underlying community need or the Project mitigation objective.

II. Off-Site Transportation Improvements

As set forth in Section III.L of the Agreement, Developer shall spend a minimum of Forty Five Million Dollars ($45,000,000) on transportation improvements related to the Project, exclusive of land acquisition or right of way costs, including, without limitation, the following improvements. In no event shall less than Nine Million Three Hundred Twenty Thousand Dollars ($9,320,000.00) be allocated and expended in connection with transportation improvements within the City owned and maintained street and sidewalks. To the extent that the total cost of the construction and implementation of Items 3, 4, 5, 6, 7, and 8 as described below is less than said $9,320,000.00, the remaining funds shall be dedicated and expended on other transportation improvements within the City as the City, in its sole discretion, determines appropriate.

Item	Location or Type	Action(s)[1]	Completion Date	Cost
TRAFFIC CONGESTION AND SAFETY-BOSTON				
1	Route 1A Boardman to Jughandle	Construct flyover; add lanes and signals	Full Build-Out Transportation Improvement	$25,000,000
3	Bennington Street/Saratoga Street	Modify channelization, phasing and timing	Early Opening Transportation Improvement	$500,000

[1] As necessary, these actions are more fully described in the narrative that follows this chart.

4	Boardman Street/Saratoga Street	Reconfigure roundabout approaches	Early Opening Transportation Improvement	$500,000
5	Neptune Rd/Chelsea St to NB Ramp	Signal coordination, turn restrictions, islands	Early Opening Transportation Improvement	$2,500,000
6	Curtis Avenue/Route 1A	Channelization, signage	Early Opening Transportation Improvement	$1,100,000
7	Boardman Street/Ashley Street	Reconstruction of intersection	Early Opening Transportation Improvement	$720,000
8	Contingency Fund	Create Contingency Fund	Early Opening Transportation Improvement	See narrative below
TRAFFIC CONGESTION AND SAFETY-REVERE*				
9	Route 1/Route 16	Ramp connection improvements	As per Revere HCA	$2,100,000
10	Route 1/Route 16	Develop long-range plan for intersection improvements (feasibility study)	As per Revere HCA	$400,000
11	Route 16/Route 145/Harris Street	Add turn lanes, pedestrian accommodations, islands	As per Revere HCA	$1,600,000
12	Donnelly Square	Channelization, pedestrian access., timing	As per Revere HCA	$860,000
13	North Shore Rd/RBP/Tomasello Drive	Island, pedestrian accommodations, timing	As per Revere HCA	$1,000,000
14	Mahoney (Bell) Circle	Fund channelization, pedestrian access., timing, signs	As per Revere HCA	$400,000
15	Brown Circle	Fund signs, markings and channelization	As per Revere HCA	$200,000
16	Route 60/Revere Street	Fund detection, curbing and pedestrian accommodations	As per Revere HCA	$680,000
17	Copeland Circle/Route 1	Coordination w/MassDOT re: long-range plans	Post Opening	
ALTERNATIVE MODES				

23	Blue Line Access	Provide walkway to SD Station	Early Opening Transportation Improvement	$430,000 for Items 23 and 27]
24	Blue Line Access	Upgrade sidewalks to Beachmont along Winthrop Street	Early Opening Transportation Improvement	
25	Blue Line Access	Construct Suffolk Downs station upgrades	Full Build-Out Transportation Improvement	$3,000,000
27	Bus Access	Provide bus stops and shelters on site	Early Opening Transportation Improvement	See Item 23 above.
29	Bicycle Access	Provide bike lanes on Bennington Street	Early Opening Transportation Improvement	$140,000
31	Bicycle Access	Provide bike share parking	Early Opening Transportation Improvement	$114,000

* To the extent that items 9 through 16 above are not completed prior to the Full Build-Out Operations Commencement Date, the Developer will work with the City to design and implement interim solutions to mitigate the adverse traffic impacts in the City between the Full Build-Out Operations Commencement Date and the date of completion of such improvements per the Revere HCA.

Narrative Description of Off-Site Transportation Improvements

Item 1 - Route 1A/Boardman to Jughandle

Four intersections are treated as one in the proposed Resort construction program. The proposed improvements include construction of a northbound Route 1A overpass bridging the Boardman Street intersection, meeting grade to the south of Waldemar Avenue. At Waldemar Avenue, a traffic signal would be installed allowing controlled movement between the Route 1A northbound through movement from the overpass and vehicles on an adjacent northbound frontage road serving vehicles proceeding northbound from the Boardman Street corridor. The Route 1A corridor width approaching this traffic signal would be five lanes, one of which would be set for movement to Waldemar Avenue. Continuing northbound, the intersection of Tomasello Drive (a private way) and Route 1A would be signalized with four northbound lanes provided, one of which will be for right turns into Tomasello Drive. The three remaining lanes will continue northerly several hundred feet through an upgraded traffic signal referred to as the "Jughandle" (at or near the Boston/Revere City Line) where the existing traffic signal would be upgraded and then the third lane would be dropped, tapering the existing two northbound lanes north of the Jughandle in Revere. Southbound, two through lanes would be maintained approaching the Jughandle, and extend through the Tomasello Drive intersection. Two additional left turn only lanes would be added approaching Tomasello Drive for access to the

Resort at Suffolk Downs. The Route 1A SB corridor would then be widened to three through lanes from Tomasello Drive southerly to and through the Boardman Street intersection, extending for a distance several hundred feet beyond the Boardman Street intersection and then taper to two lanes. A fourth lane will be provided approaching Boardman Street for left turns under the flyover to access Orient Heights and U-turns on the southbound approach to the new northbound frontage road.

All of the associated widening required for this work will be completed on the easterly side of the Route 1A corridor. Boardman Street westbound will be widened to allow for three lanes to approach Route 1A, consistent with the proposal advanced as part of the proposed hotel development at the intersection of Route 1A and Boardman Street. Waldemar Avenue will be maintained as one lane in each direction. Tomasello Drive will be widened to provide two lanes departing from Route 1A (entering the Resort), and four lanes approaching Route 1A (exiting the Resort - three for left turns and one for right turns). This plan is subject to the approval of MassDOT, City of Boston Transportation Department (BTD) and the City of Boston Public Improvement Commission (PIC).

Item 3 - Bennington Street/Saratoga Street

The base design used for improvements at this location is to improve pedestrian conditions and to upgrade signal operations. At the intersection, the installation of a traffic island in the southwest quadrant and redirection of crosswalks for both the Bennington and Saratoga crossings is proposed, providing a compliant curb ramp for the Bennington Street cross in the southeast quadrant, lane use changes on the northbound Bennington Street approach (one right only and one through left), and median removal and median removal/relocation on the northerly leg of Bennington Street to allow a three lane SB approach (two through and one left), with one through lane NB. Signal phasing modifications are also proposed with minor support relocations. As part of this intersection work, improvements will be made to the Saratoga Street pedestrian crossing in the Barnes Avenue/Bayswater Street triangle area to provide a pedestrian warning beacon system and compliant crossing ramps. The base design concept assumes the City of Boston has all of the right of way necessary to make these improvements. This work is subject to the approval of BTD and PIC.

Item 4 - Boardman Street/Saratoga Street

The basic concept of a traffic circle has been maintained within this intersection with the 11 year old geometry upgraded to a more standard roundabout design. The circle diameter would be increased and splitter islands added where roadway widths permit. The curb line along the easterly side of Saratoga Street would be modified to significantly reduce the pavement area and the reclaimed roadway would be used for parking adjacent to the Saratoga Street residences. Pedestrian crossings would be relocated and generally pass through the splitter islands where available. The base design cost assumes that the City of Boston has all of the right of way necessary to make these improvements. This work is subject to the approval of BTD and PIC.

Item 5 - Neptune Rd/Chelsea St to NB Route 1A Ramp off-ramp

This corridor has been split in two areas for the proposed improvement plan. The westerly section extends from Chelsea Street to Bremen Street, and the easterly section extends from Bremen Street to Frankfort Street.

Within the westerly section, the plan creates a one-way couplet with Saratoga Street providing a one-way SB corridor from Bremen Street to Neptune Road and Bremen Street one way NB from Neptune Road to Saratoga Street. The curb line on the southeast corner of Chelsea Street and Saratoga Street would be modified (pavement area reduced) and a median would be added on Neptune Road from Chelsea Street to Bremen Street where two lanes would be provided – one left turn and one lane continuing to Bennington Street. Based on traffic count evaluation, provide stop control on Neptune Road only or multi-way stop control on all approaches. Given geometric concerns and heavy truck activity, traffic signal control is not a viable option. The base design concept assumes that the City of Boston has all of the right of way necessary to make these improvements. Approvals are required from BTD and PIC. A neighborhood review process is also anticipated.

Within the easterly section the plan developed looks to increase capacity at the intersection by splitting the function of the overall intersection with the elimination of the westbound Neptune movement between the Route 1A NB ramps and Bennington Street. All traffic from the ramp (except the U-turn to Route 1A SB) and from Frankfort Street would be directed to Vienna Road and then allowed to access Bennington Street northbound and southbound via a new traffic signal and median break. Removal of the westbound movement from the Bennington Street intersection will allow increased time for the Bennington Street southbound phase, accommodating both the existing demand and the redirected movement from the closed link. The base design concept assumes that the City of Boston has all of the right of way necessary to make these improvements. Approvals are required from BTD, PIC, MassDOT and MassPort. A neighborhood review process is also anticipated.

Item 6 - Route 1A SB at Curtis Street

A proposal to realign Route 1A SB has been developed in response to the request for improvements to this intersection. The realignment is intended to create an "exit" from Route 1A SB to the Curtis Street area rather than the wide pavement area that currently exists. The relocation would be into a grass and tree area within the Route 1A median and provide for two continuous lanes for the southbound through movement. An island would be created within the current paved area of the exiting movement and through movement. Movement from the newly created ramp would intersect with the Curtis Street movement under single or multi-way stop control (to be evaluated) and the movement from the Curtis Street corridor onto Route 1A southbound would be in a free-flow condition to the third lane available south of the interchange area. The base design concept assumes that all work will be completed within the State Highway layout and that no right of way acquisition is necessary to make these improvements. This work is subject to the approval of MassDOT, BTD and PIC.

Item 7 - Improvements at Boardman Street and Ashley Street

The objective of this intersection improvement is to improve safety for pedestrian travel along the north side of Boardman Street. Ashley Street presently meets Boardman Street from the north at a very flat angle such that the Ashley Street opening is approximately 250 feet wide.

"Squaring up" of the intersection is proposed to significantly narrow the width of this opening. The conceptual plan would realign the northern curb line along Ashley Street to meet Boardman Street at a 90-degree angle closing the Ashley Street opening and shortening the pedestrian crossing to approximately 30 feet. To the west of the new intersection location the curb line would be moved to the south to parallel the Boardman Street travelway. Existing driveways on this segment would be extended to meet Boardman Street. Drainage systems would be redesigned to be compatible with the new street layout and new landscaping would be added. The design concept assumes the City of Boston has all of the right of way necessary to make these improvements. The design will be developed with community input and final design is subject to the approval of the City of Boston.

Item 8 – Contingency Fund

The Developer shall post a bond payable to the City of Boston in the amount of Four Million Five Hundred Thousand Dollars ($4,500,000.00) which is equal to ten percent (10%) of the costs for all transportation improvements listed in Section II of this Exhibit E, which the City may use to address unforeseen roadway capacity and safety issues. The funds could be used to modify to the above roadway improvements and/or address new locations to the extent that the issues identified may be attributable all or in part to the casino resort project. Funds that have not been expended within six (6) years of the Full Build-Out Operations Commencement Date will be returned to the applicant.

Item 9 - Route 1/Route 16:

The Developer represents and warrants that the Revere HCA provides that the Developer will fund and cause the permitting, design and construction of, in coordination with state and municipal agencies, and in consultation with the City of Revere, intermediate geometric improvements and new signalizations at this interchange.

The improvements are intended to provide missing movements to an important regional highway access point. Under existing conditions, access from Route 1 SB to Route 16 EB and from Route 16 WB to Route 1 NB are not provided, and there is redundant ramp access from Route 16 WB to Route 1 SB provided less than 1,500 feet from the existing interchange, or approximately 600 feet west of Webster Avenue. The proposed build condition would include closure of the Route 16 WB access to Route 1 SB within the existing interchange and a diversion of that movement farther to the west beyond Webster Avenue. The current on/off ramp configuration to and from Route 1 SB would become a four lane off ramp to Route 16 East and west with a median break on Route 16 and installation of a traffic signal. This ramp will provide the opportunity to significantly reduce left lane and left/U-turn congestion at the Route 16/Webster Street intersection. The on-ramp to Route 1 NB from Route 16 WB would be developed with a second Route 16 median break on the easterly side of Route 1 together with construction of a left turn lane, The left turn movement to Route 1 NB would be signal controlled and would tie into the existing EB to NB loop ramp through an open in-field area. Both signals would operate in two phases (Route 16 east and west and the Route 1 SB off at the off-ramp location and the eastbound through and westbound left to Route 1 NB at the second site). Note that there would be no stopping of the westbound through movement at the proposed signal to the northbound on-ramp movement. The interchange work would also include an update the Route 16, Webster Avenue, Garfield Avenue intersection, and pavement area reduction where

acceleration lanes are no longer required. The improvements are subject to the approval of DCR, MassDOT, and cities of Revere and Chelsea.

Item 10 – Route 1/Route 16 Feasibility Study

The Developer represents and warrants that the Revere HCA requires that the Developer will fund a study of Route 1/Route 16 interchange. The study will be in the nature of a long-range plan for the interchange based on a conceptual plan consistent with long range plans for interchange developed in the North Shore Transportation Study by CTPS. The plan is limited to a study of the merits of the design and does not include a full review of the environmental planning process nor final design plans.

Item 11 - Route 16/Revere Beach Parkway/Harris Street Intersection

The Developer represents and warrants that the Revere HCA requires the following work to be completed at this intersection, as follows:

The design and implementation of an optimal traffic signal timing and phasing plan, including split phasing;
Construction of two exclusive right turn lanes eastbound onto Revere Beach Parkway;
Construction of pedestrian safety improvements to allow for safe pedestrian routes from Winthrop Avenue to Revere Beach Parkway in both eastbound and westbound directions, including associated sidewalk reconstruction, curb ramps, crosswalks and median improvements; and
Installation of an emergency vehicle preemption system.

A series of improvement alternatives have been developed for this location. The common elements of each are the control of the right turn movement from Route 16 East to Winthrop Avenue (Route 145), a widening of this right turn movement from one lane to two lanes, and an associated widening of Route 16 EB to maintain the two-lane through movement toward Mahoney (Bell) Circle. Pedestrian connections will be provided in the intersection area and the traffic signal installation will be upgraded. The alternatives include maintaining Harris Street as a two-way corridor, changing to a one-way away from Winthrop Avenue, one-way to Winthrop Avenue and full closure of Winthrop Avenue at the intersection coupled with construction of a left turn lane on the Mahoney Circle to Route 16 Connector south-westbound. The improvements require City of Revere, DCR and, potentially MassDOT, approval.

Item 12 - Donnelly Square

The Developer represents and warrants that the Revere HCA requires the following work to be completed at this location, as follows:

Design and implementation of an optimal traffic signal timing and phasing plan, including split phasing, for the weekday morning, weekday evening and Saturday midday peak periods;
Redesign of the intersection to channelize traffic flow on the intersection approaches;

Construction of permanent pedestrian crosswalks with new ADA accessible ramps at all crosswalks within the Donnelly Square area;
Widening of Winthrop Avenue west of Washburn Avenue to provide for the relocation of the MBTA bus stops in the eastbound and westbound lanes, to accommodate bus turn-in lanes and to provide for two lanes on Winthrop Avenue eastbound;
Construction of aesthetic improvements within the Donnelly Square area, including new pavement markings;
Construction of landscaping improvements within the Donnelly Square area and along Winthrop Avenue leading to the Project entrance at Revere Beach Parkway and Tomasello Drive; and
Installation of an emergency vehicle preemption system.

This signal controlled intersection is adjacent to the MBTA Beachmont Station. The base improvement assumed for this site includes a signal upgrade using concurrent pedestrian crossings, extension of the Bennington Street median to the south to better control the prohibited left turn movement to a retail parking lot, and realignment of the Crescent Street approach to better manage the Bennington Street approach to Winthrop Avenue. City of Revere and MassDOT approval of the intersection work will be required. Approval of the MBTA may also be required.

Item 13 - North Shore Road/Revere Beach Parkway/Tomasello Drive Intersection

The Developer represents and warrants that the Revere HCA requires the following work to be completed at this location, as follows:

Design and implementation of an optimal traffic signal timing and phasing plan at the intersection of North Shore Road and Revere Beach Parkway, including split phasing, to accommodate increased traffic movements associated with the Project;
A study of alternatives for the provision of an exclusive right hand turning lane into the Tomasello Drive entrance to the Project;
Construction of pedestrian safety improvements at the intersection and along Revere Beach Parkway, including traffic median improvements and potential realignment; and
Installation of an emergency vehicle preemption system.

This intersection will be the secondary access to the Resort. The intersection improvement is limited by a series of environmental concerns west of the intersection and constrained geometry to the north. Improvements under consideration include updating signal operation including concurrent pedestrian crossings, turn lane extensions, minor realignments within the right-of-way, and construction of an island in the southwest quadrant allowing for pedestrian protection. The improvements will require the approval of DCR, MassDOT and the City of Revere.

Item 14 – Mahoney (Bell) Circle

The Developer represents and warrants that the Revere HCA requires the Developer to pay the City of Revere to make improvements to this location as a part of a $1,270,000 payment (including items 14, 15, and 16). Basic improvements are proposed to address as series of pedestrian crossing issues including the upgrade of ramps and walkways, the addition of pedestrian crossing on the American Legion Highway (Route 60) side of the circle, and upgrades to signing and markings. These improvements are subject to approval of MassDOT and the City of Revere.

Item 15 – Brown Circle

The Developer represents and warrants that the Revere HCA requires the Developer to pay the City of Revere to make improvements to this location as a part of a $1,270,000 payment (including items 14, 15, and 16). Improvements at the intersection of Routes 60 and 107 include signing and stripping, addition of a splitter island on the Broadway side of the traffic circle, and upgrades to sidewalk ramps and pedestrian crossings. These improvements are subject to approval of MassDOT and the City of Revere.

Item 16 – Route 16/Revere Street

The Developer represents and warrants that the Revere HCA requires the Developer to pay the City of Revere to make improvements to this location as a part of a $1,270,000 payment (including items 14, 15, and 16). General intersection improvements are proposed for this location, including an upgraded vehicle detection system, improved sidewalk ramps and crossings, curbing, median and sidewalk repair, resurfacing and signal upgrades. These improvements are subject to approval of MassDOT and the City of Revere.

Item 17 – Copeland Circle/Route 1

This feasibility study is proposed to be completed in conjunction with item 10 – the long range plan. The study will be in the nature of a long range plan for this segment of roadway based on conceptual plan consistent with long range plans for segment developed in the North Shore Transportation Study by CTPS. The plan is limited to a study of the merits of the design and does not include a full review of the environmental planning process nor final design plans.

Item 23 – Blue Line Access/walkway to Suffolk Downs Station

See Item 30 for additional detail.

Item 24 – Blue Line Access/upgrade sidewalks to Beachmont Station along Winthrop Avenue (Revere)

The Developer represents and warrants that the Revere HCA requires the Developer to upgrade the sidewalks along Winthrop Avenue in Revere. The improvements are subject to the approval of the City of Revere.

Item 25 – Blue Line Access /construct Suffolk Downs Station upgrades

Discussions with the MBTA regarding the specific improvements to be made to Suffolk Downs Station remain preliminary and subject to change. At this point in the negotiation, the proposed improvements consist of the following concepts:

> Maintenance Improvements: The proposed improvements include concrete restoration and repair of the existing structure, ramps, stairs, overpass and platform. The existing structure will also be repainted;
> Elevators: The proposed improvements include installation of 2 new ADA compliant elevators, together with the associated foundations, structure and improvements;
> Turnstiles: The proposed improvements include installation of 3 new turnstiles at the station;
> Site Improvements: The proposed improvements include installation of new sidewalks, ramps, railings, lighting, way finding ($50,000 allowance) and landscaping from the station to the entrance to the Resort. A pedestrian shelter will be provided at the entrance to the Resort.

The Developer shall ensure that should work continue at this MBTA station after the Early Opening Operations Commencement Date, the Developer shall ensure full functionality and a clean and safe environmental for patrons with adequate wayfinding signage.

These improvements are subject to the MBTA's approval.

Item 27 – Bus Access – Provide bus stops and shelters on site

The Developer shall provide a bus stop and bus shelter along Tomasello Drive in proximity to the entrance to the Project if and when MBTA bus service is extended to Tomasello Drive. The bus stop and shelter location shall be designated on the final site plan.

Item 29 – Bicycle Access – Provide bike lanes on Bennington Street

These improvements call for a "Constitution Beach to Revere Beach" bicycle connection. Bicycle lanes will be marked along the Bennington Street corridor from Saratoga Street in East Boston to Winthrop Parkway in Revere. The bicycle route will start at the northerly end of Constitution Beach Park, proceed northerly along Barnes Avenue (shared lanes) to Saratoga Street, and follow Saratoga Street easterly to Bennington Street also as a shared lane given width limitations on Saratoga Street over the MBTA Blue Line. From Saratoga, to the Boston/Revere City Line, a five foot minimum bicycle lane will be provided with one lane established for through movement northbound. Parking will generally be permitted along the curb line, except approaching the Bennington Street, Leyden Street Walley Street extended intersection area where two travel lanes will be designated, one for left turns and one for through movement. Within an area from 250 feet south of Leyden Street through Palermo Street, parking will be restricted. Parking restrictions, and/or painted median area or two-way left turn lane (TWLT lane) will be considered from Leverett Avenue to the Boston/Revere City Line. Southbound from the Revere/Boston City Line to the Suffolk Downs T Station parking will be restricted (matching northbound). Southerly from the T Station, one travel lane will be maintained with on

street parking and the bicycle lane to an area between Ashley and Antrim Streets, where lane sharing will be provided to Saratoga Street. Initial plans in Revere would provide for a three lane corridor (one through/right lane in each direction with a two-way center left turn lane) with parking both sides at the curb and five foot minimum turn lanes from the City Line to Crescent Street. From Crescent Street to Winthrop Avenue, lanes would be shared in both directions. From Winthrop Avenue to Winthrop Parkway, one travel lane would be removed, maintaining one travel lane, parking and the bicycle lane. Approvals will be required from the Cities of Boston and Revere, as well as MassDOT and DCR.

Item 31 – Bicycle Parking – provide on-site bike parking

The Developer shall fund and install two Hubway bike-share stations if and when the City extends the Hubway system to East Boston. One Hubway station shall be installed near the entrance to the resort and the second shall be installed near the Suffolk Downs MBTA station. Final locations and designs are subject to review by the City.

III. Additional Off-Site Transportation Improvements, On-Site Transportation Improvements and Transportation Demand Management Measures.

In addition to the aforementioned Forty Five Million Dollars ($45,000,000) of transportation improvements, the Developer shall also construct the following transportation improvements:

Item	Location or Type	Action(s)[2]	Completion Date	Cost
TRAFFIC CONGESTION AND SAFETY-BOSTON				
2	Route 1A Boardman to Jughandle	Perform feasibility study, donate ROW owned by the Developer	Early Opening Transportation Improvement	
PARKING				
18	Daily Parking	Construct on-site structured parking garage	Full Build-Out Transportation Improvement	
19	Special Event Parking	Secure off-site parking or accommodate parking on-site	Early Opening Transportation Improvement	
20	Neighborhood Parking	New and additional signage in East Boston during full terms of construction	Early Opening Transportation Improvement	Estimated at $15,000
21	Reserve Parking	Identify reserve parking area	Early Opening Transportation Improvement	

[2] As necessary, these actions are more fully described in the narrative that follows this chart.

22	Bus Parking	Designate bus staging area	Early Opening Transportation Improvement	
ALTERNATIVE MODES				
26	Bus Access	Provide sidewalks along Tomasello	Early Opening Transportation Improvement	
28	Bicycle Access	Provide bike lanes on Tomasello Drive	Early Opening Transportation Improvement	
30	Bicycle Access	Provide connection to site from Bennington Street	Early Opening Transportation Improvement	
32	Water Access	Subsidize water transport	Early Opening Transportation Improvement	
33	Water Access	Operate shuttle bus (provided water shuttle at Maverick is operational)	Early Opening Transportation Improvement	
34	Neighborhood Access	Provide walkway, Waldemar to Target	Early Opening Transportation Improvement	
TRANSPORTATION DEMAND MANAGEMENT				
35	Employee Oriented Strategies	Provide accommodations and incentives	Early Opening Operations Transportation Improvement	
36	Guest Oriented Strategies	Provide accommodations and incentives	Early Opening Operations Transportation Improvement	
37	Scheduling Strategies	Coordinate with City re: Special Events	Early Opening Operations Transportation Improvement	

Narrative Description of Additional Off-Site Transportation Improvements, On-Site Transportation Improvements and Transportation Demand Management Measures.

Item 2 – Route 1A Boardman to Jughandle – planning

The Developer will study in the Draft Environment Impact Report and Expanded Public Notification Form to be filed for the Project the segment of Route 1A to the Jughandle. The study will be in the nature of a long-range plan for this highway segment based on current needs and following on the long range plans for this area developed in the North Shore Transportation

Study by the Central Transportation Planning Staff. The plan is limited to a study of the merits of the design and does not include a full review of the environmental planning process nor final design plans.

Item 18 – Daily Parking – Details to be specified in more detail in the Transportation Access Plan Agreement.

Item 19 – Special Event Parking – Details to be specified in more detail in the Transportation Access Plan Agreement.

Item 20 – Neighborhood Parking – Details to be specified in more detail in the Transportation Access Plan Agreement.

Item 21 – Reserve Parking – Details to be specified in more detail in the Transportation Access Plan Agreement.

Item 22 – Daily Parking – Details to be specified in more detail in the Transportation Access Plan Agreement.

Item 26 – Bus Access – Provide sidewalks along Tomasello

As part of the site development, the Developer shall fund and construct a sidewalk along the entire length of Tomasello Drive to afford pedestrians access to the resort from MBTA bus stops along Route 1A and Winthrop Avenue.

Item 28 – Bicycle Access – Provide bike lanes on Tomasello – see item 30

Item 30 - Bicycle Access – Provide connection to site from Bennington Street

The proposed improvements include construction of a combined 14 foot wide pedestrian/bikeway (approximately 1,300 LF) from the Suffolk Downs Station to the south plaza at the casino entrance (4 foot green strip, 8 foot pedestrian, 2 foot green strip, 6 foot bike path), a 14 foot bikeway (approximately 5,800 LF) from the Resort entrance extending eastward along Tomasello Road to Winthrop Street, and a 14 foot wide bikeway extending from Tomasello Road to the Employee entrance. With respect to a connection to Route 1A, a bikeway can be accommodated in the future if allowed. At the employee entrance, secure, covered storage will be provided for 60 bicycles. At the Resort entrance valet service will be available and a bicycle rack will be provided for patrons.

Item 32 – Water Access – subsidize water transport

The Developer supports the Mayor's vision to enhance water transportation options to East Boston by instituting regular water shuttle service between the South Boston and East Boston waterfronts, and agrees that funding to assist the City in establishing this service will be made out of the Community Impact Trust.

Item 33 – Water Access – operate shuttle bus

As a part its multiple occupancy vehicle strategy, the Developer will expand its current ground shuttle operation to run between the Resort and the several East Boston business districts, area hotels, local cultural and tourist destinations, and regional hubs such as principal MBTA stops on lines that do not easily connect to the Blue Line. It will operate as a connector with the planned water shuttle to the Maverick Square area once that service is running. The shuttle service will also be used to bring employees to and from the Resort. It will also be used in conjunction with Suffolk Downs' proposed guaranteed ride home program, and will operate at all times the resort is open.

Item 34 – Neighborhood Access – Provide walkway, Waldemar to Target

On site improvements at the Resort will include a safe walkway connecting the Waldemar Avenue area with the nearby shopping center that presently hosts a Target retail store. The location of this walkway during construction shall be set forth in more detail in the Construction Management Plan.

Item 35 – Employee Oriented Strategies

In addition to physical roadway, traffic and safety improvements, the Developer is committed to implementing a robust Transportation Demand Management (TDM) program to reduce single-occupancy vehicle (SOV) travel, thereby reducing Project parking demand, traffic congestion, and associated environmental impacts. Equally important, the TDM plan also enhances mobility by alternative modes of transportation by promoting walking, bicycling, ridesharing and transit use. The TDM plan will address the different needs of patrons and employees, and will overlap with other key plan elements including parking demand management and on- and off-site infrastructure improvements and will be subject to BTD approval. Details of the TDM program will be set forth in the Transportation Access Plan Agreement to be executed between the Developer and the Boston Transportation Department.

Item 36 – Guest Oriented Strategies

In addition to its ground shuttle program that will have regular connections with nearby hotels, businesses, cultural attractions and tourist locations, the Developer will have an on-site transportation coordinator at all times to work with patrons on transportation options. In addition, several of its TDM strategies will also be targeted at assisting patrons in arriving and departing from the resort. Further details of this program will be set forth in the Transportation Access Plan Agreement to be executed between the Developer and the Boston Transportation Department.

Item 37 – Scheduling Strategies

The Developer shall work with the City of Boston to coordinate special events to avoid traffic congestion to the maximum extent possible. Further details of this program will be set forth in the Transportation Access Plan Agreement to be executed between the Developer and the Boston Transportation Department.

Notwithstanding anything to the contrary in this Agreement, to the extent that any of the Early Opening Transportation Improvements set forth in this Exhibit E are not completed by the Early Opening Operations Commencement Date due to events beyond the Developer's control, such as delays in permitting, the Developer may commence Gaming operations at the Project provided that the Developer: (i) continues to undertake best efforts to diligently complete any such Early Opening Transportation Improvements; (ii) has agreed to such interim measures as the City determines are required in order to mitigate any adverse traffic and transportation impacts resulting from such delay; and (iii) provides the City escrowed funds in the amount of 110% of the estimated cost of the City to complete such Early Opening Transportation Improvements, which funds the City may elect to use to complete such Early Opening Transportation Improvements if the Developer fails to satisfy its obligations hereunder to do so.

EXHIBIT F

Description of the Full Build-Out Component

Caesars Resort at Suffolk Downs is a redevelopment proposed on approximately 161 acres of land in East Boston and Revere with all major proposed construction occurring in Boston. The main access points to the site are from Route 1A to the west and Tomasello Drive as well as from Winthrop Avenue at the north end of the property. Two mass transit stops on the MBTA Blue Line (Suffolk Downs and Beachmont stations) currently serve the Project site. The property is currently home to Suffolk Downs, which opened in 1935 and remains New England's only operating thoroughbred racetrack.

Caesars Resort at Suffolk Downs provides a unique opportunity to create a world class entertainment complex located minutes from the heart of downtown Boston and Logan International Airport. The Project will be constructed in one continuous phase, although certain portions of the Resort—described as Early Opening below—will open to the public before the Full Build is complete. As described below, the Project program includes two distinct casino gaming areas (referred to herein as Casino Area I and Casino Area II), two hotels, multi-purpose meeting/entertainment space, dedicated structured parking as well as surface parking, fine dining, retail space, and bars.

Full Build Project Narrative

In addition to the details set forth in the Early Opening Project Narrative in Exhibit D, the Full Build project will include the following. The main entrance of Casino Area II will be centered on the crescent-shaped luxury hotel (i.e., Hotel I), with a lower-story façade that will provide a clear visual connection to the interior of the building; terrace dining will support an urban, pedestrian-friendly environment along the access drive. A glass canopy and porte-cochere (i.e., covered entrance) will accommodate drop-off and valet services for guest vehicles and bicycles below-grade.

The main entrance leading directly to the gaming floor of Casino Area II will be flanked by restaurants and the hotel lobby. A feature bar and table gaming area will command the center of Casino Area II and will be the main focal point. The feature bar will have a direct visual connection from the main entrance lobby to the south, and from the north escalators leading to the parking garage.

Access to a multi-purpose conference and entertainment space will be provided off the main entry lobby with a grand open stair and escalators. The two-story pre-function lobby will spatially connect function areas with the retail and gaming floor below. In addition, outdoor terraces at the second level will lead to a greenhouse which will provide fresh produce for year-round use in the restaurants. Service access to Casino Area II will be provided through a double-bay loading dock and mechanical area northwest of the gaming floor.

A northern entrance to Casino Area II will provide pedestrian access from a detached seven-story parking garage. In addition to the on-grade access, an enclosed pedestrian bridge from the garage will lead to a mezzanine level connecting to the gaming level of Casino Area II with open stair and escalators. At ground level adjacent to the north entrance of Casino Area II,

a glass pavilion ("winter garden") will connect with Casino Area I, creating a primary gathering area; this will be the drop-off point for dedicated charter buses and shuttles from Logan Airport and other major tourist or travel venues in Boston as well as from the MBTA Suffolk Downs Station.

The approximately 300-room, nine-story luxury hotel will feature breathtaking views of Boston and the Massachusetts Bay seacoast. On the second floor, guestrooms are being designed to complement the spa interior and provide a unique experience for hotel guests. On the all-suite penthouse level, large villas will anchor each end of the plan. The second hotel, which will be 12 stories and have approximately 150 rooms, will similarly feature spectacular views. Guest rooms will also be designed to provide unique guest experiences.

The Full Build-Out Component includes the items shown on the Site Plan attached hereto at Exhibit A, including, without limitation, the following:

Two distinct Gaming Areas providing approximately between 150,000 and 250,000 square feet of gaming space with between 4,000 and 6,600 gaming positions (consisting of an evolving combination of slot machines and table games);

1. A World Series of Poker™ room or rooms;
2. Two luxury hotels providing up to a maximum of 450 rooms;
3. Between 24,000 and 46,000 square feet of meeting and entertainment space;
4. Bars, nightclubs, and between 10 and 17 restaurants, including fine dining concepts, casual dining and a local marketplace, all of which containing between 1,700 and 2,600 seats;
5. Up to 30,000 square feet of retail space, including a spa;
6. Thoroughbred horse racing and simulcast wagering;
7. A seven-story parking garage with up to approximately 2,600 spaces, valet parking area for an additional up to approximately 460 cars, and up to approximately 2,100 surface parking spaces; and
8. A central utility plant.

EXHIBIT G

Legal Description of Property

A certain parcel of land situated in the Cities of Boston and Revere, County of Suffolk, Commonwealth of Massachusetts, commonly known as Suffolk Downs, shown on a plan entitled "Plan of Land in Boston and Revere" prepared by Rizzo Associates dated December 10, 1996, revised January 23, 1997 and recorded with Suffolk County Registry of Deeds in Book 21541, Page 247.

The above-described parcel includes the following Registered Land, more particularly described in Certificate of Title No. 112122:

> A certain parcel of land situated in that part of Boston, called East Boston in the County of Suffolk and Commonwealth of Massachusetts, situated on Waldemar Avenue. Said land is shown as Lots One (1) through Twenty-One (21) as shown on plan drawn by B.C. & J.J. Gallo, Civil Engineers, dated June 4, 1951, and September 18, 1953, as modified and approved by the Court, filed in the Land Registration Office as Plan No. 23113-A, a copy of a portion of which is filed with Certificate of Title No. 57352.

Excepting therefrom so much of the land shown as Parcels A-1(1) and A-1(2) on a Plan entitled "Plan of Land in Revere Massachusetts (Suffolk County)" dated November 25, 2002, last revised February 26, 2003, drawn by BSC Group and recorded with Suffolk County Registry of Deeds in Book 31003, Page 26, which parcels were conveyed to Revere Diner Realty LLC by Deed dated March 21, 2003 and recorded in Book 31003, Page 26.

Also, excepting therefrom so much of the land shown as Parcels C-4(1) and C-4(2)(Z) on a plan entitled "Plan of Land in Revere, Massachusetts (Suffolk County)" by BSC Group, dated March 30, 2005 and recorded with Suffolk County Registry of Deeds in Book 2005, Page 395, which parcels were conveyed to the City of Revere by deed dated October 4, 2005 and recorded in Book 38463, Page 300.

EXHIBIT H

Sustainability Provisions

1. Notwithstanding the requirements in the Act, (a) the Project, which shall mean each component thereof, shall be constructed to achieve and the Developer shall obtain LEED Gold for New Construction certification under the applicable LEED standard ("LEED Standards") within nine (9) months after the completion of construction of each component of the Project, and (b) within eighteen (18) months after the Early Opening Operations Commencement Date for the Early Operations Component and within eighteen (18) months after the Full Build-Out Operations Commencement Date for the Full Build-Out Component, the Developer shall go through the process and obtain LEED Gold for Existing Buildings certification using the LEED Standards for each component of the Project in the Early Operations Component and Full Build-Out Component, respectively. After receipt of the initial certification, the Project or applicable component thereof shall be subject to review and recertification for LEED Gold for Existing Buildings, pursuant to the LEED standards and procedures then in effect.

2. The Developer agrees that not more than forty percent (40%) of the total square footage of the Property will be either impervious area or pervious areas used for parking or vehicle ways or drives. This will result in the addition of approximately sixteen (16) acres of open space at the Property as well as a reduction of approximately twelve (12) acres of impervious pavement that currently exists at the Property. The increase in open space and pervious surfaces and decrease in impervious surfaces is expected to restore the Property's marsh-like ecology, increase infiltration and provide a natural barrier during storm events.

3. The Developer shall ensure compliance by itself, its Authorized Representatives and its customers and invitees of the Massachusetts statutory provisions regarding engine idling contained in M.G.L. c. 90, § 16A. In the event that the City determines, in its sole discretion, to enforce this provision, the Parties will discuss the means of implementing such enforcement including any requisite reimbursement to the City for all of the City's costs of enforcement.

4. The Developer will use best efforts to obtain as much food consumed at the Property (including, without limitation, prepared foods, raw products and finish products) from local producers, suppliers and distributors, meaning food products from vendors within the Commonwealth with particular emphasis on those producers, suppliers and distributors within the City.

5. In order to protect the community, during the design and operation of the Project, the Developer will address sea level rise and storm surges in accordance with all applicable Governmental Requirements of the Massachusetts Executive Office of Energy and Environmental Affairs (including, without limitation, its Climate Change Adaption Report, as the same may be supplemented and amended), the BRA, the City's Conservation Commission and other applicable Governmental Authorities. At a minimum, the Developer will develop a landscape and topography that responds to rise in sea level by elevating buildings, critical mechanical and electrical equipment, roadways and access points to create a safe haven for the community.

6. The Project will promote a diverse typology of open space that ranges from active pedestrian plazas to passive ecological parks offering a variety of amenities for public use and enjoyment.

7. The Project will connect neighborhoods and ecosystems by connecting the neighborhood and visitors to the Project and its surroundings through a network of pedestrian walkways, bikeways, parks and open spaces located on the Property that are accessible twenty-four (24) hours per day. The design aims to promote pedestrian circulation and create a unique arrival sequence and visitor experience that embraces the marsh-like setting of the Property and a landscape for the Project which is outwardly focused.

8. The Project will develop an innovative green infrastructure and pursue sustainable systems by using the landscape to purify storm water, improving the quality of the existing soils, providing opportunities for environmental education and creating a cherished and elegant landscape.

9. The Project will include a landscape that utilizes, to the greatest extent possible, native plant material and also is low in maintenance and irrigation needs.

10. The Project will reduce urban heat islands by, among other things, including a series of planted bio swales along the parking bays to collect stormwater along with shaded walkways that provide connections to public spaces and buildings. In addition, all surface parking lots constructed by the Developer shall be constructed in a manner consistent with the future installation of solar arrays.

11. The roof of the new Casino building will feature an approximately five thousand (5,000) square foot greenhouse filled with a hydroponic planting system. This system will produce fresh vegetables and fruits year round for all the restaurants in the Project thereby limiting delivery trucks on area roadways.

12. The Developer will use best efforts to utilize a balanced cut and fill soil strategy across the Property. Parking areas will be organized and graded so that they may be used as sites for future development, and the landscape on the Property will connect with the overall East Boston Greenway system.

13. The Project will include strategies for water conservation to capture rainwater from the building roofs for reuse, incorporating low flow fixtures technologies and selecting drought resistant plantings. One hundred percent (100%) of rainwater from the building roofs and approximately fifty percent (50%) of rainwater from garage improvements will be recovered and directed towards three (3) subterranean tanks located outside the structures. The rainwater captured in these tanks will be used for site irrigation, maintenance of the thoroughbred racing track, and air conditioning system coolant water, resulting in a savings of over three (3) million gallons of potable water annually. Building water usage will be reduced by approximately thirty-five percent (35%) from the baseline set forth in the LEED Standards, resulting in a reduction of over four (4) million gallons of potable water annually. By using drought resistant plantings, use of potable water for irrigation will be reduced by up to fifty percent (50%) from the baseline set forth in the LEED Standards.

14. The Project will be designed to reduce annual energy consumption by a minimum of twenty-five percent (25%) from the baseline set forth in the LEED Standards through conservation strategies, efficiency measures, and on-site renewable energy production. Such measures shall include:

a) The production of over 2.5 megawatts of "carbon free" on-site renewable energy through the use of photovoltaic arrays placed in several locations throughout the Property, which will meet a minimum of ten percent (10%) of the annual electric consumption at the Property;

b) The heat from engine(s) used to generate electrical power will be used to heat water for use at the Property, which is more sustainable and reduces carbon dioxide emissions than using electricity supplied through the grid or natural gas;

c) Space heating, cooling and ventilation will be done through the use of less restrictive ventilation ducts, high efficiency fans, and computer-controlled distribution;

d) Using natural lighting throughout the facility, including in Gaming Areas to allow the lighting control system (which uses photocells, occupancy sensors and other systems) to dim and shut off artificial lights when they are not needed;

e) The interior and exterior lighting systems of the buildings will employ high efficiency fixtures;

f) Heating and cooling will be generated through the use of high efficiency systems that perform substantially better than what is required by the building code;

g) Installation on all new Project improvements (other than the grandstand/clubhouse improvements) of high performance low-e glazing paired with enhanced thermal performance wall and roof assemblies, and in connection with grandstand/clubhouse improvements, the use of low-e glazing on all new glass installation;

h) Hotel guestrooms with smart controllers that shut off lighting and reduce heating and air conditioning of guestrooms when guests are not present;

i) Energy recovery devices will be used to precondition incoming air by recovering energy from exhaust air leaving the building;

j) Outside air, when cool enough, will be used instead of air conditioning to cool the buildings;

k) Energy consuming systems will be monitored and tracked using an advanced building management system and metering, allowing the Developer to analyze and reduce energy consumption over time by identifying areas of high energy consumption for targeted reductions; and

l) Installation and use of food-only compactors in coordination with an organic waste collection and recycling program to be administered with a third party anaerobic processing company.

15. The Developer will use best efforts to construct the Project in a manner that will reduce or eliminate bird strikes, particularly with respect to the glass used in the Project.

16. To encourage employees to bike, walk or use other forms of alternative transportation, the Developer shall provide secure bicycle storage areas, showers and changing rooms for employees.

17. The Developer, in consultation with the City, BRA and Boston Transportation Department to implement programs to significantly increase the percentage of its customers, visitors and employees that arrive and depart from the Project via some form of transportation other than single-occupancy vehicles. The Developer shall provide financial incentives and/or alternative transportation options, as needed, to its employees and patrons in support of this obligation.

EXHIBIT I-1

Developer's Quality Job Creation and Employment Commitments

The Developer shall impose a local hiring program for both construction and permanent jobs at the Project that will include the following components:

Construction Jobs:

Host and maintain a central job bank website (in English and Spanish) as a micro-site within the larger Project website.

The Developer shall demonstrate to the Gaming Accountability Office its efforts to provide construction employment opportunities to City residents and in particular East Boston residents.

The Developer will utilize best efforts to use the existing labor force in the Commonwealth, and in particular the existing labor force in the City, when hiring for new construction jobs, as required by Section 18(17) of the Act.

During the Term of this Agreement, the Developer will hold job fairs at the Property to make City residents aware of job opportunities available at the Project.

In furtherance of specific goals for the utilization of minorities, women and veterans on construction jobs, the Developer shall send to each labor union or representative of workers with which the Developer has a collective bargaining agreement or other contract or understanding, a notice advising the labor union or workers' representative of the Developer's commitments, as required by Section 15 of the Act.

Permanent Jobs:

Establish, fund and maintain human resource hiring and training practices that promote the development of a skilled and diverse workforce and access to promotion opportunities through a workforce training program that: (i) establishes transparent career paths with measurable criteria within the gaming establishment that lead to increased responsibility and higher pay grades that are designed to allow employees to pursue career advancement and promotion; (ii) provides employee access to additional resources, such as tuition reimbursement or stipend policies, to enable employees to acquire the education or job training needed to advance career paths based on increased responsibility and pay grades; and (iii) establishes a program or partnership to provide off-site child day-care, all as required by Section 18(9) of the Act.

Host and maintain a central job bank website (in English and Spanish) as a micro-site within the larger Project website.

The Developer will provide City residents with advance notice of hiring activities by publishing announcements in local newspapers approximately four (4) to eight (8) consecutive weeks prior to initial hirings.

Residents of Boston (together with residents of host and surrounding communities (as defined in the Act)) will be given first priority to apply for jobs during a specified "advance period," such advance period to be established jointly by the Developer and the Gaming Accountability Office.

Written flyers in English and Spanish will be distributed to local community-based organizations in East Boston to inform people about local advance period hiring and the Developer shall use best efforts to otherwise notify residents in the low income neighborhoods in East Boston proximate to the Project of potential job opportunities.

The Developer will donate a minimum of twenty-five (25) computers to be placed in strategic areas in East Boston neighborhoods (e.g. local libraries or community centers) as well as install and maintain a minimum of two (2) computers on-site to ensure that residents without computers can research and apply online for jobs at the Project.

During the Term of this Agreement, the Developer will hold job fairs at the Property to make City residents aware of job opportunities available at the Project.

The Developer will utilize best efforts to use the existing labor force in the Commonwealth, and in particular the existing labor force in the City, when hiring for new jobs, as required by Section 18(17) of the Act.

The Developer will make best efforts to ensure that fifty percent (50%) permanent employees at the Project are City residents, of which a substantial percentage should be from the East Boston community, all as more particularly set forth in the Agreement.

In furtherance of specific goals for the utilization of minorities, women and veterans permanent jobs, the Developer shall send to each labor union or representative of workers with which the Developer has a collective bargaining agreement or other contract or understanding, a notice advising the labor union or workers' representative of the Developer's commitments.

During the Term of this Agreement, the Developer shall use best efforts to work with the City's Public Schools Department to establish school to work programs for hospitality jobs at the City's vocational or public high schools.

During the Term of this Agreement, the Developer shall support the efforts of and actively engage with the Commission and community colleges to develop the Massachusetts Community College Workforce Training Institute and Massachusetts Casino Careers Training Institute at community colleges in the Commonwealth, particularly those within the City.

During the Term of this Agreement, upon request by the Gaming Accountability Office, the Developer shall provide the Gaming Accountability Office with information regarding its contracts with organized labor, including hospitality services, the number of employees employed at the gaming establishment, including detailed information on the pay rate and benefits for employees and contractors, and the Developer's plans to ensure labor harmony during all phases of the construction, reconstruction, renovation, development and operation of the gaming establishment.

Consistent with the corporate policy of the Developer to provide equal opportunity for all applicants and employees, the Developer will not discriminate on the basis of race, color, religion, sex, national origin, age, disability, sexual orientation, gender identity or expression, or veteran status. This policy applies to all areas of employment including recruitment, hiring, training, promotion, compensation, benefits, transfers and social and recreational programs.

The Developer shall implement a training and development program for permanent jobs at the Project that will include the following components:

Provide opportunities for team members to pursue personal and professional growth, to enjoy satisfying careers, to participate in training and development programs and to celebrate success including rewards and recognition for superior performance against measurable goals.

Provide new employees with learning programs such as the "Empire Series." The Empire Series is Operator's best-in-class and award winning learning program for all new employees. This program offers a lively and engaging environment that uses cutting-edge technology. In addition to such learning program, the Developer shall provide specialized training courses customized to meet employee learning needs.

If a position requires serving alcoholic beverages, authorizing complimentary alcoholic beverages, or managing a food and beverage operation, that employee must obtain an alcohol awareness certification card. All table games employees, valet attendants, limo drivers and security team members must also possess this certification.

Provide an educational assistance program that reimburses employees ninety percent (90%) of tuition costs up to a maximum of $3,000 per year for pre-approved undergraduate classes or up to a maximum of $4,000 per year for pre-approved graduate study at an accredited college or university.

Provide regulatory and compliance training such as Skillsoft, which is Operator's online learning platform used to deliver all regulatory and compliance training in addition to numerous professional development courses.

Implement the Caesars Code of Commitment, which includes a commitment to all employees to treat them with respect and provide satisfying career opportunities to invest in employees by providing excellent pay and valuable benefits, including health insurance and a retirement plan, and to share financial success through bonuses for

frontline employees, to encourage professional and personal growth through tuition reimbursement, on-the-job training, career development, and promotion from within, to actively seek and respond to employee opinions on all aspects of their jobs, from the quality of their supervisors to the quality of the casinos, and to value employees from every possible background, and who approach issues and problems from different perspectives.

Developer's obligations hereunder shall be subject to and consistent with the Operational Limitations.

EXHIBIT I-2

BOSTON RESIDENTS
CONSTRUCTION EMPLOYMENT PLAN
FOR
SUFFOLK DOWNS RESORT CASINO PROJECT
525 WILLIAM F. McCLELLAN HIGHWAY, EAST BOSTON

WHEREAS, [_____], a _____, having an address c/o Suffolk Sterling Racecourse, LLC, 525 William F. McClellan Highway, East Boston, Massachusetts 02128 (the "**Developer**"), and the **BOSTON REDEVELOPMENT AUTHORITY** (the "**Authority**"), a public body corporate and politic, and the **BOSTON EMPLOYMENT COMMISSION** (the "**Commission**") desire to bring the construction employment benefits of the Project, as hereinafter described, to residents of the City of Boston, minorities, women and veterans;

WHEREAS, Chapter 30 of the City of Boston Ordinances of 1983 established the Boston Residents Jobs Policy;

WHEREAS, the Mayor of the City of Boston signed an Executive Order on July 12, 1985, entitled "Extending The Boston Residents Jobs Policy" (the "**Jobs Policy Executive Order**") and on July 25, 1985, the Authority by vote adopted as policy the standards set forth in the Jobs Policy Executive Order;

WHEREAS, the Commission has been established by Chapter 12 of the City of Boston Ordinances of 1986, as amended by Chapter 17 of the Ordinances of 1986 (collectively, the "**Ordinance**"), in part to foster these goals and to see that they are realized, a copy of which is annexed hereto as **Exhibit A** and incorporated herein;

WHEREAS, pursuant to the terms of a Host Community Agreement dated as of _____, 2013 by and between the City of Boston and the Developer ("**HCA**"), which HCA was entered into as a condition of compliance with the terms of M.G.L. c. 23K, as the same may be amended from time to time (together with any rules, regulations, policies, and guidance promulgated thereunder, the "**Act**"), the Developer was required to provide certain construction job opportunities to residents of the City of Boston, minorities, women and veterans as required by the Act and the HCA; and

WHEREAS, the Cooperation Agreement between the Developer and the Authority pertaining to the Project, of even date herewith, requires the Developer to prepare and submit and the Authority to approve a Boston Residents Construction Employment Plan with specific provisions as required by the Act and the HCA.

NOW, THEREFORE, the Developer, the Authority and the Commission do hereby agree that the Boston Residents Construction Employment Plan for the Project (the "**Plan**"), which has

been approved by the Commission and the Authority and shall take effect as a binding obligation upon the parties hereto, shall be as follows:

Section 1: DEFINITIONS

As used in this Plan, the following terms shall have the meanings set forth below. Capitalized terms used in this Plan without definition which are defined in the Ordinance or the Commission's regulations shall have the meanings ascribed to them in the Ordinance or in the Commission's regulations, a copy of which has been delivered to the Developer.

1.1 Boston Residents Construction Employment Standards with Special Provisions Applicable to Gaming Establishments ("**Boston Residents Construction Employment Standards**"): The standards established pursuant to the Ordinance, the Jobs Policy Executive Order, and the Act specifically:

1) at least fifty percent (50%) of the total employee work hours in each trade shall be by *bona fide* Boston residents and in particular, residents of East Boston in accordance with the Ordinance and the Act;

2) at least twenty-five percent (25%) of the total employee work hours in each trade shall be by minorities in accordance with the Ordinance and the Act; and

3) at least ten percent (10%) of the total employee work hours in each trade shall be by women and veterans in accordance with the Ordinance and the Act.

1.2 Contractor: Any general contractor or construction manager for the Project engaged from time to time by the Developer, and, where the context requires, any subcontractor thereto.

1.3 Days: For the purpose of this Plan, the word "days" shall mean business days in Suffolk County, Massachusetts.

1.4 On-Site Monitor: An individual or individuals employed by the Contractor whose responsibility will be (i) to serve as compliance officer for the purpose of monitoring the performance of the Project with respect to the Boston Residents Construction Employment Standards, and (ii) the day-to-day implementation of this Plan. As used in Paragraphs 3.5 and 3.6, the phrase "**On-Site Monitor**" shall also include the individual designated by each subcontractor to serve as its compliance officer for the purpose of monitoring the performance of the Project with respect to the Boston Residents Construction Employment Standards. The On-Site Monitor may also perform other, unrelated duties for the Contractor or Subcontractor.

1.5 Project: The Developer proposes to construct a resort-style destination gaming establishment on the Property consisting of (i) two distinct gaming areas providing between 150,000 and 250,000 square feet of gaming space with between 4,000 to 6,600 gaming positions (consisting of an evolving combination of slot machines and table games), (ii) a World Series of Poker™ room or rooms, (iii) two luxury hotels providing a total of 450 rooms, (iv) between 24,000 and 46,000 square feet of meeting and

entertainment space, (v) bars, nightclubs and between 10 and 17 restaurants, including fine dining concepts, casual dining and a local marketplace, collectively containing between 1,700 and 2,600 seats, (vi) up to 30,000 square feet of retail space, including a spa, (vii) thoroughbred horse racing and simulcast wagering, (viii) a seven-story parking garage with up to 2,600 spaces, (ix) valet parking area for up to 460 additional vehicles, (x) up to approximately 2,100 surface parking spaces, (xi) a central utility plant, and (xii) other amenities and uses customarily accessory or ancillary to the foregoing

Section II: GENERAL REQUIREMENTS

2.1 The Developer shall use Best Efforts, as set forth in this Plan, to ensure that the Boston Residents Construction Employment Standards are met by Contractor and any subcontractor of Contractor in constructing the Project. The Developer shall host job fairs at the Project site, maintain an on-line central job bank noting available construction jobs in both in Spanish and English, and otherwise undertake outreach to notify the community, especially the East Boston residents, of construction job opportunities at the Project. The Developer shall provide evidence of such efforts to the Commission and the Gaming Accountability Office as required by this Agreement and the HCA.

2.2 The Developer shall incorporate into its construction contract with Contractor, and shall require Contractor to incorporate into each of its subcontracts, provisions requiring that Contractor and each subcontractor engaged in construction in connection with the Project comply with the Boston Residents Construction Employment Standards and this Plan. In furtherance of specific goals for the utilization of minorities, women and veterans on construction jobs, the Developer shall send to each labor union working on the Project a notice advising said unions of the Developer's obligations under this Agreement and the HCA. The Authority, the Commission or the Gaming Accountability Office may also direct the Developer in writing to enforce such provisions. The incorporation by reference of this Plan into any such construction contract or subcontract shall satisfy such obligation.

2.3 The Developer shall require that the Contractor designate an On-Site Monitor and that each subcontractor designate an individual to serve as the compliance officer for the purposes of monitoring the performance of the Project with respect to the Boston Residents Construction Employment Standards.

2.4 Documentation of the Developer's compliance herewith shall be maintained by the Developer; documentation of Contractor's and subcontractors' compliance herewith shall be maintained by the On-Site Monitor. The Developer shall provide copies of documentation maintained by it, and that maintained by the On-Site Monitor, to the Commission, as required herein or as requested from time to time by the Authority, the Commission or the Gaming Accountability Office.

2.5 The Developer shall cause Contractor to prepare a projection of work force needs over the course of construction and to complete a Projected Work Force Form in the form attached hereto as **Exhibit B** and incorporated herein by reference. Contractor shall

update such projection periodically during the course of construction, but shall not be required to do so more frequently than quarterly, except when required by the Commission based on reviews of the Project's percentage of completion as set forth in Paragraph 2.6. The Developer shall submit such projections to the Commission upon request.

2.6 The Commission, pursuant to its regulations, shall make determinations with respect to the Project as to compliance by the Developer and Contractor with the Boston Residents Construction Employment Standards. Such determinations may be made at time intervals as set out in one of the following two schedules, the Commission reserving the right to utilize the schedule which allows more frequent determinations:

(1) When construction of the Project is 25, 50, 75, and 100 percent complete; "**Percent Complete**" shall be measured by the percentage of the total worker hours expected to be worked on the Project, as set forth in the projection of work force needs shown on the Projected Work Force Form submitted pursuant to Paragraph 2.5. Upon request of the Developer, the Commission shall provide copies of such determinations to the Developer; or

(2) Every three (3) months from the date of the commencement of construction of the Project.

2.7 The Developer shall maintain, and shall cause Contractor and its subcontractors to maintain, records necessary to ascertain compliance with this Plan for one (1) year after the issuance of a Certificate of Occupancy for all or a portion of the Project.

2.8 The Developer shall meet with Contractor no less frequently than weekly throughout the period of construction of the Project to review the Boston Residents Construction Employment Standards. The Developer shall record and maintain the minutes of such meetings and forward copies thereof to the Commission and the Authority within ten (10) days of any such meeting.

Section III: PROCEDURES

3.1 The Developer shall furnish to the Authority and the Commission in writing the name, title, business address and telephone number of the person designated as the On-Site Monitor (designated by Contractor) and of the compliance officer so designated by each subcontractor for the Project.

3.2 Prior to the start of construction of the Project, representatives of the Developer and Contractor shall meet with a representative of the Commission for the purpose of discussing and agreeing upon the methods and procedures for the implementation of the provisions of this Plan. Such meeting (the "**Pre-Construction Conference**") shall also be attended by subcontractors to Contractor then selected, if any, each of whom shall have been notified by Contractor by mail or facsimile of the time, place, and purpose of such Pre-Construction Conference at least three (3) days in advance thereof.

3.3 Prior to the start of construction for the Project, Contractor and each subcontractor to Contractor then selected, if any, shall meet with appropriate representatives of the construction trade unions and the Commission for the purpose of reviewing the Boston Residents Construction Employment Standards and the estimated employment requirements for construction workers over the course of construction of the Project.

3.4 Within three (3) days after the employment or assignment of a worker to work on the Project, Contractor and each subcontractor will obtain from each such worker a completed and signed Residency Verification Form in the form attached hereto as **Exhibit C**. Copies of the applicable Residency Verification Form shall be submitted to the Commission together with the Weekly Utilization Report (as defined in Paragraph 3.5) on which such worker's employment is first reported. If Contractor or any subcontractor shall have requested a worker to complete such Residency Verification Form and the worker shall have refused to do so, then in lieu of such Residency Verification Form, Contractor or such subcontractor shall submit a sworn statement to the effect that the worker had been requested to complete and sign such form but refused.

3.5 One (1) week following the commencement of construction of the Project, and each week thereafter until the completion of construction of the Project, the On-Site Monitor shall complete and submit to the Commission, for the previous week, Weekly Utilization Reports in the form attached hereto as **Exhibit D**. In lieu of the form attached hereto as **Exhibit D**, the On-Site Monitor may submit payroll records containing the same information as is required on the form attached hereto as **Exhibit D**. The Weekly Utilization Reports or the payroll records described in this Paragraph 3.5, as applicable, may be submitted electronically to the Commission by the On-Site Monitor if acceptable to the Commission.

3.6 All persons applying directly to Contractor or any subcontractor for employment in construction of the Project who are not employed by the person or entity to whom or to which application for employment is made shall be referred to the Commission. The On-Site Monitor shall forward in writing to the Commission weekly, the names, home addresses, and telephone numbers of all persons applying directly to the Contractor or any subcontractor for employment in construction of the Project who are not employed by the person or entity to whom or to which application for employment is made. The On-Site Monitor shall also keep a written record of any person who was referred to Contractor or any subcontractor by the Office of Boston Residents Jobs Policy ("**BRJP**") for employment in construction of the Project, but was not hired, and the reasons why any person so referred was not hired. It shall be a sufficient reason for failure to hire any person so applying or referred that employment of such person would not comply with any union security clauses contained in any applicable collective bargaining agreements to which construction of the Project is subject.

3.7 Each request for qualified construction workers made by Contractor or any subcontractor to a union hiring hall, business agent or contractor's association shall contain a recitation of the Boston Residents Construction Employment Standards in the form attached hereto

as **Exhibit E** and a request that referrals for construction positions be referred in the same proportion as outlined in the Boston Residents Construction Employment Standards; provided, however, that if at the time of any such labor request the requesting party's work force composition falls short of the Boston Residents Construction Employment Standards in any one or more categories, such labor request shall seek referrals in such proportion among such categories as would be necessary to more fully achieve the proportions set forth in the Boston Residents Construction Employment Standards. In the event that the union hiring hall, business agent or contractor's association to whom or to which such a request has been made fails to fully comply with such request, the requesting party's On-Site Monitor shall request written confirmation from the union hiring hall, business agent or contractor's association that there are insufficient workers in the categories specified in such request then shown on the list of unemployed workers maintained by such union hiring hall, business agent or contractor's association. Copies of any confirmation so obtained shall be submitted promptly to the Commission. Copies of any request for qualified workers made at a time that the requesting party's work force composition falls short of any one or more of the Boston Residents Construction Employment Standards shall be forwarded contemporaneously to the BRJP.

3.8 During construction of the Project, representatives of the Commission may visit the Project site periodically during normal working hours, to verify the information in the Weekly Utilization Reports, Residency Verification Forms or other documentation required pursuant to this Agreement. Such representatives shall comply with all safety and site control requirements imposed by the Developer or Contractor.

Section IV: DETERMINATION OF COMPLIANCE

4.1 Failure by the Developer, Contractor or any subcontractor, as the case may be, as determined by the Commission at the determination intervals set forth in Section 2.6 hereof, (i) to comply with this Plan and the Boston Residents Construction Employment Standards contained herein, or (ii) to use Best Efforts (as defined in Chapter 12 of the Ordinances of 1986, as amended) in attempting to comply with this Plan, the HCA, the Act, or the Boston Residents Construction Employment Standards, shall constitute noncompliance herewith. Any independent determination by the Commission of noncompliance as herein defined shall be made only after the Commission has held a public hearing upon the issue of such non compliance, notice of which shall have been given in writing to the Developer and Contractor at least thirty (30) days prior to such hearing.

Section V: SANCTIONS/CERTIFICATE OF COMPLIANCE

5.1 The Developer and Contractor shall be subject to only such sanctions as are authorized by Section 9 of the Ordinance, the Act, and the HCA, as the case may be.

5.2 In recommending or imposing sanctions hereunder, the Authority and the Commission shall comply with all of the terms, provisions, and procedures set forth in the Ordinance, the Act, the HCA, and in Section 4.1 hereof.

5.3 Pursuant to and in accordance with the Ordinance, the Developer shall deposit into an escrow account established by the Commission or the Authority an amount in cash or other suitable security equal to the lesser of (i) one tenth of one percent (0.1%) of the total cost of construction of the Project as stated in the building permit application or (ii) $10,000. Such deposit shall be made not later than issuance of a building permit for the Project. Such deposit shall be held until the Commission has issued a Certificate of Compliance (as hereinafter defined) for the Project indicating that the Developer and Contractor have complied with this Plan or have satisfied any fines recommended by the Commission. Upon issuance of such Certificate of Compliance, such funds (or any remaining portion thereof) will be returned to the Developer. Failure to deposit such sum shall itself be deemed noncompliance and shall be grounds for the imposition of sanctions, subject to the provisions hereof.

5.4 All fines recommended by the Commission in accordance with the Ordinance shall be deemed imposed upon the Developer by the Authority in its capacity as the contracting agency within the meaning of the Ordinance.

5.5 During the pendency of construction of the Project, the Developer may request from BRJP or counsel to the Commission, written confirmation of the status of the Developer's compliance with the provisions hereof with respect to the Project. Such written confirmation shall be provided as soon as practicable after receipt of such written request. Upon completion of construction of the Project (as evidenced by the final Certificate of Occupancy for the Project), the Commission shall, in accordance with the rules and regulations of the Commission, issue a "Certificate of Compliance" indicating that the Developer and Contractor have complied with this Plan with respect to the Project, and/or have satisfied any fines recommended by the Commission. If such is not the case, then the Commission shall so notify the Developer in writing, specifying the area(s) of noncompliance. Upon the curing of the same, the Commission shall promptly issue a Certificate of Compliance to the Developer with respect to the Project which shall be deemed approval by the Commission.

Section VI: MISCELLANEOUS

6.1 The provisions of this Plan are severable, and if any shall be held invalid, unconstitutional, or otherwise unenforceable by any court of competent jurisdiction, the decision of such court shall not invalidate or impair any of the remaining provisions.

6.2 This Plan shall be governed by and construed in accordance with the laws of the Commonwealth of Massachusetts.

6.3 All notices required or permitted to be given under this Plan shall be in writing, signed by duly authorized officers, and shall be deemed delivered if (i) mailed, postage prepaid, by registered or certified mail, return receipt requested, (ii) delivered by hand, or (iii) sent for overnight delivery by a nationally recognized courier service to the principal office of

the party to which it is directed, which is as follows unless otherwise designated by written notice to the other party:

Authority: Boston Redevelopment Authority
One City Hall Square, 9th Floor
Boston, MA 02201-1007
Attention: Director

with copy to: Boston Redevelopment Authority
One City Hall Square, 9th Floor
Boston MA 02201-1007
Attention: General Counsel

Commission: Boston Employment Commission
43 Hawkins Street
Boston, MA 02114
Attention: Counsel

BRJP: Office of Boston Residents Jobs Policy
43 Hawkins Street
Boston, MA 02114
Attention: Manager

Developer: Suffolk Sterling Racecourse, LLC
525 William F. McClellan Highway
East Boston, MA 02125
Attention: Chair of the Board and COO

With a copy to: DLA Piper LLP
33 Arch Street, 26th Floor
Boston, MA 02110-1447
Attention: Charles A. Baker, III

The Developer shall, upon selection of the Contractor, provide written notice to the Authority of the notice address for the Contractor.

6.4 From and after the date of this Plan, any increases in the percentages set forth in the Boston Residents Construction Employment Standards and any changes which serve to broaden the definitions of "Boston Resident" as set forth in the Ordinance shall not be applicable to the Project.

6.5 From time to time the Commission may modify the forms of reporting and documentation referred to in this Plan and attached as **Exhibits B, C, D** and **E**. The Developer agrees that upon receipt of written notice from the Commission of any such

modification or revision, the Developer will comply with any reasonable modifications within a reasonable time of receipt of such notice.

6.6 The liability of the Developer, and its successors and assigns (including, without limitation, mortgagees) arising hereunder shall be limited solely to its or their interest in the Project. Neither the Developer nor any trustee, beneficiary, partner, member, stockholder, manager, officer, director, agent or employee of the Developer or any of its or their successors and assigns (including, without limitation, mortgagees) shall be personally or individually liable under this Plan, nor shall it or they be answerable or liable beyond the extent of its or their then interests in the Project.

6.7 No trustee, beneficiary, partner, member, stockholder, manager, officer, agent or employee of Contractor or any of its successors and assigns shall be personally or individually liable under this Plan, nor shall it or they be answerable or liable beyond the extent of its or their then-interest in the Project.

6.8 Section titles of this Plan are for convenience of reference only, and shall be disregarded in construing any provision hereof.

6.9 In the case of any inconsistency between the provisions of this Plan, the HCA, the Act, and the Ordinance, or of the provisions of any rules or regulations which may be adopted by the Commission pursuant to the Ordinance, the provisions of the Ordinance shall govern.

6.10 This Plan shall be binding upon and enforceable against the successors and assigns of the parties hereto (other than mortgagees of the Project or those claiming through mortgagees of the Project unless said party obtains title to the Project and proceeds with development of the Project), it being understood and agreed that the Developer and its affiliates shall have a right to transfer or assign to another party or parties its or their rights and interests under this Plan and in all or a portion of the Project site.

6.11 It is the intention of the parties that the provisions of this Plan may be enforced only by the parties hereto, and that no other person or persons shall be authorized to undertake any action to enforce any provisions hereof without the prior written consent of the parties.

6.12 Nothing in this Plan shall be construed as an undertaking by the Developer to construct or complete the Project. If and to the extent that the Project is undertaken by the Developer, the sole obligation of the Developer shall be to fulfill the monetary and other obligations set forth in this Agreement with respect to the Project.

[Signatures on next page]

IN WITNESS WHEREOF, the undersigned have caused this Plan to be executed and delivered this __ day of _____, 201___.

Approved as to Form:

_____

General Counsel
Boston Redevelopment Authority

BOSTON REDEVELOPMENT AUTHORITY

By:_____
, Director

BOSTON EMPLOYMENT COMMISSION

By:_____
Name:
Title:

DEVELOPER, a _____

By:_____
Name:
Title:

Attachments to Boston Residents Construction Employment Plan

Exhibit A: Chapter 12 of the City of Boston Ordinances of 1986, as amended
Exhibit B: Projected Work Force Form
Exhibit C: Residency Verification Form
Exhibit D: Form of Weekly Utilization Report
Exhibit E: Form of Notice of Boston Residents Construction Employment Standards

Exhibit A
to
Boston Residents Construction Employment Plan

Chapter 12 of the City of Boston Ordinances of 1986, as amended by Chapter 17 of the City of Boston Ordinances of 1986

COUNCILLOR MENINO

SUBSTITUTION

CITY OF BOSTON

IN THE YEAR NINETEEN HUNDRED AND EIGHTY SIX

AN ORDINANCE.

ESTABLISHING THE BOSTON EMPLOYMENT COMMISSION

Be it ordained by the City Council of Boston, in accordance with the provisions of Massachusetts General Laws Chapter 43B, Section 13, and any other applicable law, as follows:

Preamble: Policy of the City of Boston

WHEREAS there is a need to ensure that Boston residents receive maximum benefits from the growing private economy of their city and the economic resurgence of office, hotel, retail, institutional, and unsubsidized residential development, including the permanent jobs which emanate from this economic expansion; and

WHEREAS there is unemployment and underemployment in the City of Boston, both among majority and minority residents; a

WHEREAS Boston is experiencing a resurgence in its econo that is creating the potential for unprecedented economic opportunity; and

WHEREAS Boston has fully established itself as the econo center for the entire New England region and is generating wealth and revenues for people throughout the region; and

WHEREAS one principal aspect of a strong and vibrant cit is the ability of its breadwinners to gain access to secure jobs that pay a living wage; and

AN ORDINANCE

have historically been underrepresented in the workforce; a

WHEREAS an Ordinance establishing the Boston Residents Policy, Ordinances of 1983, Chapter 30, was promulgated to insure that Boston residents, minorities, and women receiv preference in projects that have city funds or state or fe funds administered by the city; and

WHEREAS the Mayor issued an Executive Order relating t Boston Residents Jobs Policy, dated July 12, 1985, which established Resident Construction Employment Standards to further ensure employment for Boston residents, minoritie women; and

WHEREAS under the Boston Residents Jobs Policy, Bosto residents are enjoying greatly improved access to jobs in downtown construction industry; and

WHEREAS it is the policy of this City government to that all people enjoy fair and open access to employment permanent jobs in the private sector; and

WHEREAS it can be shown that broader cooperation fro private sector can produce meaningful employment opportu for Boston residents who want and need them; and

AN ORDINANCE

WHEREAS job placement is contingent upon proper job training and without necessary skills some Boston residents cannot secure permanent jobs; and

WHEREAS it is essential to the success of the 1983 Boston Residents Jobs Policy Ordinance and the 1985 Mayor's Executiv Order that projects and employment plans be monitored, that findings be made with respect to compliance, and that recommendations for sanctions be determined, and that all th be done in a manner that provides for the due process rights all parties; and

WHEREAS it is essential to engender an atmosphere of cooperation between the public and private sectors with resp to permanent jobs for Boston residents, minorities, and wom and

WHEREAS the following is declared to be in the public interest; now

THEREFORE, be it ordained as follows:

SECTION ONE: Definitions

For the purposes of this Ordinance, the following definitions shall apply, unless the context otherwise requi

AN ORDINANCE

(1) "Best Efforts." Developers and contractors may rely on traditional referral methods in the hiring of journeymen, apprentices, advanced trainees and helpers. Developers and contractors also shall implement affirmative action steps which include the following to the extent that such steps do not conflict with any applicable collective bargaining agreements:

As to Contractors:

(i) The contractor shall designate and shall require each subcontractor to designate an individual to serve as a compliance officer for the purpose of pursuing the Boston Residents Construction Employment Standards ("Standards").

(ii) Prior to the start of construction, the contractor and each subcontractor then selected shall meet with appropriate representatives of the construction trade unions, representatives from the Mayor's Office of Jobs and Community Services, and the awarding or contracting authority for the purpose of reviewing the Standards and the estimated employment requirements for construction

training programs of the particular trades participating in the Covered Project.

As to Developers:

(x) Developers of Covered Projects shall incorporate in every general construction contract or construction management agreement an enumeration of the Standards and shall impose a responsibility upon any such general contractor or construction manager to take all steps enumerated in clauses (i) - (ix) in Section One (1) and to incorporate such Standards in all subcontracts and impose upon all subcontractors the obligation to take such steps.

(xi) The developer shall meet with the contractor no less frequently than weekly throughout the period of construction of the Covered Project to review the contractor's compliance with such Standards and steps. The developer shall maintain minutes of such meetings and shall forward a copy of such minutes to the Mayor's Office of Jobs and Community Services within ten (10) days of each such meeting

activity over the construction period of the Covered Project.

(iii) Whenever any person involved in the construction a Covered Project makes a request to a union hiri hall, business agent or contractor's association for qualified construction workers, the request shall ask that those qualified applicants referre for construction positions be referred in the proportions specified in the Boston Resident Construction Employment Standards and shall, further, contain a recitation of such Standards. However, if the requesting party's workforce composition at any time falls short of any one o more of the proportions specified in the Standa the requesting party shall adjust his or her request so as to seek to more fully achieve the proportions specified in the Standards. If the union hiring hall, business agent or contractor association to whom a request for qualified employees has been made fails to fully comply w such request, the requesting party's compliance

officer shall seek written confirmation from the hall, agent o association that there are insufficient employees in the categories specified in the request and that such insufficienc is documented on the unemployed list maintained by the hall, agent or association. Copies of any confirmation so obtained shall be forwarded to the Commission. Copies of any requests for qualified employees made at a time that the requesting party's workforce composition falls short of any one or more such Standards shall be forwarded contemporaneously to the Skills Bank.

(iv) All persons applying directly to the Contractor o any subcontractor for employment in construction a Covered Project who are not employed by the pa to whom application is made shall be referred by said party to the Mayor's Office of Jobs and Community Services, and a written record of such referral shall be made by said party, a copy of which shall be sent to such Office of Jobs and Community Services.

(v) Contractors shall maintain a current file of the

names, addresses, and telephone numbers of each Boston resident, minority, and woman who has sought employment with respect to a Covered Project, or who was referred to the contractor by the Mayor's Office of Jobs and Community Servic but was not hired. The contractor shall maintain a record of the reason any such person was not hired. If the constructio of the Covered Project is subject to any union collective bargaining agreements, it shall be deemed a sufficient reaso for failure to hire that the applicant for employment was no union member.

(vi) The contractor shall in a timely manner complete and submit to the Commission a projection of workforce needs over the course of the construc of the Covered Project. Such a submission shall reflect needs by trade for each month of the construction process.

(vii) The contractor shall obtain from each worker employed in the construction of the Covered Pro a sworn statement containing the worker's name place of residence.

AN ORDINANCE

(viii) One week following the commencement of construct of the project, and each week thereafter until s: work is completed, the contractor shall complete and submit to the Mayor's Office of Jobs and Community Services for the week just ended a rep which reflects (a) for each employee, the employee's name, place of residence, race, gende trade and the total number of worker hours he or she worked, and (b) the total worker hours of it total workforce.

(ix) The contractor and each subcontractor shall maintain records reasonably necessary to ascerta compliance with the steps detailed in clauses (i through (viii) hereof for at least one year afte the issuance of a Certificate of Occupancy for t Covered Project. In its review of records of a construction project submitted to demonstrate compliance with these steps, the Commission shal take into consideration any affirmative action outreach programs and affirmative action job

CITY OF BOSTON

IN THE YEAR NINETEEN HUNDRED AND

AN ORDINANCE

AMENDING THE BOSTON EMPLOYMENT COMMISSION

Be it ordained by the City Council of Boston, in accordance with the provisions of Massachusetts General Laws Chapter 43B, Section 13, and any other applicable law, as follows:

SECTION ONE: The Ordinance establishing the Boston Employment Commission is hereby amended in section one (v) by striking the last sentence as it appears and inserting the following in place thereof "If the construction of a the Covered Project is subject to any union collective bargaining agreements, it shall be required that the employee complies with any lawful union security clauses contained in such agreement."

SECTION TWO: This Ordinance shall take effect upon passage.

In City Council September 10, 1986. Passed.
Approved by the Mayor September 26, 1986.

Attest:

City Clerk

(xii) The developer shall comply with the escrow deposit requirements of Section Eight hereof.

(2) "Boston Employment Commission", hereinafter "Commission." There shall be in the City a Commission known a the Boston Employment Commission, consisting of seven (7) members, all appointed by the Mayor. The Commission shall hav the powers and duties set forth in Section Three herein. The members of the Commission shall be deemed special municipal employees for purposes of Chapter 268A of the Massachusetts General Laws.

(3) "Boston Resident." Any person for whom the princip place where that person normally eats and sleeps and maintai his or her normal personal and household effects is within t city limits of the City of Boston.

(4) "Boston Residents Construction Employment Standard The standards as contained below:

(i) At least fifty percent (50%) of all Worker-Hour a craft-by-craft basis in Covered Projects shal worked by Boston Residents;

(ii) At least twenty-five percent (25%) of all

AN ORDINANCE

Worker-Hours on a craft-by-craft basis in Covered Projects shall be worked by Minority Persons;

(iii) At least ten percent (10%) of all Worker-Hours on a craft-by-craft basis in Covered Projects shall be worked by women.

(5) "Boston Resident New Hire Goals" The Commission will determine baseline hiring goals for Boston residents, minorities and women, such determination to be based upon a consideration of:

(i) current workforce composition;

(ii) the composition of the workforce that is unemployed

(iii) numbers and categories of new job opportunities being created in Boston; and

(iv) an examination of employment trends in Boston over the last 5 years.

The Commission shall reevaluate annually, and modify if appropriate, such goals based upon the number of permanent full-time equivalent new hires of Boston residents, minorities and women during the previous calendar year.

(6) "Covered Projects." All projects, contracts, or

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agreements within the jurisdiction of:

(i) the Boston Residents Jobs Policy, Ordinances of 1983, Chapter 30 (hereinafter referred to as "Jobs Ordinance") and for which the contract or agreement is executed after the effective date of this ordinance; and

(ii) any new construction or substantial rehabilitation project in the city to which any partial or full building permit has not already been issued for this specific construction or rehabilitation, dedicated to a retail, restaurant, and/or institutional use as defined in the Boston Zoning Code, which requires approval by the Zoning Board of Appeals and in which it is proposed to erect a structure or structures having a total gross floor area (exclusive of all accessory parking garage space) in excess of one hundred thousand (100,000) square feet or to enlarge or extend a structure or structures so as to increase its (or their) gross floor area (exclusive of all accessory parking

AN ORDINANCE

garage space) by more than one hundred thousand (100,000) square feet or to substantially rehabilitate a structure or structures having, or to have, after rehabilitation, a gross floor area (exclusive of accessory parking garage space) of more than one hundred thousand (100,000) square feet.

(7) "Major Employer." Any corporation, partnership, individual, or institution which employs more than five hundred people to work within the City of Boston.

(8) "Mayor's Office of Jobs and Community Services," hereinafter "OJCS". The agency within the City of Boston government responsible for compiling compliance information in accordance with the Boston Residents Construction Employment Standards and the Minority Business Enterprise/Women's Business Enterprise Programs.

(9) "Minority Business Enterprise" ("MBE") A business organization in which 51% in the aggregate of the beneficial ownership is held by one or more minority persons.

(10) "Womens Business Enterprise" ("WBE") A business organization in which 51% in the aggregate of the beneficial ownership is held by one or more women.

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(11) "Minority Person" or "Minority". Any person who is Black, Hispanic, Asian, or Native American, as these terms are defined by the United States Census Bureau.

(12) "Permanent Job." Any full-time position, or its equivalent, that an employer would fill year-round and contin to fill indefinitely in a particular location.

(13) "Skills Bank." A job screening and referral bank maintained by OJCS, which shall refer residents to available jobs and/or to appropriate training programs, including but n limited to, programs offered at the Hubert Humphrey Occupational Resource Center.

(14) "Voluntary Employment Plan." Any plan to promote hiring for jobs in Boston of Boston residents, minorities, and/or women developed by a Major Employer or a group of Maj Employers.

(15) "Worker-Hours." The sum total of all hours worked all persons performing construction work.

SECTION TWO: Scope of Jurisdiction

The Commission's jurisdiction shall extend to: (1) Cove Projects and (2) assistance in the formulation and monitorin

AN ORDINANCE

of Voluntary Employment Plans.

SECTION THREE: Powers and Duties

A. Covered Projects

(1) The Commission shall make determinations as t compliance by developers and contractors with the Boston Residents Construction Employment Standards. The Commission shall gather and receiv compliance information from OJCS, investigate noncompliance complaints, make compliance determinations and, where appropriate, shall recommend sanctions to the awarding or contracting authority. The Commission may gather compliance information at any time and shall make compliance determinations in phases for each Covered Project in accordance with Sections Five, Six and Seven herein. For projects under construction upon the passage of this ordinance, all existing contracts and agreements shall remain in full force and effect and the provisions of this ordinance shall not otherwise apply.

AN ORDINANCE

(2) The Commission shall have the authority to require developers of Covered Projects to submit: (i) detailed plans which show how the developer intends to meet the Boston Residents Construction Employment Standards; and (ii) detailed plans which show how the developer intends to meet MBE/WBE goals contained in or applicable to City contracts.

(3) In the review of such detailed plans, the Commission shall consider any affirmative action outreach programs and affirmative action job training programs of the particular trades participating in the Covered Project and participation, if any, of the developer or the contractor in any such program.

(4) The Commission shall monitor MBE/WBE goals contained in or applicable to City contracts. The Commission shall receive compliance information from OJCS and shall recommend to the awarding or contracting authority appropriate remedies for

noncompliance.

(5) The Commission shall monitor Davis-Bacon Act requirements contained in City agency or authority contracts. The Commission shall receive complianceinformation and shall forward any information concerning apparent noncompliance to appropriate federal agencies.

B. Voluntary Employment Plans

(1) The Commission shall meet with a group of representatives of Major Employers to review voluntary aggregate hiring goals set by said employers.

(2) The Commission shall receive information concerning the success in meeting the voluntary aggregate hiring goals.

The Commission shall encourage a group represent the Major Employers to issue an annual public report on the success of this effort and of voluntary business programs such as Boston Summe Jobs Program, the Boston Compact and BostonWorks

(3) The Commission shall encourage Major Employe to adopt Voluntary Employment Plans, which promot a collaboration between the public and private sectors to expand employment opportunities for Boston residents, minorities and women. The Commission shall encourage Major Employers to incorporate the Boston Resident New Hire Goals i their Voluntary Employment Plans. The Commissio shall advise OJCS and other City agencies of the amounts and types of assistance identified by Ma Employers as being necessary to achieve the goal included in their Voluntary Employment Plans. S assistance may include, but is not limited to, j training, adult literacy and referral services. The Commission may conduct surveys to assess the progress made toward hiring goals as to Boston residents, minorities and women.

C. General

(1) The Commission shall have the authority to promulgate regulations as to matters within the

AN ORDINANCE

Commission's purview after public notice and hearing and upon majority vote of all members.

(2) The Commission shall cause to be created, in conjunction with the Mayor's Office of Jobs and Community Services, a job training program. Said job training program shall be conducted at the appropriate sites which may include the Hubert Humphrey Occupational Resource Center, or its successor, or other appropriate skills training facilities. The purpose of said training program is to provide skills training to any Boston Resident in order to be fully qualified for entry into existing apprenticeship programs or jobs. Subject to appropriation by the Mayor and the City Council, any fines levied against the escrow fund set out in Section Eight shall be for the benefit of this jobs training program and no other.

SECTION FOUR: Composition

The Commission shall be composed of seven (7) members, all of whom shall be appointed by the Mayor. The Commission shall

AN ORDINANCE

be representative of the interests of business, minorities, women, organized labor, Boston Building Trades Council, and th Mayor's Jobs Liaison Committee. Members of the Commission shall have demonstrated commitment to equal employment opportunity. All members of the Commission shall be Boston residents or shall maintain their principal place of business in Boston.

(1) Term of Office

Commission members shall be appointed to two-year terms, and members shall serve until their successors are duly appointed. If a vacancy on the Commission occurs before a te expires, that vacancy shall be filled by appointment by the Mayor for the balance of the unexpired term.

(2) Removal

The Mayor may remove a member for just cause by filing a written statement to that effect with the City Clerk. Reason for just cause shall include but not be limited to a pattern nonattendance, lack of residency or employment in the City of Boston, noncompliance with the procedures established under Section Five herein, failure to disclose conflicts of interes

incapacity due to illness, or conviction of a crime. The Mayor's determination that just cause for removal exists shall be conclusive.

(3) Chair.

The Chairperson of the Commission shall be designated by the Mayor and shall serve in that capacity for a term of two years.

(4) Quorum

In no event shall a quorum be fewer than four members of the Commission.

(5) Voting

Every vote of the Commission shall require an affirmative vote of no fewer than four (4) members of the Commission.

SECTION FIVE: Procedures

Actions or determinations under Section Seven, Eight or Nine herein shall be taken or made in accordance with the following administrative procedures:

(1) Hearings and Notice to Parties. A party subject t the jurisdiction and recommendation power of the Commission shall be entitled to a hearing and shal

be given at least fourteen (14) calendar days notice of any such hearing directly affecting his or her interests, such notice to be in writing to the party and sent by mail, postage prepaid, first class, to the party's usual place of business.

(2) Method. Decisions to recommend sanctioning a party shall require a majority vote of the Commission. The Commission shall adopt procedures, voted by a majority of all members, to establish the time, place, and manner for its members to meet and vote and for making determinations of compliance and recommendations to awarding authorities or agencies. All protections necessary to fulfill due process requirements shall be incorporated in the aforementioned procedures. Such procedures and any revisions to such procedures shall be submitted in writing to the Mayor and OJCS within twenty-one (21) calendar days of their scheduled adoption.

(3) Public Meetings. The Commission shall be subject to the requirements of the Massachusetts Open Meetings Law, G.L. c.39, §23A-C.

incapacity due to illness, or conviction of a crime. The Mayor's determination that just cause for removal exists shall be conclusive.

(3) Chair

The Chairperson of the Commission shall be designated by the Mayor and shall serve in that capacity for a term of two years.

(4) Quorum

In no event shall a quorum be fewer than four members of the Commission.

(5) Voting

Every vote of the Commission shall require an affirmative vote of no fewer than four (4) members of the Commission.

SECTION FIVE: Procedures

Actions or determinations under Section Seven, Eight or Nine herein shall be taken or made in accordance with the following administrative procedures:

(1) Hearings and Notice to Parties. A party subject to the jurisdiction and recommendation power of the Commission shall be entitled to a hearing and shal

(4) Records.

The Commission shall keep records of its meetings and shall record no less than the following: the time and place of the meeting; the topic(s) discussed at the meeting; members in attendance at the meeting; any votes taken; and any disclosure of members of conflicts of interest. The Chairperson or his or her designee shall maintain such records in a good and legible condition. The records shall be available for inspection by any member of the public upon reasonable notice.

SECTION SIX. Standards for Compliance

The Commission shall use the Boston Residents Construction Employment Standards to monitor compliance of Covered Projects with this ordinance. A Covered Project shall be deemed to be in compliance if (1) the statistical monitoring data at the relevant determination date, as set forth in Section Seven hereof shows compliance with the Boston Residents Construction Employment Standards; or (2) if the Commission determines that Best Efforts have been made to comply with the Boston Residents

AN ORDINANCE

Construction Employment Standards.

SECTION SEVEN: Determination of Compliance

The Commission shall make determinations as to compliance by developers and contractors of Covered Projects with the Boston Resident Construction Employment Standards at time intervals as set out in one of the following two schedules, whichever allows for more frequent determinations:

(1) When the Covered Project is 25, 50, 75 and 100 percent complete, or,

(2) Every three months from the date of commencement of the Covered Project.

"Percent complete" shall be measured by the percentage of the total worker hours expected to be worked on the project. The Commission shall monitor that percentage and shall include it in its monitoring reports.

SECTION EIGHT: Establishment of Escrow Fund

An escrow fund shall be established for each project which is a Covered Project, as defined in Section One (6)(ii) herein. Payment into the escrow fund shall be made by the developer when the developer secures permanent financing for

the Covered Project. The developer shall pay into the escrow fund an amount equal to one-tenth of one percent (.1%) of the total construction cost of the project as stated in the building permit application for the Covered Project; provided, however, that if either the developer or contractor has been subject to a determination of noncompliance at more than two determination dates in any prior Covered Project in which the have participated in the preceeding twenty-four months, the amount of the escrow fund required for the Covered Project shall be two-tenths of one percent (.2%) of such construction cost. The developer shall deposit these funds with an escrow agent agreed upon by the parties pursuant to an escrow agreement to which the Commission, the awarding or contracting agency and the developer are parties, who shall hold said fur for the purpose of satisfying any accrued fines levied in relation to a project.

The escrow agent, at the time of deposit into the escrow account, shall deduct all fines which have accrued against t fund to that date. There shall be a written escrow agreemen detailing the terms under which the escrow funds are held.

Such agreement shall provide, at a minimum, that any demand fo payment from the escrow account which is made upon the escrow agent by the awarding or contracting authority shall be made i writing and shall be accompanied by a written statement of the reason for such demand, including any factual findings supporting such reason. The demand shall further instruct th escrow agent that he/she is to take no action on the demand f at least forty-eight (48) hours after receipt. A copy of the demand shall be simultaneously served upon all other parties the escrow agreement.

Interest, if any, accrued by the fund, shall remain in an become a part of the escrow fund until such time as the fund shall be released. When all necessary permits for the use of the building have been issued to the developer, including but not limited to an occupancy permit and a finding of complianc has been made by the Commission, all monies in the escrow fu including any accrued interest, shall be released and returne to the developer.

SECTION NINE: Sanctions

The Commision shall have the authority to recommend to t

awarding or contracting agency that sanctions against the developers and contractors of Covered Projects be imposed for noncompliance with the Boston Residents Construction Employment Standards and/or for non-compliance with section Three (A)(2) of this ordinance. The Commission shall recommend the imposition of any or all three of the following sanctions:

(1) Fines to a maximum of three hundred dollars ($300.00) for each violation as determined by the Commission when such developer or contractor was not in compliance, as defined in Section Six, each day of non-compliance to be considered as a separate violation, to be levied against the escrow fund as established by Section Eight herein, provided that fines may still be levied and will still be due if the escrow account is exhausted;

(2) Preclusions from the award of municipal contracts and competitions for public development rights for a period of up to three (3) years, provided that this sanction may only be recommended at the

completion of the Covered Project; or

(3) Sanctions as authorized by the Jobs Ordinance or incorporated in contracts.

The recommendation of sanctions under this section shall not preclude and shall be in addition to any action or sanction authorized by contract or agreement or otherwise authorized by law.

SECTION TEN: Staffing

The Commission shall have staff consistent with the Commission's purpose. The Director of OJCS shall be the Executive Director of the Commission, provided, however, that said Director shall be wholly compensated for his/her duties as Director from the budget of OJCS.

SECTION ELEVEN: Conflicts of Interest

No member shall appear before the Commission or represent any person, firm, corporation or other entity in any matter pending before the Commission. Members shall not participate in a discussion or a decision of the Commission on any matter in which they are directly or indirectly interested in a personal or a financial sense. Any disclosure of conflict of

AN ORDINANCE

interest shall be entered into the records of the Commission

SECTION TWELVE: Severability

The provisions of this ordinance are severable, and if a provision shall be held invalid or unconstitutional by a decision of any court of competent jurisdiction such invalid shall not impair, or otherwise affect, any other provisions this ordinance.

SECTION THIRTEEN: Effective Date

This ordinance shall take effect 30 days after enactmen

In City Council July 30, 1986. Passed.

Approved by the Mayor August 12, 1986.

Attest:

City Clerk

Exhibit B
to
Boston Residents Construction Employment Plan

Projected Work Force Form

BRJP
EMPLOYMENT PLAN
QUARTERLY WORK FORCE PROJECTION TABLE

PROJECT:			
CONTRACTOR:	ADDRESS:		
CONTACT:	PHONE NUMBER:		
QUARTER START DATE:	QUARTER END DATE:		
MONTH			
TRADE:			
TOTAL EMPLOYEES			
RESIDENT EMPLOYEES			
MINORITY EMPLOYEES			
FEMALE EMPLOYEES			
TRADE:			
TOTAL EMPLOYEES			
RESIDENT EMPLOYEES			
MINORITY EMPLOYEES			
FEMALE EMPLOYEES			
TRADE:			
TOTAL EMPLOYEES			
RESIDENT EMPLOYEES			
MINORITY EMPLOYEES			
FEMALE EMPLOYEES			
TRADE:			
TOTAL EMPLOYEES			
RESIDENT EMPLOYEES			
MINORITY EMPLOYEES			
FEMALE EMPLOYEES			
TRADE:			
TOTAL EMPLOYEES			
RESIDENT EMPLOYEES			
MINORITY EMPLOYEES			
FEMALE EMPLOYEES			

COMPANY OFFICIAL'S SIGNATURE: _____ DATE: _____

Exhibit C
to
Boston Residents Construction Employment Plan

Residency Verification Form

Exhibit C

BOSTON RESIDENT VERIFICATION FORM

This form must be submitted to verify the address of all Boston resident employees and to report the change of address for any Boston resident employee while working on this project.

Check if reporting an address change. ☐ Date moved: _____

Project Name: _____

Contractor Name: _____

Employee Name: _____ Race: Sex:

Address: _____

City: _____

State & Zip: _____

Phone: _____

Race Codes
- A. Asian
- B. Black
- C. Caucasian
- H. Hispanic
- O. Other (specify)
  - ☐ Native American
  - ☐ Cape Verdean

Date Arrived on Job Site: **Trade:** _____

Check if Applicable: ☐**Non-union** ☐**Union (Local)** ☐**New Hire** ☐**Transfer**

I hereby state under the pains and penalties of perjury that the foregoing information is true.

Signature of Employee: _____ Date: _____

PLEASE ATTACH A PHOTOCOPY OF ONE OF THE BELOW DOCUMENTS AS PROOF OF RESIDENCY.

_____ Driver's License (current)

_____ Massachusetts Identification Card (current)

_____ Utility Bill (Bill must be less than 6 months old)

Signature of Contractor
or Subcontractor: _____ Date:

RACE AND ETHNIC STANDARDS

C) CAUCASIAN: A person having origins in any of the original peoples of Europe, North Africa, or the Middle East.

B) BLACK: A person having origins in any of the black racial groups of Africa.

H) HISPANIC: A person of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish/
Indian cultural origins. (This category is not to include people of European or Arabic ancestry.)

A) ASIAN OR PACIFIC ISLANDERS: A person having origins in any of the original peoples of the Far East, Southeastern Asia, the Indian Subcontinent, or the Pacific Islands. This area includes China,
Japan, Korea, the Philippine Islands, Samoa, India, Pakistan, Bangladesh, Sri Lanka, Nepal, Sikhism,
and Shulan.

O) NATIVE AMERICAN OR ALASKAN NATIVE: A person having origins in any of the original peoples of North America, and who maintain cultural identification through tribal affiliation or community recognition.

O) CAPE VERDEAN: A person having origins in any of the original peoples of the Cape Verde Islands.

NOTE: Ethnic classifications are based on section one, (11) of the 1986 Ordinance establishing the Boston Residents Jobs Policy as defined by the U.S. Bureau of the Census and promulgated
by the Federal Office of Management and Budget.

AREAS THAT COMPRISE THE CITY OF BOSTON

Allston
Charlestown
Dorchester
Fenway/Kenmore
Jamaica Plain
Mission Hill/Longwood
Readville
Roxbury
South End



Brighton
Chinatown
East Boston
Hyde Park
Mattapan
North End
Roslindale
South Boston
West Roxbury

Revised September 29, 2005

BRJP OFFICE – TRADECODE DESCRIPTION

ASBESTOS WORKER
ASPHALT RAKER
BLASTER
BRICKLAYER
CARPENTER
CARPET LAYERS
CEMENT FINISHER
CEMENT LABORER
CURBSETTER/PAVER
DRILLER
ELECTRICIAN
ELEVATOR CONSTR. HELPER
ELEVATOR CONSTRUCTOR
EQUIPMENT OPERATOR
FLOOR COVERER
GLAZIER
GROUNDMAN
HVAC
INSTALLER/APT WIRER
INSULATOR
IRON WORKER
LABORER
LINEMAN
MARBLE TILE WORKER
MASON
MASON TENDER
METAL REFINISHER
MILLWRIGHT
OILER
PAINTER
PILEDRIVER
PIPEFITTER
PIPELAYER
PITCHWORKER
PLASTERER
PLUMBER
PUMPMAN
ROOFER
SANDBLASTER
SHEETMETAL WORKER
SPLICER
SPRINKLER FITTER
TAPER
TERRAZZO WORKER
TREE SURGEON
WATERPROOFER
WELDER
WRECKER

If the trade utilized by your company is not listed above, please contact the BRJP Construction Monitor for your project.

Exhibit D

Form of Weekly Utilization Report

Boston Residents Jobs Policy Office

43 Hawkins Street • Boston, Massachusetts, 02114
• Phone (617) 918-5460 • Fax (617) 918-5474

WEEKLY UTILIZATION REPORT

For MIS use only:
Project #: _____
Contractor #: _____

Project Name: _____
Project Location: _____
Contractor Name: _____
Contractor Address: _____
Contractor Phone: _____
Week No. _____ Week of _____ to: _____

PLEASE CHECK ONE:

General: ☐
Subcontractor: ☐
Final Weekly: ☐

RACE CODES:
A. Asian
B. Black
C. Caucasian
H. Hispanic
O Other (specify)
☐ Native American
☐ Cape Verdean

Award Department: _____ Projected Completion Date: _____

General Contractor: _____
Federal Prevailing Wage Contracts Only: _____

SSN / Sex / Race	Employee Name / Street, City, State, Zip Code	Trade	OT / ST	S	M	T	W	T	F	S	Tot. Hours	Pay Rate	Gross Earn	FICA	Wthld Tax	State Wthld	Union	Total	Net Wage
				Daily Work Hours															
			O																
			S																
			O																
			S																
			O																
			S																
			O																
			S																
			O																
			S																
			O																
			S																
			O																
			S																

Name:	Signature	Date
Title:		

The willful falsification of any of the above statements may subject the contractor or subcontractor to civil or criminal prosecution. See section 1001 of Title 10 and section 231 of Title 31 of the U.S. Code.

TALLY	TOTAL	Resident	Minority	Female
Worker Hours				
Worker Percentage				

Date _____

I, _____ , _____
(NAME OF SIGNATORY PARTY) (TITLE)

do hereby state:

(1) That I pay or supervise the payment of the persons employed by _____

_____ on the _____
(CONTRACTOR OR SUBCONTRACTOR) (BUILDING OR WORK)

_____ ; that during the payroll period commencing on the _____

day of _____ , 19 ____ , and ending the _____ day of _____, 19 ____,

all persons employed on said project have been paid the full weekly wages earned, that no rebates have been or will be made either directly or indirectly to or on behalf of said

_____ from the full
(contractor or subcontractor)

weekly wages earned by any person and that no deductions have been made either directly or indirectly from the full wages earned by any person, other than permissible deductions as defined in Regulations, Part 3 (CFR Subtitle A), issued by the Secretary of Labor under the Copeland Act, as amended (48 Stat. 948; 63 Stat. 108; 72 Stat. 967; 76 Stat. 357; 40 U.S.C. 276c), and described below:

_____

_____

_____

_____

(2) That any payrolls otherwise under this contract required to be submitted for the above period are correct and complete; that the wage rates for laborers and mechanics contained therein are not less than the applicable wage rates contained in any wage determination incorporated into the contract; that the classifications set forth therein for each laborer or mechanic conform with the work he preformed.

(3)That any apprentices employed in the above period are duly registered in a bona fide apprenticeship program registered with a State apprenticeship agency recognized by the Bureau of Apprenticeship and Training, United States Department of Labor, or if no such recognized agency exists in a State, are registered with the Bureau of Apprenticeship and Training, United States Department of Labor.

(4) That:

(a) WHERE FIRNGE BENEFITS ARE PAID TO APPROVED PLANS, FUNDS OR PROGRAMS

☐ - In addition to the basic hourly wage rates paid to each laborer or mechanic listed in the above referenced payroll, payments of fringe benefits as listed in the contract have been or will be made to appropriate programs for the benefit of such employees, except as noted in Section 4(c) below.

(b) WHERE FRINGE BENEFITS ARE PAID IN CASH

☐ - Each laborer or mechanic listed in the above referenced payroll has been paid, as indicated on the payroll, an amount not less than the sum of the applicable basic hourly wage rate plus the amount of the required fringe benefits as listed in the contract, except as noted in Section 4(c) below.

(c) EXCEPTIONS

EXCEPTION (CRAFT)	EXPLANATION

REMARKS

NAME AND TITLE	SIGNATURE

THE WILLFUL FALSIFICATION OF ANY OF THE ABOVE STATEMENTS MAY SUBJECT THE CONTRACTOR OR SUBCONTRACTOR TO CIVIL OR CRIMINAL PROSECUTION, SEE SECTION 1001 OF TITLE 18 AND SECTION 231 OF TITLE 31 OF THE UNITED STATES CODE.

Exhibit E
to
Boston Residents Construction Employment Plan

Form of Notice of Boston Residents Construction Employment Standards

APPLICANT DISPOSITION FORM

DATE:	PROJECT NAME:	CONTRACTOR:
APPLICANT NAME:		MIN ___ RES ___ FEM ___ (Please check all that apply)
ADDRESS:		TEL. NO.:
POSITION APPLIED FOR:		☐ NON-UNION ☐ UNION:(PLEASE SPECIFY)
LIST ALL TRADES EXPERIENCED IN:		
RECRUITMENT SOURCE (PLEASE SPECIFY):		
RESULTS: _____ HIRED _____ NOT HIRED REASON: _____ _____ REFERRED TO UNION: RESULT: _____ _____ REFERRED TO SUBCONTRACTOR _____ HIRED _____ NOT HIRED REASON NOT HIRED: _____		

ALL REFERRALS REQUIRE A FOLLOW-UP PHONE CALL EITHER TO THE LOCAL UNION, THE BOSTON RESIDENTS JOBS POLICY OFFICE AND/OR SUBCONTRACTOR TO WHOM THE REFERRAL WAS MADE TO:

CONTACT PERSON: _____

FOLLOW-UP RESULTS: _____

_____

WORK FORCE REQUEST DOCUMENTATION

PROJECT: _____

Submit this form when requests for new employees are made.

FROM:			
DATE REQUESTED:	DATE REQUIRED:		
LOCAL #:			
REQUEST MADE TO:			
NAME:			
I. REQUEST (S) MADE TO UNION:			
TRADE:			
TOTAL	RESIDENT	MINORITY	FEMALE
TRADE:			
TOTAL	RESIDENT	MINORITY	FEMALE
REQUEST MADE BY:			
NAME:			
II. ACTUAL EMPLOYEE (S) SENT BY UNION:			
TRADE:			
TOTAL	RESIDENT	MINORITY	FEMALE
TRADE:			
TOTAL	RESIDENT	MINORITY	FEMALE

Please note this form should be used for all telephone calls made to your local union representative, when requesting workers. Please have your union follow-up in writing with your request and submit it to the general contractor. Workforce Request Documentation Forms without a follow-up letter will not be considered as a "Best Faith Effort".

EXHIBIT I-3

BOSTON RESIDENTS EMPLOYMENT AGREEMENT

Suffolk Downs Resort Casino Project
525 William F. McClellan Highway, East Boston, Massachusetts

This Boston Residents Employment Agreement ("Agreement") is made as of the ___ day of _____, 2013, by and between the Office of Jobs and Community Services ("JCS"), a division of the Economic Development Industrial Corporation ("EDIC") and [_____], a _____ [_____], having an address c/o Suffolk Sterling Racecourse, LLC, 525 William F. McClellan Highway, East Boston, Massachusetts 02128 (the "Developer").

The Developer is the developer of a project known as the Suffolk Downs Resort Casino Project (the "Development"). The Developer is a party to a Cooperation Agreement, a Development Impact Project Plan Agreement, a Boston Residents Construction Employment Plan Agreement, and a Transportation Access Plan Agreement (collectively, the "Development Agreements"). The Development has been reviewed by the Boston Redevelopment Authority (the "BRA") in accordance with Article 80B of the Boston Zoning Code and an Adequacy Determination under said Article 80 has been issued. **[TO BE ADDED TO EXTENT DEVELOPMENT APPROVED AS A 121A PROJECT; The Development has also been the subject of an approval by the BRA as a project approved under Chapter 121A of the General Laws of the Commonwealth of Massachusetts and Chapter 652 of the Acts of 1960, each as amended ("Chapter 121A").]** The Development will be operated by Caesars Massachusetts Management Company, LLC, or its affiliates, who will manage and/or operate the Development ("Operator").

Pursuant to the Host Community Agreement dated as of _____, 2013 by and between the City of Boston, a municipal corporation, and the Developer (the "HCA"), the Developer has agreed to formulate and submit to JCS a voluntary employment opportunity plan, the purpose of which is to detail the Developer's good faith efforts on its own behalf and its good faith efforts to encourage Operator to fill with, or make available to, Boston residents with certain employment opportunities created in four thousand (4,000) permanent jobs to be created at the Development. Working in cooperation with JCS and the Boston Employment Commission ("BEC"), the Developer, by agreeing to the provisions set forth herein and by signing this Agreement, has formulated such a plan, and has agreed to encourage Operator and other occupants of the Project to pursue the plan at the Development.

The Employment Opportunity Plan (the "Plan") set forth in this Agreement focuses upon steps which the Developer can take on its own behalf and its good faith efforts to encourage Operator to hire Boston residents for new job openings. The following paragraphs set forth the Plan:

I. Undertakings by Developer

A. With respect to all jobs created at the Development, the Developer will encourage Operator, other occupants of the Development, and the successor or assign of such Development, to notify at least one of Boston's One-Stop Career Centers when such Development is being filled with jobs prior to announcing or advertising the availability of any employment position.

B. With respect to all jobs created at the Development, the Developer will, or will encourage Operator, other occupants of the Development and successor or assign of Operator or any such other occupants of the Development, to utilize at least one of Boston's One-Stop Career Center as one of its recruiting methods for available employment opportunities.

C. The Developer shall provide to Operator, and any other occupants of the Development, the information regarding resources available through one of Boston's One-Stop Career Center, the City of Boston Neighborhood Jobs Trust and JCS, which information is attached to this Agreement as **Exhibit A**.

D. The Developer shall impose a local hiring program for permanent jobs at the Development that will include the following components:

1. Host and maintain a central job bank website (in English and Spanish) as a micro-site within the larger Development website.

2. The Developer will provide City residents with advance notice of hiring activities by publishing announcements in local newspapers approximately four (4) to eight (8) consecutive weeks prior to initial hirings.

3. Residents of Boston (together with residents of host and surrounding communities (as defined in the Act)) will be given first priority to apply for jobs during a specified "advance period," such advance period to be established jointly by the Developer and the Gaming Accountability Office of the City of Boston.

4. Written flyers in English and Spanish will be distributed to local community-based organizations in East Boston to inform people about local advance period hiring and the Developer shall use best efforts to otherwise notify residents in the low income neighborhoods in East Boston proximate to the Development of potential job opportunities.

E. The Developer will donate a minimum of twenty-five (25) computers to be placed in strategic areas in East Boston neighborhoods (e.g. local libraries or community centers) as well as install and maintain a minimum of two (2) computers on-site to ensure that residents without computers can research and apply online for jobs at the Development.

F. During the Term of this Agreement, the Developer will hold job fairs at the Development to make City residents aware of job opportunities available at the Development.

G. The Developer will utilize best efforts to use the existing labor force in the Commonwealth, and in particular the existing labor force in the City, when hiring for new jobs, as required by M.G.L. c. 23K, Section 18(17).

H. The Developer will make best efforts to ensure that fifty percent (50%) of permanent employees at the Development are City residents, of which a substantial percentage should be from the East Boston community, all as more particularly set forth in the HCA.

I. In furtherance of specific goals for the utilization of minorities, women and veterans permanent jobs, the Developer shall send to each labor union or representative of workers with which the Developer has a collective bargaining agreement or other contract or understanding, a notice advising the labor union or workers' representative of the Developer commitments.

J. During the term of this Agreement, the Developer shall use best efforts to work with the City's Public Schools Department to establish school-to-work programs for hospitality jobs at the City's vocational or public high schools.

K. During the term of this Agreement, the Developer shall support the efforts of, and actively engage with, the Commission and community colleges to develop the Massachusetts Community College Workforce Training Institute and Massachusetts Casino Careers Training Institute at community colleges in the Commonwealth.

L. During the term of this Agreement, upon request by the Gaming Accountability Office, the Developer shall provide the Gaming Accountability Office with information regarding its contracts with organized labor, including hospitality services, the number of employees employed at the gaming establishment, including detailed information on the pay rate and benefits for employees and contractors, and the Developer's plans to ensure labor harmony during all phases of the construction, reconstruction, renovation, development and operation of the gaming establishment.

M. After the Early Opening Operations Commencement Date (as defined in the HCA) through the remainder of the term of this Agreement, the Developer shall establish a program or partnership to provide off-site child day-care in accordance with Section 18(9) of the Act.

N. The Developer shall implement a training and development program for permanent jobs at the Project that will include the following components:

1. Provide opportunities for team members to pursue personal and professional growth, to enjoy satisfying careers, to participate in training and development programs and to celebrate success including rewards and recognition for superior performance against measurable goals.

2. Provide new employees with learning programs such as the "Empire Series." The Empire Series is Operator's best-in-class and award winning learning program for all new employees. This program offers a lively and engaging environment that uses cutting-edge technology. In addition to such learning program, the Developer shall provide specialized training courses customized to meet employee learning needs.

3. If a position requires serving alcoholic beverages, authorizing complimentary alcoholic beverages, or managing a food and beverage operation, that employee must obtain an alcohol awareness certification card. All table games employees, valet attendants, limo drivers and security team members must also possess this certification.

4. Provide an educational assistance program that reimburses employees ninety percent (90%) of tuition costs up to a maximum of $3,000 per year for pre-approved undergraduate classes or up to a maximum of $4,000 per year for pre-approved graduate study at an accredited college or university.

5. Provide regulatory and compliance training such as Skillsoft, which is Operator's online learning platform used to deliver all regulatory and compliance training in addition to numerous professional development courses.

6. Implement the Caesars Code of Commitment, which includes a commitment to all employees to treat them with respect and provide satisfying career opportunities to invest in employees by providing excellent pay and valuable benefits, including health insurance and a retirement plan, and to share financial success through bonuses for frontline employees, to encourage professional and personal growth through tuition reimbursement, on-the-job training, career development, and promotion from within, to

actively seek and respond to employee opinions on all aspects of their jobs, from the quality of their supervisors to the quality of the casinos, and to value employees from every possible background, and who approach issues and problems from different perspectives.

O. Consistent with the corporate policy of the Developer to provide equal opportunity for all applicants and employees, the Developer will not discriminate on the basis of race, color, religion, sex, national origin, age, disability, sexual orientation, gender identity or expression, or veteran status. This policy applies to all areas of employment including recruitment, hiring, training, promotion, compensation, benefits, transfers and social and recreational programs. The Developer will provide Developer's workforce development plan, which pursuant to M.G.L. c. 23K, Section 18, will provide equal employment opportunities to all employees, including persons with disabilities.

P. In addition, as in part as it is fulfillment of a condition of the HCA, **[to the extent that 121A approvals are obtained] in consideration of its obtaining stabilization of existing tax payments through the execution of a contract pursuant to Section 6A of Chapter 121A which benefits both Operator and the Developer,** and being a party of the Development Agreements noted above, the Developer or Operator, as the case may be, will meet with the Director of JCS, or her designee, to review resources and information regarding the Plan; such meeting shall be scheduled any time after the execution of this Plan and in any event, prior to the issuance of any certificate of occupancy for the Development.

II. Continuing Joint Efforts

Recognizing that this Plan is entered into voluntarily by the Developer and JCS, as a commitment to the economic health of the City and its residents, in particular the residents of East Boston, the execution of this Agreement subscribing to the foregoing Plan by the Developer is hereby recognized by the JCS to satisfy each and every obligation of the Developer under the HCA, the Development Agreements, **[the 121A approvals],** and under Article 80 to formulate such a Plan. The foregoing Plan is hereby approved by JCS. The Developer hereby agrees to fulfill all of the undertakings and responsibilities imposed upon a Developer by the Plan from the date hereof and including _____, _____ **[a date which is fifteen (15) years after the effective date]**. This Agreement shall be binding upon, and inure to the benefit of, the successor owner of the Development.

EXECUTED the date first above written.

[DEVELOPER]

By:

By:_____
Name:
Title:

[OPERATOR]

By:

By:_____
Name:
Title:

OFFICE OF JOBS AND COMMUNITY SERVICES, a Division of EDIC

By:_____
Name:
Title: Director

EXHIBIT A

TO BOSTON RESIDENTS EMPLOYMENT AGREEMENT

Legal Description

EXHIBIT B

TO BOSTON RESIDENTS EMPLOYMENT AGREEMENT

One Stop Career Center Services

EXHIBIT J

DRAFT Construction Management Plan

This draft Construction Management Plan (CMP) addresses construction sequencing, staging plans, material deliveries, and specific mitigation measures intended to avoid and minimize impacts from the Project. As Project design progresses, protection measures will be added and modified as appropriate. A CMP will be submitted to the Boston Transportation Department for approval prior to commencement of construction, and the Developer's general contractor will be bound by the operational parameters described herein.

For on-site construction, the Developer and construction team will coordinate CMPs with the cities of Boston and Revere and applicable state agencies and authorities, as appropriate.

1. Construction Methodology

This section describes the construction schedule and the methods that will be used for staging, site access, public safety, and erosion and sediment control.

1.1 Construction Activity Schedule

Project construction is expected to take up to 60 months. Weekend, extended hours and $2^{nd}/3^{rd}$ shift activities will require an off-hours permit jointly issued by the Inspectional Services Department and Boston Transportation Department (BTD), and will be performed in a manner that will minimize impacts as may be necessary to meet permitting restrictions. The general contractor will also need to perform some activities, such as materials unloading, during off hours; deliveries of large construction equipment (e.g., cranes, excavation equipment) will be scheduled to avoid and/or minimize impacts to vehicular, pedestrian traffic and noise generated from the site.

Within the site, activities such as excavation, pile driving, and steel erection will also be prohibited during these hours. Every two weeks, the contractor will publish an updated schedule of upcoming work and will disseminate the schedule to affected parties in local neighborhoods. In addition, the general contractor will publish monthly schedule updates describing progress as well as projected activity for the next month. This information will be available on a Project website which will allow neighbors real-time access to the most up-to-date construction information.

1.2 Construction Staging and Truck Deliveries

The proposed staging plan is designed to isolate construction activities while providing safe access for pedestrians and automobiles during normal daily activities as well as emergencies. All adjacent streets will remain open to the public during construction.

Construction storage and staging will remain within the fenced construction fence enclosure. This boundary will be enclosed with a six-foot-high chain link fence with privacy screening. Plans illustrating construction phasing and staging on the Project site will be provided to and subject to review and approval by BTD prior to the commencement of any Work on the Property.

All construction delivery trucks will enter the site from Route 1A at Tomasello Drive, and will not be allowed to park or idle on neighborhood streets. Major deliveries such as steel or large pieces of mechanical equipment will be staged on-site. Specific language regarding staging locations and the prohibition of staging materials in neighborhood streets will be called out in all subcontracts. While it is not anticipated that any off-site staging or marshalling areas will be used, the locations of any and all staging and marshalling areas will be forwarded to the BTD and the City of Revere for review and approval. Truck wheel wash stations will be located and used at all site exits to ensure that soil materials are not tracked onto roadways from the site. During all site work activities, construction laborers will maintain adjacent streets and sidewalks to prevent accumulation of dirt and dust. Mechanical sweeping, and at the City's sole discretion, vacuum sweeping, will be used continuously during the excavation, foundation, and site work phases of the project to maintain adjacent roadways.

1.3 Perimeter Protection and Public Safety

Proper signage will direct pedestrians, vehicles and bicyclists safely around the site and construction activities.

The general contractor will work to minimize impacts to both pedestrian, bicycle and vehicular flow. Specific configurations of staging and pedestrian access around the site will vary depending on the phase of work being performed (see attached construction phasing plans). These configurations will ensure safe egress to and from the existing racetrack facilities during operation. As pedestrian, bicycle and vehicular access changes with the progression of construction, all changes will be submitted to BTD and the City of Revere for their review and approval prior to implementation. Fire department access as well as access to the fire hose connection will be continuously maintained at all times as shown in the attached construction phasing plans.

In general, secured fencing will isolate construction areas from pedestrian traffic within the site. Police details will be provided as needed to facilitate traffic flow both on and off the project site. In addition, sidewalk areas and walkways near construction activities will be protected, well marked, and lighted to ensure pedestrian safety. The general contractor will provide sufficient temporary site lighting to ensure the safety of all pedestrians accessing the site until permanent street lighting is installed. Construction safety procedures will be designed to meet all OSHA safety standards for specific site construction activities.

All subcontractors will be required to wear appropriate personal protective equipment, and each subcontractor will implement and manage its own Safety and Health Program for the project. These programs will be reviewed by the general contractor's field staff and safety department, which will also monitor compliance. This program will ensure that subcontractors' employees, subcontractors, and suppliers, regardless of tier, know and understand the complete safety and health requirements of the project.

Snow removal and ice treatment will occur in a timely manner and will be provided on the surrounding City sidewalks. Trash removal and debris cleanup will be performed on a continuous basis throughout the entire construction process. Construction-period way finding and directional signage will be provided and updated as necessary during construction.

1.4 Erosion Control, Dewatering and Mitigation

The Developer will prepare a Stormwater Pollution Prevention Plan (SWPPP) and submit a Notice of Intent to the U.S. EPA for coverage under EPA's NPDES Construction General Permit (CGP). The SWPPP will detail methods for preventing soil erosion and pollution of downstream receiving waters due to stormwater runoff from construction zones, and will be a "living" document to be revised as construction phasing dictates. The SWPPP will include both structural and non-structural BMPs to be used during construction, and will require site inspections in accordance with the CGP during all periods when ground surfaces remain un-stabilized. Locations for materials stockpiles, construction staging, construction trailers, and equipment storage will be identified.

Construction-period erosion and sediment controls will include the non-structural and structural BMPs described below. These controls will be designed, installed, and maintained in accordance with the SWPPP as well as the following documents:

> "Storm Water Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices" (EPA 832-R92-005, Sept. 1992);

"Storm Water Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices – Summary Guidance" (EPA 833-R92-001, Oct. 1992);

Massachusetts Stormwater Management Policy Handbook (Volume I) and Technical Handbook (Volume II) issued by the Massachusetts Department of Environmental Protection, March 1997; and

Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas, A Guide for Planners, Designers and Municipal Officials, March 1997.

Stormwater management for the post-construction, operational phase of the Resort is described in Section 9.3.2.

Non-Structural Controls

One of the most important methods of preventing soil erosion and sedimentation associated with stormwater runoff is to minimize the amount and duration of non-stabilized surfaces. Maintaining an efficient construction sequence that minimizes the size of disturbed areas reduces the exposure of non-stabilized surfaces to the erosive effects of stormwater. As with the SWPPP, the CMP will require contractors to minimize areas of disturbance. The thoughtful siting of storage and stockpile areas away from downstream receptors will also help prevent sedimentation from stormwater runoff.

On-site storage of hazardous materials or toxic chemicals will be limited to what is absolutely necessary. Where necessary, these materials will be stored off the ground and in enclosed or covered structures to prevent contact with stormwater runoff.

Daily street sweeping (or more frequent street sweeping as needed) of construction areas and surrounding streets and sidewalks will be required throughout construction to control fugitive dust emissions and to remove sediments tracked off site where they could otherwise by washed into surface waters, wetland resource areas, or the municipal stormwater management system, on a schedule approved by BTD. Permanent stabilization of exposed surfaces will be required within seven days of the completion of work in any given area. In instances when it may not possible to permanently stabilize exposed soils within seven days of work completion, or when soils will be exposed for 14 days or longer without work occurring, temporary stabilization of surfaces will be required. This temporary stabilization will be achieved by seeding with quickly-germinating grasses or the use of erosion control blankets.

Structural Practices

In addition to the non-structural controls discussed above, many construction-period structural BMPs will be required to prevent pollution from stormwater runoff.

Appropriate perimeter controls such as silt socks, straw wattles, and compost berms will be installed to filter and slow stormwater runoff as it leaves the construction site. To prevent the import of invasive species and weed seeds, hay bales will not be used for erosion and sedimentation control in the Project. In accordance with the SWPPP, these perimeter controls will be inspected every seven days. Sediment build-up behind perimeter controls will be removed when it reaches one-half the height of the controls, and controls will be repaired or replaced as needed.

To prevent the tracking of sediments beyond the construction site, stabilized construction exits of crushed stone will be installed. All construction traffic will be directed over these exits when leaving the site to remove soils from vehicle tires. Construction exits will be inspected weekly in accordance with the SWPPP, and will be repaired or replaced as necessary when sediment builds up on the surface or crushed stone is displaced. Appropriately-sized concrete truck wash-out basins will be installed in locations to prevent contact with stormwater runoff. These basins will be cleaned as needed, and concrete materials will be disposed of in accordance with applicable local, state, and federal regulations.

New and existing inlets to stormwater management systems will be protected against sediment inflow. Catch basins will be fitted with filter inserts or will be surrounding by silt socks or other materials to filter incoming stormwater. The stormwater management systems will be constructed starting at the downstream end, and no flows will be directed to permanent stormwater BMPs prior to their completion and upstream surface stabilization.

Where larger site disturbances are necessary to accommodate particular construction activities, various measures will be implemented to prevent sediment-laden runoff from leaving the Project site. Where long, exposed slopes are required, temporary check dams will be constructed to reduce runoff velocities and promote less erosive sheet flow. These check dams may be earthen berms, straw wattles, compost berms, or other appropriate systems of slowing runoff velocities and promoting sediment removal. Temporary sediment basins will be constructed where necessary to allow sediments to drop out of suspension prior to discharge and promote construction-period infiltration to groundwater. Disturbed surfaces will be temporarily graded towards these basins, or temporary diversion swales will be built to direct flows to these basins. Basin outlets will be constructed to promote low-velocity sheet flow and will be directed towards existing vegetated areas for further treatment.

2. Construction Air Quality

Construction operations at the site, including earthwork, will generate dust. All demolition and construction work will be performed in accordance with applicable sections of the MassDEP Air Pollution Control Regulations at 310 CMR 7.02 and 310 CMR 7.09. Specific air quality mitigation measures will be as follows:

Use of appropriately designed construction entrances and wheel wash facilities at all construction exists by all vehicles that would otherwise track mud or dirt onto public roadways to prevent off-site migration of soils;

Mechanical street sweeping, and at the City's sole discretion, vacuum sweeping, of construction areas and surrounding streets and sidewalks;

Encapsulation of demolition sites as necessary where hazardous materials such as asbestos or lead paint are identified;

Removal of demolition and construction waste in covered or enclosed trailers;

Wetting of exposed soils and stockpiles to prevent dust generation;

Minimizing stockpiling of materials on site;

Turning off construction equipment when not in use, complying with all idling limitations in applicable law and regulations and minimizing idling times;

Minimizing the storage of demolition and construction wastes on site; and

Minimizing the duration that soils are left exposed.

Many of these measures are intended to minimize potential impacts associated with construction activities that may generate fugitive dust, which will result in localized increases in airborne particulate levels. Fugitive dust emissions from construction activities will depend on such factors as the properties of the emitting surfaces (e.g., moisture content and volume of spoils), meteorological variables, and construction practices employed.

Although fugitive dust may be generated during demolition and construction activities, the distance to off-site receptors makes it unlikely that the migration of dust will cause off-site impacts. Nonetheless, the contractor will implement dust control measures during active demolition and construction that will primarily consist of using wetting agents regularly to control and suppress dust that may come from the structure being demolished or the construction materials. The contractor will comply with the National Emission Standards for Hazardous Pollutants (NESHAP) throughout renovation,

demolition, and construction activities. The proposed redevelopment also includes on-site processing and reuse of brick and concrete, which will involve use of an on-site crusher. Appropriate notifications 30 days prior to any crushing will be performed, including notifying local officials and MassDEP in accordance with 310 CMR 16.05(3)(e)6. At no time shall fugitive dust be allowed to migrate beyond the immediate work zone. Dust mitigation during processing will include the use of water sprayers.

Site preparations involving construction haul roads, soil stockpiles, and vehicles exiting the Project site have the greatest potential to create fugitive dust. Soil excavation does not typically generate dust, however, due to the natural moisture content of subsurface soils. As necessary, haul roads will be routinely misted to suppress dust generation. Soil stockpiles can either be covered or vegetated, depending on how long the stockpile will remain. Dust from construction traffic exiting the Project site onto public roads will be controlled with the use of wheel wash stations and vehicle tracking pads, which remove soil from the tires of construction vehicles. Paved construction entrances will also be routinely swept by street sweepers to remove accumulated soils. At no time will visible soils be permitted on public streets that could result in fugitive dust issues.

In addition, the Developer acknowledges the importance of emission controls and will require contractors to comply with MassDEP's Diesel Retrofit Program and the use of ultra low sulfur diesel in off-road engines. The Diesel Retrofit Program, formerly called the Clear Air Construction Initiative of the Clean Construction Equipment Initiative, originated as an air quality mitigation measure for the Central Artery/Tunnel Project. The program was designed to encourage users of diesel construction equipment to install exhaust emission controls such as oxidation catalysts or particulate filters on their diesel engines.

Construction vehicles will be required to comply with all applicable laws and regulations regarding engine idling, and shall minimize any such idling. The approved construction contractor(s) will be required to use equipment fitted with diesel oxidation catalysts (DOC) or diesel particulate filters (DPF) to reduce emissions. DOCs can reduce fine PM by 25 percent, toxic carbon monoxide by 60 percent and smog-forming volatile organic compounds by 60 percent. DPFs can reduce fine PM by 85 percent or more, as well as smaller reductions in carbon monoxide and VOCs.

A construction air quality dust and emissions mitigation plan will be developed before construction begins and enforceable measures will be executed in the construction contracts.

Indoor air quality will be evaluated and tested by the Project environmental consultant, as appropriate, in buildings that are to remain or be renovated. The need for protective measures such as vapor barriers will be determined during final design. The potential for

methane migration (from organic deposits) will be assessed by the Project environmental consultant during final design.

3. Construction Period Noise

Predicted sound levels from construction within the proposed Project site are not anticipated to cause a significant noise impact and are expected to meet the relevant City of Boston daytime construction noise criteria at all noise-sensitive locations.

Construction will require the use of equipment that will be heard off-site, but background ambient noise conditions in the area, including urban activities and traffic, will lessen the impacts from construction noise. In addition, the Developer is committed to mitigate noise impacts related to the construction activities. A noise analysis performed for the Project to quantify the expected noise level associated with different construction activities and has been provided to BTD and the City of Revere.

The proposed construction process has been designed around site constraints, and the exact pieces of equipment will be finalized after subcontractor selection is complete.

Every reasonable effort will be made to minimize the noise impact of construction activities. Mitigation measures will be as follows:

Scheduling work during daytime hours. If extended hours, weekend or $2^{nd}/3^{rd}$ shift work is proposed, it will be coordinated with BTD and the City of Revere. During any such extended hours, weekend or $2^{nd}/3^{rd}$ shift work, all back up alarms on vehicles shall be disengaged and manual traffic controls will be used.

Using appropriate mufflers on all equipment and providing ongoing maintenance of intake and exhaust mufflers.

Maintaining muffler enclosures on continuously operating equipment, such as air compressors and welding generators.

Replacing specific construction operations by less noisy ones where feasible and practical.

Selecting the quietest practicable equipment (e.g., electric instead of diesel-powered equipment).

Selecting equipment operations to keep average noise levels low, to synchronize the noisiest activities with times of highest ambient noise levels, and to maintain relatively uniform noise levels.

Turning off idle equipment.

Securing any decking on roadways so that there is no rattling when traffic passes over.

Using vehicles and equipment with either ambient-sensitive or manually adjustable back-up alarms.

The proper sizing of impact equipment such as hoe rams, pile drivers and jackhammers and powering only to the degree needed to perform the work.

The installation of noise suppression enclosures on hoe rams.

The placement of stationary noise producing equipment such as pumps and generators as far away as possible from residential and sensitive receptor locations.

Keeping engine housing panels on all equipment closed; and when not in use, shutting off equipment.

4. Construction Schedule

The Project will be constructed in one continuous phase. Staging plans will be provided to BTD for review and approval prior to the commencement of any Work on the Property. The precise details of such staging will be set forth in the final CMP as approved for the Project but in all events shall require that all construction staging will be sequenced such that all construction staging and construction worker parking will be provided on the Property.

5. Construction Traffic Impacts

The number of workers required during construction will vary by period of construction and level of activity. Because the workforce will arrive prior to peak traffic periods, these trips are not expected to impact traffic conditions. In addition, the general contractor will encourage jobsite personnel to utilize public transportation such as by providing personnel with subsidized MBTA passes or shuttle services. Personal vehicles will be allowed to park within designated areas at the Project construction site at no cost, and no construction or personal vehicle parking will be allowed in adjacent neighborhoods. The general contractor shall develop a parking plan for BTD's review and approval, which shall include the general contractor's plans and protocols for enforcing the prohibition on construction personnel parking personal vehicles on streets in the adjacent neighborhood. Terms and conditions to maximize protection of the neighborhoods related to workforce parking will be written into each subcontract and reviewed with each worker during a mandatory orientation. Terms and conditions encouraging public transportation use will be included in each subcontract.

Truck traffic will vary throughout the construction period, depending on the activities being performed. It is expected that truck traffic will average 15-20 trucks daily spread evenly throughout the day.

Specific truck routes will be identified and described to BTD and the City of Revere, and will be clearly delineated on site logistics drawings, for BTD and the City of Revere's review and approval. Construction contracts will include clauses restricting truck travel to BTD- and Revere-approved routes. Unless a specific exception is approved by BTD and the City of Revere, the Developer shall require all construction vehicles to access the Project site from Route 1A at Tomasello Drive. Wheel wash stations and anti-tracking stone pads, which will be at least 50 feet long and consist of a four-inch-thick layer of crushed stone placed over a non-woven filter fabric, will be placed at each access point to the work area. Wheel wash stations will remain in place until the completion of construction and anti-tracking stone pads will remain in place until the work area is paved or otherwise stabilized.

Off-site traffic improvements will require close coordination with the cities of Boston and Revere as well as certain state agencies. The general contractor will develop a construction-period traffic management plan for review and approval by the cities and state. Signage, traffic cones, drums, and other traffic control measures will be employed during construction to provide positive guidance for traffic near the work zone.

6. Dewatering and Groundwater

Should dewatering become necessary during demolition, installation of utilities, or construction of building foundations, appropriate BMPs will be implemented to prevent pollution of downstream receptors. Temporary construction dewatering will likely be required locally for various excavations, and intermittent pumping will be used as needed to allow for construction in-the-dry. Effluent generated during temporary construction dewatering will be infiltrated into the ground where possible. Groundwater testing will be conducted during dewatering operations as appropriate to determine the type and degree of contamination present and to evaluate and implement appropriate measures to manage groundwater associated with Project excavation and construction, including use of a fractionation tank(s) and adherence to the requirements of temporary construction dewatering permits, as appropriate.

7. Material Handling

The Project includes the demolition of existing buildings, paved driveways, parking lots, sidewalks, and various utilities that will generate large volumes of waste products. Based on available information, a portion of the demolition waste includes hazardous materials such as asbestos, minor amounts of materials containing low levels of polychlorinated biphenyls (PCBs), and lead paint. In addition, due to the scale of the Project, a large

amount of general construction waste is also expected. The sections below detail how hazardous and non-hazardous solid wastes will be handled during demolition and construction. The Developer is targeting a 75% reduction in construction debris.

7.1 Solid Waste and Recycling

Proposed construction, demolition, and remediation activities will generate solid waste, including certain regulated building waste streams (e.g., asbestos-containing materials, PCBs, and oil/hazardous materials). The general contractor will take an active role in the processing and recycling of construction waste. The disposal contract will include specific requirements to ensure that procedures allow for the necessary segregation, reprocessing, reuse, and recycling of materials. For those materials that cannot be recycled, solid waste will be transported in covered trucks to an approved solid waste facility per MassDEP Regulations for Solid Waste Facilities, 310 CMR 16.00. Brick, concrete, gypsum wallboard, wood and metal will be segregated from other construction debris for recycling, with the other debris to be disposed of as non-banned construction waste in accordance with waste facility management regulations at 310 CMR 19.017.

Demolition of the administration building, electrical building, and portions of the existing grandstand and link buildings will generate asphalt, brick and concrete (ABC) debris. ABC that is not coated, impregnated, or otherwise treated will be crushed and reused on site without MassDEP pre-approval, provided that MassDEP and the municipalities are notified in advance. However, for ABC that is painted, coated, impregnated, or otherwise treated, the contractor will submit a Beneficial Use Determination (BUD) Application to MassDEP for approval before those materials are crushed and reused on site. The application will be supported by documentation demonstrating that the material will be beneficially used on site and that use of the material will not result in a significant risk to health or the environment and will not increase the overall level of contamination at the site.

7.2 Hazardous Waste

Releases of oil or hazardous material to the environment are managed under the MCP (M.G.L. Chapter 21E and 310 CMR 40.0000) under the supervision of an LSP. The Project includes demolition and reconstruction as part of site redevelopment. [*Customary background information regarding Project environmental matters to be addressed in final CMP*].

An LSP has been engaged by Developer to provide environmental consulting services during Project design and construction. If contamination is identified in pre-construction sampling or during construction, an LSP will provide services consistent with the MCP as required for regulatory compliance and close-out. The Project environmental consultant will ensure that the Project conforms to MCP regulatory requirements for construction of

buildings in contaminated areas, and that all required submittals will be provided to MassDEP.

The presence of PCBs in the caulking of buildings constructed between 1950 and 1980 has recently become public knowledge. There are minor amounts of PCB-containing materials on the Project site, specifically the caulking used to seal some of the windows. PCB-containing material is also common in items such as florescent light fixtures. A building assessment of the existing buildings has been completed quantifying the demolition debris that requires special disposal conditions. Non-hazardous waste landfills in Massachusetts landfills are permitted to accept PCB-containing materials where concentrations are less than 2 mg/kg; such disposal does not require approval from the EPA.

The site is also regulated under asbestos abatement regulations (310 CMR 4.00), and asbestos-containing materials are known to exist on the Project site. Asbestos is classified as a "special waste" under MassDEP solid waste regulations, and asbestos and asbestos-containing material require special handling and transporting methods set out in MassDEP regulations. Asbestos-containing material surveys and abatement plans will be developed for each building prior to demolition. Asbestos can only be disposed of in landfills that have been approved to accept asbestos-containing waste materials. Any entity or individual engaged at the site for asbestos abatement or containment shall be licensed and certified under 453 CMR 6.00.

The Project involves the demolition of existing buildings, paved driveways, parking lots, sidewalks, and various utilities including portions of existing water mains and sewer mains. Based on available information, a portion of the demolition waste will include hazardous materials such as asbestos and lead-based paint. These materials are classified as "special waste" under MassDEP solid waste regulations. Accordingly, asbestos, asbestos-containing material, and materials with lead-based paint will be segregated and Project operations will proceed in accordance with the required special handling and transporting methods set out in MassDEP regulations.

Based on a February 14, 2007 Phase I/Phase II Environmental Site Assessment report completed by GEI Consultants, an on-site inspection for asbestos-containing building materials and lead-based paint was conducted by Smith & Wessel of Merrimac, Massachusetts in select buildings on the Project site. Materials that tested positive for asbestos included floor tile and paper, wall and ceiling panels, insulation, window glazing compound, and door caulking. It is unclear whether the existing grandstand roof contains asbestos. It is also noted that some painted surfaces contain lead-based paint.

Surveys and abatement plans related to asbestos-containing material, PCB-containing material, and lead-based paint will be required for each building prior to demolition.

Asbestos, PCBs, and lead-based paint will be disposed of in accordance with MassDEP regulations at landfills that have been approved to accept these materials. Any entity or individual engaged at the site for asbestos, lead-based paint, or PCB abatement or containment shall be licensed and certified under 453 CMR 6.00.

Construction operations at the site, including earthwork, will generate dust. As required on construction projects, the Contract Documents will specify the requirements for dust control and include the site-specific Contractor Health & Safety Plans to protect worker safety. If required, dust will be suppressed by spraying the site with water, and air quality will be measured with dust monitors.

Based on existing information, one active UST exists on site. The existing UST is a 7,000-gallon partitioned gasoline and fuel oil tank located near the northwest corner of the existing building. During construction, the existing UST will be removed and a new UST will be installed near the proposed new maintenance building. The Project LSP will ensure that tank removal and closeout is completed in accordance with the MCP and requirements for the city of Revere. In addition, previously unknown USTs encountered during construction will be managed similarly, as needed.

8. Draft Spill Response Plan

Small quantities of hazardous materials or chemicals may be utilized on site, including petroleum/fuel products. Any such materials will be handled and stored in accordance with all applicable regulatory requirements. In the event of an unplanned release of petroleum/fuel products or other contaminants, the general contractor and its subcontractors will utilize the following procedures:

1. Notify Fire Department and contracted spill response contractor;
2. Notify the U.S. Army Corps of Engineers;
3. Mobile excavating equipment will come to the spill/release area and if necessary, create berms, dig channels or cover effected area with soil to reduce spreading or migration;
4. The general contractor will maintain a spill kit on site containing absorbent materials that will be positioned near fueling areas and utilized in the event of spill or release;
5. The general contractor and its subcontractors will reduce the probability of an unplanned spill or release by having fuels delivered by truck to a designated fueling area rather than bulk storage and/or tanks of petroleum/fuel products or other contaminants;

6. Fire extinguishers will be positioned adjacent to fueling areas;

7. No hot work, smoking or potential ignition sources will be allowed in the fueling areas;

8. Personnel involved with fueling or handling of any contaminant will be equipped with communication devices to sound an alarm in the event of spill or unplanned release;

9. Only authorized personnel will be allowed in the spill release area; and

10. The general contractor and its subcontractors will provide assistance as necessary to the qualified spill response contractor and fire department.

9. Geotechnical Impacts and Monitoring

Excavation will be required for the deep foundations (precast piles and/or steel piles), drilled elements such as micropiles, and PIFs proposed in the Project design. Means and methods for installing the deep foundation system will consider potential impacts to abutting facilities that will remain within the property limits (e.g., the grandstand). It is not expected that vibrations will approach thresholds that could potentially impact existing facilities; nonetheless, vibration monitoring will be conducted during pile driving activities. In addition, the Project team will conduct a full existing conditions survey of existing structures prior to commencement of construction, with follow-up on completion.

10. Rodent Control

To control rodent infestation, the City enforces requirements established under the Massachusetts State Sanitary Code, Chapter 11, 105 CMR 410.550 and the State Building Code, Section 108.6. Policy Number 87-4 (City of Boston), which require the extermination of rodents for issuance of permits for demolition, excavation, foundation and basement rehabilitation.

A rodent control program will be developed for the Project prior to commencement of construction and submitted to the City for its review and approval. The program will include performing extermination and control procedures on a bi-weekly basis and placing tamper-resistant bait boxes around the site perimeter.

11. Utilities

New infrastructure for sewer, drainage, domestic water, fire protection water, telephone, gas, and electric services will be tied into existing infrastructure. Specific traffic management plans will be developed for the work required to perform these tie-ins. Connections to the existing services will be coordinated with the proper utilities and their

respective contractors, as necessary. All shutdowns will be arranged with affected parties and proper notice will be given prior to any shutdowns. Any and all work requiring a BTD Permit will be approved in writing by the general contractor at the time of permit application. The written approval of the general contractor will be presented to BTD by the contractor performing the work at the time of application of permit to BTD.

12. Damage to Public Property

The Contractor will be responsible for repairing any damage to public streets, public sidewalks, or other public property resulting from its construction activities.

13. Emergency Contacts

A 24-hour emergency contact list will be distributed to all parties involved in the Project. This list shall contain at least three (3) representatives for the Contractor. A 24-hour complaint hotline telephone number shall be provided and will be visibly posted on Project site signage subject to the approval of BTD, including on a Project sign visible from Route 1A. This hotline shall be staffed appropriately to ensure that a caller is allowed to speak to a person as opposed to leaving a message. Logs of all complaints and how/when the complaints were resolved will be kept on-site.

EXHIBIT K-1

Calculation of Annual Host Community Agreement Fee

The Developer shall pay a Base Annual Host Community Agreement Fee for each calendar year as set forth in Table 1—Base Annual Host Community Agreement Fee below:

TABLE 1
Base Annual Host Community Agreement Fee

Period	**Base Annual Host Community Agreement Fee**	**Amount to Be Transferred therefrom to Community Impact Trust Each Year**
Construction Commencement Date until Early Opening Operations Commencement Date	Real estate taxes applicable to existing improvements and land at their current assessed value, plus taxes assessed on the value of improvements under construction (taxed consistent with ordinary taxation of commercial construction without a gaming use premium), but not less than $1,500,000 annually	$0.00. ** *Note: The Developer will be paying an Upfront Community Impact Fees in the amount of $33,400,000.00 as set forth in Section IV.B.*
Early Opening Operations Commencement Date until Full Build-Out Operations Commencement Date (FBOOCD)	$20,000,000 annually	$12,000,000 annually
First Year following FBOOCD	$24,000,000 annually	$16,000,000 annually
Second Year following FBOOCD	$28,000,000 annually	$20,000,000 annually
Third Year following	$32,000,000 annually	$20,000,000 annually

FBOOCD and each Year thereafter		

The Base Annual Host Community Agreement Fee shall be equitably pro-rated for any partial years falling between the periods set forth above.

In addition to payment of the Base Annual Host Community Agreement Fee, commencing on the Full Build-Out Operations Commencement Date, in the event the Gross Gaming Revenues from the facility are greater than $800,000,000 during any Casino Year, the Developer shall also pay an Additional Annual Host Community Agreement Fee in addition to the Base Annual Host Community Agreement Fee in an amount equal to the total Gross Gaming Revenue multiplied by the corresponding percentage set forth in Table 2 – GGR Percentage Table below:

TABLE 2
GGR Percentage Table

Gross Gaming Revenue *	**Percentage**
$810,000,000 - $819,999,999	0.1%
$820,000,000 - $829,999,999	0.2%
$830,000,000 - $839,999,999	0.3%
$840,000,000 - $849,999,999	0.4%
$850,000,000 - $859,999,999	0.5%
$860,000,000 - $869,999,999	0.6%
$870,000,000 - $879,999,999	0.7%
$880,000,000 - $889,999,999	0.8%
$890,000,000 - $899,999,999	0.9%
$900,000,000 - $909,999,999	1.0%
$910,000,000 - $919,999,999	1.1%
$920,000,000 - $929,999,999	1.2%
$930,000,000 - $939,999,999	1.3%
$940,000,000 - $949,999,999	1.4%
$950,000,000 - $959,999,999	1.5%
$960,000,000 - $969,999,999	1.6%
$970,000,000 - $979,999,999	1.7%
$980,000,000 - $989,999,999	1.8%
$990,000,000 - $999,999,999	1.9%
$1,000,000,000 - $1,009,999,999	2.0%
$1,010,000,000 - $1,019,999,999	2.1%
$1,020,000,000 - $1,029,999,999	2.2%
$1,030,000,000 - $1,039,999,999	2.3%
$1,040,000,000 - $1,049,999,999	2.4%
$1,050,000,000 - $1,059,999,999	2.5%
$1,060,000,000 - $1,069,999,999	2.6%

$1,070,000,000 - $1,079,999,999	2.7%
$1,080,000,000 - $1,089,999,999	2.8%
$1,090,000,000 - $1,099,999,999	2.9%
$1,100,000,000 - $1,109,999,999	3.0%
$1,110,000,000 - $1,119,999,999	3.1%
$1,120,000,000 - $1,129,999,999	3.2%
$1,130,000,000 - $1,139,999,999	3.3%
$1,140,000,000 - $1,149,999,999	3.4%
$1,150,000,000 - $1,159,999,999	3.5%
$1,160,000,000 - $1,169,999,999	3.6%
$1,170,000,000 - $1,179,999,999	3.7%
$1,180,000,000 - $1,189,999,999	3.8%
$1,190,000,000 - $1,199,999,999	3.9%
$1,200,000,000 - $1,209,999,999	4.0%
$1,210,000,000 - $1,219,999,999	4.1%
$1,220,000,000 - $1,229,999,999	4.2%
$1,230,000,000 - $1,239,999,999	4.3%
$1,240,000,000	4.4%

* In the event the Gross Gaming Revenues are between $800,000,001 and $809,999,999, no Additional Annual Host Community Agreement Fee shall be due.

In the event the Gross Gaming Revenues exceed $1,240,000,000 in any Casino Year, the Developer shall pay an Annual Host Community Agreement Fee (meaning the Base Annual Host Community Fee plus the Additional Annual Host Community Fee) equal to 7% of the total Gross Gaming Revenues in accordance with the provisions of Section IV.D. of this Agreement.

EXHIBIT K-2

Procedures for the determination of monthly payment of Annual Host Community Agreement Fees:

For all monthly payments other than the monthly payment for December of each Casino Year:

1) At the end of each month during a Casino Year (the month in question being referred to as a "Measurement Month" for purposes of measuring the monthly Annual Host Community Agreement Fees payable following the end of such month), calculate Cumulative Year to Date (YTD) Gross Gaming Revenue by summing all monthly Gross Gaming Revenues since January 1 of the Casino Year to the end of the current month.

2) Annualize YTD Gross Gaming Revenue to arrive at Projected Annual Gross Gaming Revenue as of the end of the Measurement Month by multiplying the Year to Date Gross Gaming Revenue as of the end of the Measurement Month by the applicable Annualizing Coefficient for the corresponding month.

Month	**Annualizing Coefficient**	**# Months Remaining in Casino Year**	**Payment Due Date**
January	12.00	12	February 10
February	6.00	11	March 10
March	4.00	10	April 10
April	3.00	9	May 10
May	2.40	8	June 10
June	2.00	7	July 10
July	1.71	6	August 10
August	1.50	5	September 10
September	1.33	4	October 10
October	1.20	3	November 10
November	1.09	2	December 10

3) Based on Projected Annual Gross Gaming Revenue as of the end of the Measurement Month, use the tables in Exhibit K-1 to calculate the Projected Annual Host Community Agreement Fee payment as of the end of the Measurement Month.

4) Subtract the total YTD payments made by the Developer to the City from the Projected Annual Host Community Agreement Fee payments to arrive at the Net Remaining Annual Host Community Agreement Fees due.

5) Divide Net Remaining Annual Host Community Agreement Fees by the number of months remaining in the Casino Year to arrive at the monthly payment amount to be

made to the City for that month, which payment shall be due on or before the date set forth in the table above.

For the monthly payment for December of each Casino Year:

1) Obtain the Gross Gaming Revenues for the Casino Year as certified by the Commission on February 1 of each year, or if such information is not available, calculate Cumulative YTD Gross Gaming Revenue by summing all Gross Gaming Revenues for the Casino Year.

2) Use the tables in Exhibit K-1 to calculate the Annual Host Community Agreement Fee payment for the Casino Year.

3) Subtract the total YTD payments made by the Developer to the City from the Projected Annual Host Community Agreement Fee payments.

4) If applicable, subtract the Excise Tax (as defined below).

The monthly payment for December is due on or before April 1 of the following Casino Year.

The City further agrees that, to the extent that the Project receives the 121A Approvals and the Developer is required to make a payment in accordance with Section 10 of Chapter 121A ("Excise Tax"), the fair cash value of the real and personal property constituting the Project, as of January 1 of the year in which the Early Opening Operations Commencement Date first occurs and for each succeeding January 1 of the year next following the year in which the Developer's property tax exemption under Chapter 121A shall terminate, shall be an amount which, when used in the computation of the Excise Tax for or with respect to the previous calendar year, would result in an Excise Tax no greater than the amount which would be due in accordance with the terms of a contract by and between the Developer and the City as required in accordance with the terms of Section 6A of said Chapter 121A.

The calculations set forth above shall be appropriately modified for the first Casino Year and last Casino Year if either is less than a full calendar year, consistent with the principles set forth in this Exhibit K-2.

EXHIBIT L

Form of Estoppel

ESTOPPEL CERTIFICATE

This Estoppel Certificate (this "Estoppel") dated as of the ____ day of _____, 20__, is executed by the City of Boston, Massachusetts, a municipal corporation, acting by and through its Mayor, with a principal place of business at 1 City Hall Square, Suite 500, Boston, Massachusetts 02201 (the "City") to and in favor of Sterling Suffolk Racecourse, LLC, a Massachusetts limited liability company with a principal place of business at 525 William F. McClellan Highway, East Boston, Massachusetts 02128 ("Sterling Suffolk")

WHEREAS, the City is a party to that certain Host Community Agreement dated as of August __, 2013 by and between the City and Sterling Suffolk (the "Host Community Agreement") in connection with the development, construction and operation of a destination resort casino complex on land owned by Sterling Suffolk known as Suffolk Downs. Capitalized terms not otherwise defined herein shall have the meanings ascribed to such terms in the Host Community Agreement.

WHEREAS, Sterling Suffolk has requested that the City deliver this Estoppel pursuant to the terms of the Host Community Agreement.

NOW, THEREFORE, the City hereby certifies to Sterling Suffolk, that as of the date hereof, to the City's actual knowledge:

1. The Host Community Agreement is in full force and effect and unmodified.

2. Except as set forth in Exhibit A attached hereto, there is no default under the Host Community Agreement by the Developer.

[remainder of page intentionally left blank]

IN WITNESS WHEREOF, the City has executed this Estoppel under seal as of the date first above written.

CITY OF BOSTON

By: _____
Name:
Title:

EXHIBIT A TO ESTOPPEL CERTIFICATE

List defaults, if any, or state NONE.

EXHIBIT M

Form of Disclosure of Beneficial Interests

Disclosure Statement Concerning Beneficial Interests as
Required by Article 80, Section 80B-8, of the Boston Zoning Code

1. Proposed Project:

2. Location:

3. Applicant

4. I hereby state, under the penalties of perjury, that the true names and addresses of all Persons who have a Beneficial Interest (including the amount of their Beneficial Interest accurate to within one-tenth of one percent if such interest exceeds one percent) in the Proposed Project are listed below in compliance with the provisions of Article 80, Section 80B-8, of the Boston Zoning Code.

5. NAME AND RESIDENCE OF EACH PERSON WITH SAID BENEFICIAL INTEREST: attached as Exhibit A hereto.

6. The undersigned also acknowledges and states that except as stated below, none of the above-listed individuals is an official elected to public office in the Commonwealth of Massachusetts, nor is an employee of the Commonwealth's Department of Capital Asset Management and Maintenance.

7. I hereby state, under the penalties of perjury, that the names and addresses of all firms and professional corporations employing attorneys, real estate brokers, architects, engineers, planners, or surveyors, and all other agents who have acted on behalf of any of the foregoing with respect to the Project Notification Form on the above-listed property, for compensation not less than $50,000.00, are listed on the attached Exhibit B in compliance with the provisions of Article 80, Section 80B-8, of the Boston Zoning Code.

[The balance of this page has been intentionally left blank]

SIGNED under the penalties of perjury

_____

By: _____
Name:
Title: Authorized Signatory
As to the Beneficial Interests Affiliated with _____

EXHIBIT A

Beneficial Interests

The following entities hold 100% of the beneficial interests in _____:

Name	**Address**	**Percentage Interest**

EXHIBIT B

EXHIBIT N

Revenue Enforcement Certification Pursuant to M.G.L. c. 62C, § 49A

Pursuant to M.G.L. c. 62C, § 49A, I hereby certify under the pains and penalties of perjury that I, and the entity on behalf of which I am signing, have complied with all laws of the Commonwealth of Massachusetts relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

STERLING SUFFOLK RACECOURSE, LLC

By:_____
Name:
Title:
Hereunto duly authorized

CAESARS MASSACHUSETTS MANAGEMENT COMPANY, LLC

By: Caesars Massachusetts Acquisition Company, LLC, its sole member

By: Caesars Entertainment Operating Company, Inc., its sole member

By:_____
John W. R. Payne
President, Central Markets and Partnership Development

COMMONWEALTH OF MASSACHUSETTS
COUNTY OF SUFFOLK

On this ___ day of _____, 2013, before me, the undersigned notary public, personally appeared _____, proved to me through satisfactory evidence of identification, which was personal knowledge, to be the person whose name is signed on the preceding document, and acknowledged to me that he signed it voluntarily for its stated purpose, as Manager of Sterling Suffolk Racecourse, LLC

.

_____
Notary Public
My commission expires:

COMMONWEALTH OF MASSACHUSETTS
COUNTY OF SUFFOLK

On this ___ day of _____, 2013, before me, the undersigned notary public, personally appeared _____, proved to me through satisfactory evidence of identification, which was personal knowledge, to be the person whose name is signed on the preceding document, and acknowledged to me that he signed it voluntarily for its stated purpose, as President of Caesars Entertainment Operating Company, Inc., the sole member of Caesars Massachusetts Acquisition Company, LLC, the sole member of Caesars Massachusetts Management Company, LLC.

.

_____
Notary Public
My commission expires:

EXHIBIT O

Form of Notice of Agreement

NOTICE OF HOST COMMUNITY AGREEMENT

This Notice of Host Community Agreement (this "Notice") dated as of the ___ day of _____, 201_ is made by and between the City of Boston, Massachusetts, a municipal corporation, acting by and through its Mayor, with a principal place of business at 1 City Hall Square, Suite 500, Boston, Massachusetts 02201 (the "City") and Sterling Suffolk Racecourse, LLC, a Massachusetts limited liability company with a principal place of business at 525 William F. McClellan Highway, East Boston, Massachusetts 02128 ("Sterling Suffolk").

Notice is hereby given that the City and Sterling Suffolk have entered into a Host Community Agreement dated _____, 2013 (the "Host Community Agreement") which sets forth their mutual rights and obligations with respect to the development, construction and operation of a destination resort casino complex on land owned by Sterling Suffolk, more particularly described in Exhibit A attached hereto and incorporated herein, including, without limitation, certain limitations on transfer as set forth in the Host Community Agreement.

A copy of the Host Community Agreement is available for inspection in the office of the City of Boston Office of Gaming Accountability.

Executed under seal as of the date first written above.

APPROVED AS TO FORM:

_____
Corporation Counsel

CITY OF BOSTON:

By:_____
Thomas M. Menino, Mayor
Hereunto duly authorized

DEVELOPER:

STERLING SUFFOLK RACECOURSE, LLC

By:_____
Name:
Title:
Hereunto duly authorized

COMMONWEALTH OF MASSACHUSETTS
COUNTY OF SUFFOLK

On this ___ day of _____, 2013, before me, the undersigned notary public, personally appeared Thomas M. Menino, proved to me through satisfactory evidence of identification, which was personal knowledge, to be the person whose name is signed on the preceding document, and acknowledged to me that he signed it voluntarily for its stated purpose, as Mayor of the City of Boston.

_____
Notary Public
My commission expires:

COMMONWEALTH OF MASSACHUSETTS
COUNTY OF SUFFOLK

On this ___ day of _____, 2013, before me, the undersigned notary public, personally appeared _____, proved to me through satisfactory evidence of identification, which was personal knowledge, to be the person whose name is signed on the preceding document, and acknowledged to me that he signed it voluntarily for its stated purpose, as Manager of Sterling Suffolk Racecourse, LLC

.

_____
Notary Public
My commission expires:

EXHIBIT P

Form of Mortgagee Subordination

SUBORDINATION OF MORTGAGE AND SECURITY AGREEMENT

Bank of America, N.A., a national banking association ("Mortgagee"), being the holder of that certain Mortgage and Security Agreement granted by Sterling Suffolk Racecourse, LLC, a Massachusetts limited liability company ("Grantor") and recorded with the Suffolk County Registry of Deeds in Book 42786, Page 51 and filed with the Suffolk County Registry District of the Land Court as Document No. 745733 (the "Mortgage"), for good and valuable consideration, hereby subordinates the lien of the Mortgage to that certain Host Community Agreement between Grantor and the City of Boston dated _____, 2013 (the "HCA"), evidenced by a Notice of Agreement recorded in Book _____, Page _____ and filed as Document No. _____, and agrees to be bound by the terms of the HCA.

IN WITNESS WHEREOF, the undersigned has caused this instrument to be signed and delivered in its name by its duly authorized officer this ____ day of _____, 2013.

BANK OF AMERICA, N.A.

By: _____
Name:
Title:

STATE OF NEW YORK
COUNTY OF _____

On this ___ day of _____, 2013, before me, the undersigned notary public, personally appeared _____, proved to me through satisfactory evidence of identification, which was a state-issued driver's license or personal knowledge, to be the person whose name is signed on the preceding document, and acknowledged to me that he/she signed it voluntarily for its stated purpose, as an officer of Bank of America, N.A.

_____
Notary Public
My commission expires:

EXHIBIT Q

Additional Financing Provisions

A. In connection with any Financing, the Developer shall have the right, without the City's consent but subject to any approvals required under the 121A Approvals, to subject its interest under the Agreement and the Project to the lien of a Mortgage to such Authorized Lender to secure indebtedness of the Developer and to give the Authorized Lender a collateral assignment and pledge, of all of the Developer's interest in, to and under the Agreement (an "Authorized Mortgage") and the Authorized Lender shall have the benefit of this Exhibit Q. The Developer's right to execute and deliver an Authorized Mortgage shall be subject to the following conditions:

The Authorized Mortgage shall be in such form and shall contain such provisions as may be customarily required by Authorized Lenders for similar projects, subject to such modifications as are required to reflect the particular transaction and to eliminate any conflict with the provisions of this Agreement, and within thirty (30) days after the execution of such Authorized Mortgage, the City will be furnished with a certified copy thereof and a street, post office and email address where notices shall be served upon the Authorized Lender identified therein.

B. If the Developer shall execute an Authorized Mortgage pursuant to the provisions hereof, including fulfillment of the preceding conditions, then in such event, commencing with the City's receipt of a copy of such Authorized Mortgage from either the Developer or the Authorized Lender thereunder and a street, post office and email address where notices shall be served upon such Authorized Lender pursuant to Section A above (an "Authorized Mortgage Notice"), and thereafter so long as the City has not received notice from the Developer or the Authorized Lender of the discharge or other termination of the Authorized Mortgage, and except as otherwise mutually agreed to by such Authorized Lender and the City, each in their sole and absolute discretion, the following shall apply:

1. No agreement by the Developer and the City for the cancellation, surrender, or termination of the Agreement shall be effective without the written consent of the Authorized Lender, except to the extent otherwise specifically contemplated by the terms of the Agreement.

2. Upon any default by the Developer pursuant to the provisions of the Agreement, the City shall deliver to the Authorized Lender written notice thereof simultaneously with providing such notice to the Developer. The City shall afford the Authorized Lender thirty (30) days beyond the cure or grace period afforded to the Developer under the Agreement to cure a default under Section VIII(A)(1),(2),(3),(4),(5),(6) and (12) of the Agreement (collectively, "Monetary Defaults") and sixty (60) days beyond the expiration of the cure or grace period afforded to the Developer under the Agreement to cure a default under Section VIII(A)(7),(8),(9),(10),(11),(13),(14),(15),(16) and (17) of the Agreement (collectively, "Non-Monetary defaults"); provided that if a Non-

Monetary Default is of such a nature that it can be cured by the Authorized Lender, but the cure cannot be completed within such additional sixty (60) days, then the period afforded to the Authorized Lender to cure such Non-Monetary Default shall be extended automatically so long as Authorized Lender (i) provides written notice to the City of its intention to cure the Non-Monetary Default within such sixty (60) day period, (ii) commences to cure such Non-Monetary Default within such sixty (60) day period and thereafter diligently prosecutes said cure to completion, (iii) cures all Monetary Defaults within the thirty (30) day cure period above and ensures that all other payment obligations under the Agreement are timely paid and (iv) cures all other Non-Monetary Defaults within the periods provided above; and provided further that the cure periods set forth above with respect to Non-Monetary Defaults (but not Monetary Defaults) shall be extended automatically during the pendency of any proceeding instituted by the Authorized Lender for the foreclosure or other judicial enforcement of the Authorized Mortgage to sell or acquire the Project, said extension for Non-Monetary Defaults to continue as long as the Authorized Lender prosecutes said proceedings diligently and in good faith to foreclose the Authorized Mortgage or to acquire the Project.

3. In case the Developer's interest under the Agreement or the Project shall be assigned or otherwise transferred to an Acquiring Party (as defined below) pursuant to the exercise of any right, power or remedy of any Authorized Lender or pursuant to judicial proceedings, as a consequence of a default under the Authorized Mortgage or any related loan document (individually, a "Mortgage Default"), the City, within sixty (60) days after receiving written request therefor, and upon payment to the City of all expenses, including reasonably attorneys' fees incident thereto, and provided that all prior Monetary Defaults under the Agreement have been cured and all continuing Non-Monetary Defaults under the Agreement have been cured to the extent that they can be cured by the Acquiring Party (provided that the City has provided notices of all such Monetary Defaults and Non-Monetary Defaults in accordance with Section B(2) above), will execute and deliver such instrument or instruments as may be required to confirm such transfer of the Developer's interest under the Agreement to the Acquiring Party; provided, however, that such Acquiring Party must possess equal or better financial strength as the Developer as of the Effective Date and must have equal or greater industry experience as the Developer as of the Effective Date.

4. The restrictions set forth in Section VII of the Agreement (Transfers and Assignment) shall not apply to any transfer to a Authorized Lender or its designee pursuant to a foreclosure or other exercise of the security rights held by the Authorized Lender, or deed in lieu of foreclosure or similar measure afforded to a Authorized Lender or its designee, nor to the transfer to any third party purchaser who may acquire the interest of the Developer in the Project directly in a foreclosure or other enforcement proceeding (the acquiring Authorized Lender or third party referred to herein as an "Acquiring Party"); provided, however, that as set forth above, such Acquiring Party must possess equal or better financial

strength as the Developer as of the Effective Date and must have equal or greater industry experience as the Developer as of the Effective Date.

5. In the event an Acquiring Party should, following a Mortgage Default by the Developer, ever succeed to the interest of the Developer under the Agreement or the Project, it is explicitly understood and agreed that the liability of said Acquiring Party as the Developer hereunder shall be limited to matters arising or occurring from and after the date that such Acquiring Party obtains possession of the Project or succeeds to the interest of the Developer under the Agreement (whichever is sooner), provided that such Acquiring Party also shall be obligated to cure all Monetary Defaults and all continuing Non-Monetary Defaults (provided that the City has provided notices of all such Monetary Defaults and Non-Monetary Defaults in accordance with Section B(2) above), to the extent that they can be cured by the Acquiring Party, under the Agreement arising before such Acquiring Party has become the Developer under the Agreement and obtain the appropriate approvals from the BRA as required in accordance with the terms of the 121A Approvals.

6. It is explicitly understood and agreed that any Authorized Lender shall have the right to give, on behalf of and in place of the Developer, any notice or election or decision which the Developer otherwise has the right to give, and that, following the delivery of the Authorized Lender Notice related to such Authorized Lender, any such action by an Authorized Lender hereunder shall be recognized by the City and the Developer as an action of the Developer hereunder.

The City agrees that any Acquiring Party shall have the right to operate the Project in the Developer's place and stead as the Developer hereunder, and said Acquiring Party shall, by virtue of its obtaining possession of the Project, be deemed to be the Developer under the Agreement, subject to the provisions of Section B(5) above, and shall execute an express written assumption of all the terms and conditions of the Agreement (which assumption shall be in form and substance satisfactory to the City). Any Acquiring Party shall be subject to the Transfer restrictions with regard to any subsequent Transfer of the Agreement or of the Acquiring Party's interest in the Project. Any act of assignment to an Acquiring Party or deed in lieu of foreclosure executed to an Acquiring Party as a result of a Mortgage Default shall be subject to the written assumption by the Acquiring Party of all of the terms and conditions of the Agreement and to obtaining all appropriate approvals as required in accordance with the terms of the 121A Approvals. Following such a Transfer, the Acquiring Party shall have the right to operate the Project in accordance with the Agreement. Each Acquiring Party shall provide written notice to the City of its possession of or acquisition of the Project within five (5) days after the date thereof.

Attachment B2

Host Community Agreement Revere

HOST COMMUNITY AGREEMENT

THIS AGREEMENT (this "Agreement") is by and between the **CITY OF REVERE**, a Massachusetts municipality acting by and through its duly authorized Mayor, having a principal place of business at 281 Broadway, Revere, Massachusetts 02151 (the "City"), and **STERLING SUFFOLK RACECOURSE, LLC**, a Massachusetts limited liability company having a principal place of business at 525 McClellan Highway, East Boston, Massachusetts 02128 (the "Owner"), dated as of August 28, 2013 (the "Effective Date"). Hereinafter, the "Owner" shall also mean the Owner's successors and/or assigns. Hereinafter, the Owner and the City are together the "Parties" and individually a "Party."

RECITALS

Reference is made to the following facts:

1. The Owner is the owner of a 161-acre parcel of land (the "Property") located both in the City and the City of Boston, Massachusetts, of which approximately 45 acres are located in the City and approximately 116 acres are located in the City of Boston, on which the Owner operates historic Suffolk Downs, a thoroughbred horse racing facility licensed pursuant to the provisions of M.G.L. chapter 128A, and which is licensed to conduct simulcast wagering pursuant to the provisions of M.G.L. chapter 128C.

2. The Owner has filed an application with the Massachusetts Gaming Commission (the "Commission") seeking a license to operate a resort gaming establishment (a "Gaming License") at the Property together with Caesars Massachusetts Management Company, LLC (the "Project") pursuant to the provisions of M.G.L. chapter 23K ("Chapter 23K").

3. The City is a "Host Community" as that term is defined and used in Chapter 23K, because the Owner has proposed locating a portion of its gaming establishment within the municipal boundaries of the City.

4. The Owner intends to request from the City a binding vote of the residents of the City on the ballot question specified in Section 15(13) of Chapter 23K (the "Ballot Question Election").

5. In accordance with Sections 15(8) and 15(13) of Chapter 23K, prior to requesting the Ballot Question Election the Owner is required to enter a "Host Community Agreement" with the City, as that term is defined and used in Chapter 23K, setting forth the conditions to have a gaming establishment located within the City, including a community impact fee for the City and all stipulations of responsibilities between the City and the Owner, including stipulations of known impacts from the Project.

6. This Agreement is the "Host Community Agreement" between the Owner and the City for the Project, as contemplated by Section 15(8) of Chapter 23K.

7. The Parties acknowledge that total investment in the Project (including improvements to the regional infrastructure) will be approximately $1 billion. In addition, the Project is expected to bring significant new investment to the City, increased governmental revenue and new permanent employment opportunities for residents of the City and other local communities, all as specified in this Agreement.

8. The Parties acknowledge the Project will result in at least 2,500 construction jobs and at least 4,000 permanent jobs.

9. The Parties acknowledge that once all stages of the Project are complete and open to the public, the Project's annual "Gross Gaming Revenue" (defined below) is anticipated to be approximately $1 billion. For the purposes of this Agreement, "Gross Gaming Revenue" shall have the same meaning as given to such term in Chapter 23K, and shall also specifically include, to the extent permitted by the Commonwealth at any time in the future, gross revenues attributable to the Owner's Gaming License or the Project and received by the Owner or its controlled affiliates from internet-based gaming, sports betting or any other forms of gaming authorized by laws enacted after the Effective Date, but shall not include pari-mutuel wagering such as is currently authorized at the Property under M.G.L. c. 128A and M.G.L. c. 128C.

10. Pursuant to Chapter 23K, a portion of the state taxes on the Project's Gross Gaming Revenue would be, following the date that any stage of the Project opens for gaming to the general public (the "Opening"), allocated to a state community mitigation fund (the "Community Mitigation Fund"). Upon the Owner's receipt of a Gaming License, the City would have the ability to apply for payments from the Community Mitigation Fund to address some of the impacts of the Project.

11. Pursuant to Chapter 23K, a portion of the state taxes on the Project's Gross Gaming Revenue would be allocated to a state grant program to be administered by the Massachusetts Cultural Council. Upon the Owner's receipt of a Gaming License, municipally-owned performing arts centers in the area that are impacted by the Project would have the ability to apply for grants from this program.

12. In addition to the new jobs and direct investment at the Property, the Project is expected to promote small businesses and the tourism industry and have a positive economic impact on the City and the Commonwealth of Massachusetts. The Project is expected to permit tourists to enjoy both the gaming establishment and the unique cultural and social resources of the City, resulting in additional enjoyment of and support for those resources.

13. Suffolk Downs opened in 1935 and remains New England's only operating thoroughbred racetrack. The operation of the racetrack requires the dedication of approximately 63 acres to operate a one-mile oval racing surface and related open space, all in an urban environment. The maintenance of this open space and related view corridor is an important community amenity.

14. Suffolk Downs is located in an area designated in the Zoning Ordinance of the City of Revere as Planned Development District 1, and the City has concluded that the proposed use of

the Property as a gaming establishment is consistent with the City's economic plans and priorities, all in accordance with Section 9(a)(18) of Chapter 23K.

15. The City recognizes the historic civic support Suffolk Downs has contributed to the City and its residents.

16. The Owner and the City have entered into this Agreement to evidence the obligations of the Owner to make certain payments to the City and to undertake certain mitigation measures with respect to the Project.

THEREFORE, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the Parties hereby enter into this Agreement with mutual understandings and agree as follows:

SECTION 1. IMPACTS OF THE PROJECT

A. STIPULATIONS OF KNOWN IMPACTS

1. The Parties intend that this Section 1.A shall be deemed to be the "stipulations of known impacts" that are required to be included in this Agreement pursuant to Section 15(8) of Chapter 23K.

2. The Project is expected to increase the number of vehicles using the City's public ways and other highways and roads in the vicinity of the Project. The projects identified in the provisions of this Agreement regarding infrastructure improvements will mitigate such impacts and remedy longstanding background traffic conditions.

3. The Project may have an impact on crime in the City and is expected to require additional expenditures by the City in order to provide police services to the Project and the areas located near the Property. In addition to the relevant sections of Chapter 23K that address the provision of state and local police services to the Project, the Owner's payments to the City under this Agreement will provide the City with adequate resources to mitigate any such impacts.

4. The Project is expected to have an impact on municipal services and require additional expenditures by the City in order to provide such services to the Project. The Owner's payments to the City under this Agreement will provide the City with adequate resources to mitigate any such impacts.

5. As planned, the Project would be constructed within the municipal boundaries of the City of Boston and no new significant construction is currently proposed on the portion of the Property located in the City, thereby resulting in no significant increase in the City's tax levy. The Owner's payments to the City under this Agreement will mitigate any such impacts.

6. The Project may have an impact on problem or compulsive gambling in the City. In addition to the relevant sections of Chapter 23K providing financial and other resources

necessary to address problem or compulsive gambling, provisions of this Agreement regarding compulsive gaming resources will mitigate such impacts.

7. Other impacts of the Project are noted in the various studies obtained and reviewed by the City, and the matters addressed in this Agreement will mitigate such impacts.

B. ADDITIONAL IMPACTS

1. The Parties acknowledge that there may be additional impacts associated with the Project that are unknown as of the Effective Date (the "Additional Impacts"). The Parties intend that any Additional Impacts of the Project that are not sufficiently mitigated through this Agreement shall be mitigated through the Commission's licensing process, through any other state or municipal permitting processes that may be necessary to carry out the Project and through the Community Mitigation Fund established by Section 61 of Chapter 23K.

2. Consistent with the Gaming Commission's regulations, set forth at 205 CMR 127, which are designed to protect host communities from significant and material adverse impacts occurring after the execution of a host community agreement, the Owner and the City shall, if reasonably necessary under the circumstances, negotiate in good faith an amendment to this Agreement if a triggering event, as provided in 205 CMR 127.02, occurs.

3. Notwithstanding Section 1.B.2 of this Agreement and consistent with the provisions of 205 CMR 127.06, the Owner and the City shall (i) negotiate in good faith amendments to this Agreement to correct any non-material terms or typographical errors in this Agreement, and (ii) negotiate in good faith amendments to this Agreement (if any) under the conditions as expressly set forth elsewhere in this Agreement.

SECTION 2. RESPONSIBILITIES AND UNDERTAKINGS BY THE OWNER

A. INFRASTRUCTURE

The Owner shall complete a series of infrastructure improvements in connection with the Project, which are anticipated to cost the Owner in excess of $45,000,000, including, without limitation:

1. Boardman Street FlyOver. The Boardman Street/Route 1A intersection is a critical regional intersection located at the corner of Boardman Street and Route 1A. The Owner shall fund and cause the permitting, design and construction of – in coordination with state and municipal agencies, and in consultation with the City – a so-called "FlyOver" described conceptually in the attached Exhibit B (the "Boardman Street FlyOver"), to alleviate and improve traffic conditions at the intersection and on Route 1A generally, the cost of which is anticipated to exceed $25,000,000, or such other superior improvements as may be approved by MassDOT. In addition to addressing certain traffic and transportation impacts associated with the Project, the Boardman Street FlyOver is intended to address existing historic and background traffic issues of concern to the City, neighboring communities and the region. The Owner shall

diligently pursue the completion of the Boardman Street FlyOver following the date that the Owner closes on the initial funding under the third party financing for the construction of the Project (the "Financing Date"); provided, however, that the completion of the Boardman Street FlyOver shall occur as required under the MEPA Secretary's Certificate for the Project and shall not be a condition to Opening.

2. Route 1/Route 16 Interchange.

(a) The City has had a long-standing concern about, and interest in, improving traffic flow and conditions at the Route 1/Route 16 interchange, both to improve the interchange and to ameliorate traffic conditions within the City, particularly along the Route 60 corridor. The Owner shall fund and cause the permitting, design and construction of – in coordination with state and municipal agencies, including the City – a series of intermediate geometric improvements and new signalizations described conceptually in the attached Exhibit C, to provide access to Route 1 northbound from Route 16 westbound and to facilitate access from Route 1 southbound to Route 16 eastbound (collectively, the "Route 1/Route 16 Intermediate Improvements"), the cost of which is anticipated to exceed $2,100,000. Consistent with the Boston Metropolitan Planning Organization's Lower North Shore Transportation Improvement Study (prepared by the Central Transportation Planning Staff for the Massachusetts Highway Department in October of 2000), the Route 1/Route 16 Intermediate Improvements are intended to transfer Project traffic and some regional traffic from the Route 60 corridor to Route 1/Route 16. The Owner shall diligently pursue the completion of the Route 1/Route 16 Intermediate Improvements following the Financing Date; provided, however, that the completion of the Route 1/Route 16 Intermediate Improvements shall not be a condition to Opening; and, provided further, that the Owner shall complete the Route 1/Route 16 Intermediate Improvements within eighteen (18) months after the date that all state and local approvals and necessary rights of way (if any) for such improvements have been obtained and/or all appeal periods applicable to any such approvals have expired with no appeals pending.

(b) In coordination with state and municipal agencies, including the City, and prior to completing the construction phase of the Route 1/Route 16 Intermediate Improvements, the Owner shall fund and complete a study of the Route 1/Route 16 interchange for the purpose of planning additional improvements unrelated to the Route 1/Route 16 Intermediate Improvements, the cost of which is estimated to be approximately $400,000. The study will be in the nature of a long-range plan for the interchange based on a conceptual plan consistent with long range plans for interchange developed in the North Shore Transportation Study by CTPS. The plan is limited to a study of the merits of the design and does not include a full review of the environmental planning process nor final design plans.

3. Additional Roadway Improvements. The Owner shall fund and cause the permitting, design and construction – in coordination with state and municipal agencies, including the City – of the roadway improvements described in Subparagraphs 3(a) through 3(c) below (the "Additional Roadway Improvements") each to be generally consistent with the preliminary conceptual plans prepared by the Owner's transportation consultant, which were reviewed by the City's transportation consultant prior to the Effective Date, subject to reasonable adjustments and

modifications. The Owner shall obtain the City's approval for all preliminary and final plans for the Additional Roadway Improvements. The Owner shall diligently pursue the completion of such Additional Roadway Improvements following the Financing Date; provided, however, that the completion of such Additional Roadway Improvements shall not be a condition to Opening; and, provided further, that the Owner shall complete the Additional Roadway Improvements within eighteen (18) months after the date that all state and local approvals and necessary rights of way (if any) for such improvements have been obtained and/or all appeal periods applicable to any such approvals have expired with no appeals pending. The Additional Roadway Improvements are as follows:

(a) Route 16/Revere Beach Parkway/Harris Street Intersection (cost estimated to be approximately $1,600,000):

(i) Design and implementation of an optimal traffic signal timing and phasing plan, including split phasing;

(ii) Construction of two exclusive right turn lanes eastbound onto Revere Beach Parkway;

(iii) Construction of pedestrian safety improvements to allow for safe pedestrian routes from Winthrop Avenue to Revere Beach Parkway in both eastbound and westbound directions, including associated sidewalk reconstruction, curb ramps, crosswalks and median improvements; and

(iv) Installation of an emergency vehicle preemption system.

(b) Donnelly Square (cost estimated to be approximately $860,000):

(i) Design and implementation of an optimal traffic signal timing and phasing plan, including split phasing, for the weekday morning, weekday evening and Saturday midday peak periods;

(ii) Redesign of the intersection to channelize traffic flow on the intersection approaches;

(iii) Construction of permanent pedestrian crosswalks with new ADA accessible ramps at all crosswalks within the Donnelly Square area;

(iv) Construction of aesthetic improvements within the Donnelly Square area, including new pavement markings;

(v) Construction of landscaping improvements within the Donnelly Square area and along Winthrop Avenue leading to the Project entrance at Revere Beach Parkway and Tomasello Drive; and

(vi) Installation of an emergency vehicle preemption system.

(c) North Shore Road/Revere Beach Parkway/Tomasello Drive Intersection (cost estimated to be approximately $1,000,000):

(i) Design and implementation of an optimal traffic signal timing and phasing plan at the intersection of North Shore Road and Revere Beach Parkway, including split phasing, to accommodate increased traffic movements associated with the Project;

(ii) A study of alternatives for the provision of an exclusive right hand turning lane into the Tomasello Drive entrance to the Project;

(iii) Construction of pedestrian safety improvements at the intersection and along Revere Beach Parkway, including traffic median improvements and potential realignment; and

(iv) Installation of an emergency vehicle preemption system.

4. Beachmont Streetscape Improvements. Not later than the Financing Date, in conjunction with the work proposed for Donnelly Square, the Owner shall submit to the City plans for streetscape, lighting, planting and other infrastructure improvements in and around the area bounded by Winthrop Avenue, Unity Avenue, Bennington Street and Washburn Avenue in the city's Beachmont neighborhood (the "Beachmont Streetscape Improvements"). Upon receiving the City's approval of the Beachmont Streetscape Improvements, the Owner shall fund and diligently cause the permitting, design and construction of the Beachmont Streetscape Improvements; provided, however, that the completion of such Beachmont Streetscape Improvements shall not be a condition to Opening; and provided further, that the Owner shall complete the Beachmont Streetscape Improvements within twelve (12) months after the date all state and local approvals and necessary rights of way (if any) for such improvements have been obtained and/or all appeal periods applicable to any such approvals have expired with no appeals pending. The foregoing Beachmont Streetscape Improvements are estimated to cost not less than $200,000.

5. Route 1A Planning. The City has a long-standing concern about, and interest in, improving traffic flow along Route 1A from the south. In connection with such concerns, not later than the one year anniversary of the Opening the Owner shall provide to the City a feasibility study, by a consultant or consultants reasonably approved by the City, of various options available to improve traffic flow along Route 1A from the south. The foregoing study is estimated to cost approximately $150,000.

6. Copeland Circle / Route 1. The City has a long-standing concern about, and interest in, improving traffic in the Copeland Circle area. In connection with such concerns, not later than the one year anniversary of the Opening the Owner shall provide to the City a long range plan for this segment of roadway consistent with conceptual plans developed in the North Shore Transportation Study by CTPS, to be completed in conjunction with the plan for the Route

1/Route 16 interchange described above. The plan is limited to a study of the merits of the design and does not include a full review of the environmental planning process nor final design plans.

7. City Infrastructure Improvements. Not later than the Financing Date, the Owner shall make a payment to the City in the amount of $1,267,000 (the "Additional Transportation Contribution") for use by the City in its discretion to complete certain improvements to Mahoney Circle, Brown Circle, and the Route 60/Revere Street Intersection, substantially as described in subsections (a) through (c) below (collectively, the "City Intersection Improvements"); provided, however, that the City shall coordinate the City Intersection Improvements with the Owner and relevant state agencies; and, provided further, that in the event that the Owner is required to complete any portions of the City Intersection Improvements pursuant to any state or local permits, licenses or approvals obtained in connection with the Project (including, without limitation, the Project's MEPA Certificate), then the City shall have no obligation or liability to the Owner to complete such portions of the City Intersection Improvements and the amount of the Additional Transportation Contribution shall be reduced by the amount of the costs incurred by the Owner in connection with completing such portions of the City Intersection Improvements. The City Intersection Improvements are as follows:

(a) Mahoney Circle:

(i) Design and implementation of a comprehensive upgrade of the signs and pavement markings approaching and within Mahoney Circle, consistent with the Manual on Uniform Traffic Control Devices ("MUTCD") standards, to improve motorist and pedestrian guidance and safety;

(ii) Installation of ADA accessible ramps and associated sidewalk and median improvements within and around Mahoney Circle;

(iii) Design and installation of channelization and signalization improvements within and around Mahoney Circle;

(iv) Construction of upgrades to the traffic islands within Mahoney Circle, including new curbing and landscaping; and

(v) Installation of an emergency vehicle preemption system.

(b) Brown Circle:

(i) Design and implementation of a comprehensive upgrade of the signs and pavement markings approaching and within Brown Circle, consistent with the MUTCD standards, to improve motorist and pedestrian guidance and safety;

(ii) Installation of ADA accessible ramps and associated sidewalk and median improvements within and around Brown Circle;

(iii) Design and implementation of channelization and signalization improvements, including new pavement and directional markings and channelization islands, at the Route 107 northbound approach to Brown Circle;

(iv) Construction of geometric and channelization improvements by extending existing islands and installing new islands to facilitate safer traffic flow; and

(v) Installation of an emergency vehicle preemptions system.

(c) Route 60/Revere Street Intersection:

(i) Design and implementation of an optimal traffic signal timing and phasing plan at the intersection, including split phasing;

(ii) Construction of pedestrian safety improvements including new crosswalks and ADA accessible ramps with associated sidewalk reconstruction; and

(iii) Installation of an emergency vehicle preemption system.

8. MBTA and Bicycle Access Improvements. The Owner shall fund and cause the permitting, design and construction – in coordination with state and municipal agencies, including the City – of the MBTA and Bicycle Access Improvements described conceptually in the attached Exhibit D.

9. Modification of Infrastructure Improvements. The Parties acknowledge that many of the infrastructure improvements described in this Section 2.A (an "Infrastructure Improvement" or the "Infrastructure Improvements"), require the approval of various state and municipal agencies other than the City. If the City reasonably determines that any modification to an Infrastructure Improvement or the refusal to authorize all or a portion of an Infrastructure Improvement by a state or municipal agency would materially and adversely affect the City, then the City shall promptly notify the Owner of such determination and the Parties shall negotiate in good faith an amendment to this Agreement to mitigate such adverse impacts.

B. PAYMENTS TO THE CITY

Except as otherwise set forth in this Agreement, all payments required under this Section 2.B are in addition to any costs incurred by the Owner in compliance with any other sections of this Agreement, and in addition to any taxes or other legally required payments made to the City by the Owner.

1. Initial Payments and Pre-Payments. The Owner shall make payments to the City as follows:

(a) Initial Payments:

(i) The Owner shall make a payment to the City in the amount of Four Million Dollars ($4,000,000), which payment shall be due in full on the later of (i) July 15, 2014, or (ii) thirty (30) calendar days after the date the Owner receives its Gaming License, in conditional or final form, and notwithstanding any appeals of such Gaming License (the "First Initial Payment"). The First Initial Payment shall be made notwithstanding the Opening and shall be made in addition to any other payments due to the City by the Owner under this Agreement.

(ii) The Owner shall make a payment to the City in the amount of Four Million Dollars ($4,000,000), which payment shall be due in full on the later of (i) May 1, 2016, or (ii) the Financing Date (the "Second Initial Payment"). The Second Initial Payment shall be made notwithstanding the Opening, which may occur prior to May 1, 2016, and shall be made in addition to any other payments due to the City by the Owner under this Agreement, including any payments of the Community Impact Fee (defined below) made prior to or after May 1, 2016.

(b) Pre Payments:

On May 1 of each year after 2016 until the Opening, the Owner shall make a payment to the City in the amount of Four Million Dollars ($4,000,000) as pre-payment of the Community Impact Fee set forth herein, (a "Pre-Payment" or the "Pre-Payments"); provided, however, that the Owner shall not be obligated to make any Pre-Payments until the Financing Date if the Financing Date occurs after May 1 of a year after 2016. All Pre-Payments shall be subject to adjustment as set forth in Section 2.B.2(g).

(c) Pro Rata Adjustment of the Final Pre-Payment:

The final Pre-Payment shall be due in full on May 1 in the City fiscal year (July 1 to June 30) in which the Opening occurs; provided, however, that the Owner is entitled to a pro-rated credit against the final Pre-Payment, said credit to be the sum of all payments made to the City pursuant to Section 2.B.2 of this Agreement during the City fiscal year in which the Opening occurs, unless such difference would be a negative number, in which event no Pre-Payment would be required by the Owner in the City fiscal year in which the Opening occurs.

(d) Notwithstanding the foregoing, the Owner shall not be obligated to make the Frist Initial Payment, the Second Initial Payment or any Pre-Payments if this Agreement is terminated pursuant to Section 4.N(b) or (c) of this Agreement.

2. Community Impact Fee. Commencing on the Opening, the Owner shall make payments to the City referred to herein as the "Community Impact Fee", which is the community impact fee called for by Section 15(8) of Chapter 23K. For the purposes of this Agreement, an "Impact Fee Year" shall be each successive twelve (12) month period following the Opening. Payment of the Community Impact Fee shall be as follows:

(a) First Impact Fee Year:

Commencing on the first day of the month after the Opening and continuing on the first day of each month thereafter during the first Impact Fee Year, the Owner shall make monthly installment payments of the Community Impact Fee to the City (an "Installment Payment" or the "Installment Payments"), each to be one percent (1.00%) of the Project's Gross Gaming Revenue in the prior calendar month; provided that in no event shall the sum of the twelve (12) Installment Payments in the first Impact Fee Year be less than Four Million Two Hundred Fifty Thousand Dollars ($4,250,000) (the "First Minimum Payment").

(b) Second Impact Fee Year:

Commencing on the first day of the month after the first Impact Fee Year and continuing on the first day of each month thereafter during the second Impact Fee Year, the Owner shall make monthly Installment Payments to the City, each to be one and one quarter percent (1.25%) of the Project's Gross Gaming Revenue in the prior calendar month; provided that in no event shall the sum of the twelve (12) Installment Payments in the second Impact Fee Year be less than Four Million Seven Hundred Fifty Thousand Dollars ($4,750,000) (the "Second Minimum Payment").

(c) Third Impact Fee Year:

Commencing on the first day of the month after the second Impact Fee Year and continuing on the first day of each month thereafter during the third Impact Fee Year, the Owner shall make monthly Installment Payments to the City, each to be one and one quarter percent (1.25%) of the Project's Gross Gaming Revenue in the prior calendar month; provided that in no event shall the sum of the twelve (12) Installment Payments in the third Impact Fee Year be less than Five Million Dollars ($5,000,000) (the "Third Minimum Payment").

(d) Fourth Impact Fee Year:

Commencing on the first day of the month after the third Impact Fee Year and continuing on the first day of each month thereafter during the fourth Impact Fee Year, the Owner shall make monthly Installment Payments to the City, each to be one and one half percent (1.50%) of the Project's Gross Gaming Revenue in the prior calendar month; provided that in no event shall the sum of the twelve (12) Installment Payments in the fourth Impact Fee Year be less than Five Million Five Hundred Thousand Dollars ($5,500,000) (the "Fourth Minimum Payment").

(e) Fifth and Subsequent Impact Fee Years:

Commencing on the first day of the month after the fourth Impact Fee Year, and continuing on the first day of each month thereafter for the duration of this Agreement, the Owner shall make monthly Installment Payments to the City as follows, each to be one and one half percent (1.50%) of the Project's Gross Gaming Revenue in the prior calendar month; provided that in no event shall the sum of the twelve (12) Installment Payments in the fifth and all subsequent Impact Fee Years be less than Nine Million Dollars ($9,000,000) (the "Ongoing Minimum Payment").

(f) Heightened Gross Gaming Revenue:

Notwithstanding any provision of Sections 2.B.2(a), (b), (c), (d) or (e) of this Agreement to the contrary, in any Impact Fee Year for which the Project's Gross Gaming Revenue is One Billion Two Hundred Fifty Million Dollars ($1,250,000,000) (as escalated for inflation using mutually agreeable, then applicable consumer price indexes in good faith) or greater, the Owner shall make a Make-Whole Payment (defined below) to the City such that the total Community Impact Fee paid the City for such Impact Fee Year is equal to one and three quarters percent (1.75%) of the Project's Gross Gaming Revenue; and, provided further, that in any Impact Fee Year for which the Project's Gross Gaming Revenue is One Billion Five Hundred Million Dollars ($1,500,000,000) (as escalated for inflation using mutually agreeable, then applicable consumer price indexes in good faith) or greater, the Owner shall make a Make-Whole Payment to the City such that the total Community Impact Fee paid the City for such Impact Fee Year is equal to two percent (2%) of the Project's Gross Gaming Revenue.

(g) Make-Whole Payment:

The Owner hereby agrees to pay, not later than fifteen (15) days following the end of each Impact Fee Year (i) any amount by which the sum of the twelve (12) Installment Payments made during such Impact Fee Year was less than the First Minimum Payment, the Second Minimum Payment, the Third Minimum Payment, the Fourth Minimum Payment or the Ongoing Minimum Payment, respectively, or (ii) any amount required by Section 2.B.2(f) of this Agreement (a "Make-Whole Payment").

(h) Certification of Gross Gaming Revenue:

Each monthly Installment Payment and Make-Whole Payment made to the City under Section 2.B.2 of this Agreement shall be accompanied by documentation reasonably acceptable to the City certifying the Gross Gaming Revenue received by the Owner in the respective payment period.

(i) Credits for Pre-Payments.

The City and the Owner agree that in each of the first five (5) Impact Fee Years, the amount of the annual Community Impact Fee to be paid by the Owner to the City shall be reduced by an amount equal to twenty percent (20%) of the aggregate amount of the Pre-Payments, provided that in no event shall such reduction cause the Community Impact Fee in any Impact Fee Year to be less than the First Minimum Payment, the Second Minimum Payment, the Third Minimum Payment, the Fourth Minimum Payment or the Ongoing Minimum Payment, respectively; provided further that in the event that the Community Impact Fee in any Impact Fee Year is not sufficiently higher than the First Minimum Payment, the Second Minimum Payment, the Third Minimum Payment, the Fourth Minimum Payment or the Ongoing Minimum Payment, respectively, to provide the reduction that would otherwise be due, then the amount of the reduction not received by the Owner shall be provided in the next Impact Fee Year in which the Community Impact Fee is sufficient to allow such reduction to be received. For example, if the aggregate amount of the Pre-Payments is $6,000,000, then the Community Impact Fee shall be reduced by $1,200,000 in each of the first five (5) Impact Fee Years. For the purpose of clarity, the entirety of the Pre-Payments shall be repaid to the Owner in the form of reductions in the Community Impact Fee due from the Owner to the City.

C. UNANTICIPATED PRE-DEVELOPMENT TAX INCREASE OFFSETS

1. For City fiscal year 2013, total real property taxes due to the City for the approximately 45 acres of the Property located in the City (the "Revere Property") were approximately $343,164.50. Until such time as the Owner receives a Material Building Permit, defined below, the City and the Owner do not anticipate that the total real property taxes due to the City for the Revere Property for any subsequent City fiscal year will increase by more than five percent (5%) over the prior City fiscal year (the "Maximum Anticipated Tax Bill"). The Owner is relying on this mutual understanding regarding the Maximum Anticipated Tax Bill as a basis for its agreement to make the Community Impact Fee payments set forth herein.

2. The Owner and the City anticipate that the Owner will construct on the Revere Property certain improvements to existing racing-related structures (such as barns, maintenance buildings, and the like) and surface parking improvements accessory to the Project (the "Anticipated Improvements"). Notwithstanding Section 2.C.1 of this Agreement, increases in total real property taxes due to the City for the Revere Property attributable to any Anticipated Improvements shall not be counted towards the calculation of the Maximum Anticipated Tax Bill in the City fiscal year in which such Additional Improvements are first assessed, but shall be counted towards the calculation of the Maximum Anticipated Tax Bill in subsequent City fiscal years.

3. Upon the Effective Date, in the event that total real property taxes due to the City for the Revere Property for any City fiscal year exceed the Maximum Anticipated Tax Bill (exclusive of Anticipated Improvements), then the Owner may reduce the payments made under Section 2.B.2 of this Agreement in the next succeeding Impact Fee Year by the amount due to the City in excess of the Maximum Anticipated Tax Bill. For example, if the Maximum Anticipated Tax Bill for a City fiscal year is $350,000, but the actual total real property taxes due to the City in such City fiscal year are $375,000, then the Owner may reduce the payments made under Section

2.B.2 of this Agreement in the next succeeding Impact Fee Year by $25,000, and the Maximum Anticipated Tax Bill for the next City fiscal year shall be $367,500 (5% more than $350,000).

4. The provisions of Sections 2.C.1, 2.C.2, and 2.C.3 above shall be of no force and effect following the date that the Owner receives a building permit for a change of use for the Revere Property or a building permit for an improvement that is not an Anticipated Improvement (a "Material Building Permit").

D. OTHER FINANCIAL OBLIGATIONS

1. Wonderland Greyhound Park. The Owner shall cause its affiliate which owns the property commonly known as the Wonderland Greyhound Park ("Wonderland") to commission a master plan study, conducted by a consultant or consultants reasonably approved by the City, for the future development of Wonderland, provided that such master plan shall be completed and delivered to the City not later than one (1) year after the Owner's receipt of its Gaming License. The City acknowledges that Elkus-Manfredi would be an acceptable consultant if selected by the Owner to prepare the master plan study.

2. Community Improvements. Not later than the Financing Date, the Owner shall (i) make a payment to the City in the amount of Two Million Dollars ($2,000,000) towards the renovation by the City of the City's football field, (ii) make a payment to the City in the amount of One Million Dollars ($1,000,000) towards the construction of a youth center in the City, and (iii) at the Owner's expense, cause the Owner's architect to prepare schematic designs for a youth center in the City in collaboration with the City.

3. Reimbursement of Costs. The Parties acknowledge that the Owner and the City entered into a separate agreement concerning the reimbursement of costs related to certain of the City's expenses in negotiating this Agreement and carrying out the Ballot Question Election. Following the Ballot Question Election, the Owner shall within thirty (30) days of receipt of a proper invoice, directly reimburse the City for all reasonable costs incurred by the City for outside consultants, legal counsel and other such similar and reasonable costs of third party service providers necessary in connection with (i) the Owner's application for a Gaming License, (ii) the implementation of this Agreement by the City, (iii) the review of the Infrastructure Improvements required by this Agreement, and (iv) other ongoing Project-related expenses; provided, however, that the City shall not seek reimbursement from the Owner for any such costs for which it has received reimbursement from the Gaming Commission; and, provided further, the aggregate amount of such reimbursement for costs incurred after the date hereof in any City fiscal year shall not exceed $50,000.

E. CONSTRUCTION AND PERMANENT EMPLOYMENT

The Owner shall make and cause its agents, operators and contractors to make certain commitments relating to employment at the Project as follows:

1. Construction Employment. The Owner shall ensure that its general contractor or construction manager for the Project and those engaged by said general contractor or construction manager, on a craft-by-craft basis, shall use best efforts to meet the following goals:

(a) at least ten percent (10%) of the total employee worker hours in each trade shall be by bona fide residents of the City; provided, however, that for any future projects by the Owner to be constructed exclusively within the municipal boundaries of the City, the Owner shall in good faith endeavor to substantially increase the percentage of total employee worker hours by bona fide residents of the City in such future projects;

(b) at least twenty five percent (25%) of the total employee worker hours in each trade shall be by minorities; and

(c) at least ten percent (10%) of the total employee worker hours in each trade shall be by women.

2. Permanent Employment.

(a) The Owner shall use best efforts to ensure that at least ten percent (10%) of the total permanent workforce for the Project shall be bona fide City residents; provided, however, that for any future projects by the Owner to be located exclusively within the municipal boundaries of the City, the Owner shall in good faith endeavor to substantially increase the percentage of bona fide City residents within its permanent workforce in such future projects;

(b) The Owner's workforce shall be unionized and organized in accordance with Section 18(18) of Chapter 23K.

(c) Throughout the Term of this Agreement, the Owner shall employ one or more full-time employees to promote awareness of employment and business opportunities at the Project for City residents and businesses, including, without limitation, the job opportunities and local business, purchasing and economic development initiatives set forth in this Agreement, as well as to undertake outreach to neighborhood groups in the City.

(d) The Owner agrees to comply with the job creation and employment commitments listed in the attached Exhibit E.

(e) The Parties acknowledge that the Project is an important public policy initiative that requires the involvement of the entire community and adjoining communities. In that regard, the Owner shall work with the City to devise a plan to hold a jobs fair to promote the opportunities at the facility and shall work with the City to devise a network of training and recruitment partners. The Owner shall work with the City and other communities in the vicinity of the Project to encourage expansion of access to employment for minorities, women and veterans and other disadvantaged groups and generally to expand local employment opportunities. The Owner shall establish a protocol which shall be submitted to the City annually to define and assess these employment and other opportunities for City

residents.

F. PARKING

1. On-Street Parking by Employees Prohibited. The Owner shall, in consultation with the City, adopt and enforce policies prohibiting employees, contractors and agents of the Project from parking their vehicles on streets in the City.

2. Parking on the Property. The Owner shall use reasonable efforts to provide parking facilities on the Property sufficient to accommodate all patrons of the Project.

3. Parking at Wonderland. If the Owner decides, in its sole discretion, to use the Wonderland property to provide parking facilities for patrons, employees, contractors, agents and other visitors of the Project, it shall only do so for a maximum of three (3) years following the Opening, subject to an extension of such time granted in writing by the City in its sole discretion.

4. Parking Plan. The Owner shall, as soon as reasonably possible after the Effective Date and not later than three (3) months after receiving the Gaming License, provide the City with a list of properties located in the City to be utilized by the Owner to provide parking facilities for patrons, employees, contractors, agents and other visitors of the Project. In addition to obtaining any necessary permits, licenses and other approvals from the City for such parking facilities, the Owner shall, in consultation with the City, develop a plan to minimize the impacts of such parking facilities on City residents and businesses.

G. SUPPORT FOR CITY APPLICATIONS FOR COMMUNITY MITIGATION FUNDS

Upon the Effective Date, the Owner shall support the City's requests for payments from the Community Mitigation Fund. Such support shall include, but not be limited to: (i) providing letters in support of the City's applications for funds; (ii) providing any non-proprietary and non-confidential studies, data, or other information requested by the Commission in order to process the City's applications for funds (with costs not to exceed $50,000 per annum); and (iii) making personal appearances and/or testimony from representatives of the Owner at meetings of the Commission in support of the City's applications for funds.

H. ONGOING COMMUNITY MITIGATION

1. Vendor Opportunities. On an annual basis, the Owner shall utilize best efforts to purchase not less than Seven Million Five Hundred Thousand Dollars ($7,500,000.00) in goods and services from vendors and companies with a principal place of business in the City. The Owner shall work with the City to hold vendor fairs that provide City businesses with information concerning providing goods and services to the Project. The Owner shall meet with local businesses regarding any opportunities to open satellite businesses within the Project. Moreover, the Owner shall ensure that City businesses will be able to benefit from partnership programs that incentivize employees and patrons of the Project to utilize City businesses, including through the rewards program maintained by the Owner's operator. In addition, the Owner will create and implement a marketing program for the utilization of minority business

enterprises, women business enterprises and veteran business enterprises to participate as vendors in the provision of goods and services procured by the Owner and any businesses operated as part of the Project. The Owner shall, on a semi-annual basis, consult with the Revere Chamber of Commerce, the Community Advisory Board (defined below) and such other business groups or associations as the City may reasonably request to identify opportunities in furtherance of the objectives set forth in this section. The Owner shall, upon reasonable request, meet with the Mayor to provide updates on the Owner's efforts to comply with this Section 2.H.1. The Owner's obligations under this section shall be subject to the availability of such goods and services on commercially reasonable terms.

2. Community Advisory Board. The Owner shall work with the City to establish a "Community Advisory Board" to provide additional benefits relevant to the impacts of the Project and to generally benefit the City and its residents. The Owner shall work with the Community Advisory Board to develop mechanisms and networks for the inclusion of local vendors, with special emphasis on women, minority and veteran-owned enterprises in accordance with Sections 15(15) and 18(16) of Chapter 23K, and to provide goods, services and materials for the Project on an on-going basis in accordance with Section 18(10) of Chapter 23K, all in coordination with the Owner's obligations under this Agreement. The Owner shall use commercially reasonable efforts to cause its agents, operators and contractors operating in any portion of the Project to comply with this provision.

3. Additionally, the Owner shall:

(a) work with the City to develop a program to provide incentives for employees and patrons of the Project to utilize other businesses located in the City;

(b) enter into a construction mitigation agreement with the City that is similar to the form used by the City of Boston to address and mitigate impacts on the City's residents and businesses associated with construction activity at the Project; and

(c) ensure that taxi cab and livery service businesses based in the City shall have equal access to serve patrons and employees of the Project as is provided to taxi cabs and livery services based outside the City to the extent permitted under applicable laws and regulations.

I. HORSE RACING

As required by Chapter 23K, the Owner, as the holder of a live racing license under M.G.L. c. 128A, shall maintain the existing racing facility on the Property, subject to the permitted changes in the number of live racing days. Nothing in this Agreement shall limit, impact or waive the City's right to receive the local share of racing taxes currently collected by the Commonwealth pursuant to M.G.L. c. 58, § 18D, as the same may be amended.

J. INCREASES IN CAR INSURANCE RATES

The Owner shall use best efforts to work with the Commonwealth's Division of Insurance to monitor, reduce or eliminate increases to car insurance rates within the City that are proposed as a result of the Project, including, without limitation, a safe driver educational program for all employees and the promotion of safe, unimpaired driving for all guests and patrons.

K. VEHICLES FOR HIRE

Due to increase in use of and demand for taxi cabs and other vehicles for hire to serve the Project, the Owner shall work with the City to facilitate and mitigate the use and impact of such vehicles in the City. The City will monitor and enforce rules, regulations and operation of such vehicles.

L. GUARANTEED RIDE HOME PROGRAM

The Owner shall establish a guaranteed ride home program funded and implemented by the Owner to provide safe rides home for patrons whose driving may be impaired. The guaranteed ride home program shall include advertising and informing patrons of the existence of the program and training of employees at the Project with respect to the program In addition, the Owner shall implement a guaranteed ride home program for all employees.

M. COMPULSIVE GAMBLING RESOURCES

The Owner shall implement a responsible gaming plan at the Property to make sure that those people who cannot game responsibly get the help they need and to make sure that people who can game responsibly understand the importance of gaming responsibly. The Owner shall mitigate the potential negative public health consequences associated with the Project.

The Owner shall accomplish the responsible gaming goals for the Project by, among other things: (i) complying in every respect with all responsible gaming provisions in Chapter 23K and all responsible gaming provisions subsequently adopted by the Commission or adopted by the City or its departments or agencies; (ii) ensuring that all patrons of the Project are twenty-one (21) years of age or over, as required by Chapter 23K; (iii) educating its employees through formal training programs about the importance of responsible gaming and underage gambling and the policies and procedures of Owner's responsible gaming programs; (iv) providing information to patrons about the odds of games, signs and symptoms of compulsive gaming and how to make responsible gaming decisions; (v) promoting responsible gaming in daily operations; and (vi) supporting public awareness of responsible gaming, including, at a minimum, working with the National Council on Problem Gambling, Inc., its local councils and other service agencies in and around the City and region on a continuing basis to promote a better understanding of responsible gaming and underage gambling and supporting research on responsible gaming and underage gambling issues through on-going financial contributions.

The Owner shall implement a "self-restriction" program that allows anyone to request not to receive direct marketing by the Owner's owned, managed, or operated properties, as well as to be denied credit and check cashing privileges at the Project. Forms to request self-restriction or

self-exclusion shall be readily available to all customers and individuals who visit the Property.

The Owner shall join and actively participate in the Massachusetts Partnership for Responsible Gaming and actively work with City agencies for the express purpose of assisting the City to address issues of treatment for compulsive behavior, especially problem gaming in the City. The Owner's obligations under this Section 2.M shall not be inconsistent with any applicable orders, rules, policies or other directives of the Commission, the Commonwealth of Massachusetts, or any other governmental body, agency, authority or commission.

N. EXPANSION OF THE GAMING ESTABLISHMENT

If the Owner seeks to expand its gaming establishment onto the Revere Property or beyond the Property onto property located within or outside the City, the Owner shall promptly notify the City and the Parties shall negotiate in good faith an amendment to this Agreement to mitigate any negative impacts, if any, upon the City of such expansion.

O. INSURANCE AND INDEMNIFICATION OF THE CITY

1. Insurance.

(a) The Owner shall maintain in full force and effect the types and amounts of insurance as set forth below, and to the extent permissible by applicable law, the City shall be named as an additional insured under each policy. The Owner shall be responsible for all deductibles related to such insurance. In addition, the City may require commercially reasonable increases in all insurance coverage amounts from time to time as may be appropriate for projects of similar size and complexity.

Type of Coverage	**Requirements**
Commercial General Liability (occurrence form)	Coverage shall include products liability, completed operations, liquor liability, garagekeepers legal liability, damage to rented premises, personal and advertising injury and blanket contractual injury. The policy shall have limits of at least $1,000,000 per occurrence and $2,000,000 per location aggregate for property damage and bodily injury.
Automobile Liability Insurance	$1,000,000 combined single limit coverage each accident. This policy shall include coverage for loss due to bodily injury or death of any person, or property damage arising out of the ownership, maintenance, operation or use of any motor vehicle whether owned, non-owned, hired or leased.
Workers' Compensation	Limits as required by statute in the Commonwealth covering all of the Owner's personnel performing work

Insurance	or services in connection with the Project.
Employers' Liability Insurance	$1,000,000 each accident and each employee for disease.
Umbrella and/or Excess Liability Insurance	$200,000,000 each occurrence/aggregate.
Pollution Legal Liability Insurance	$5,000,000 each occurrence/aggregate. This policy shall provide coverage for third-party bodily injury, property damage, cleanup costs and defense costs that arise in connection with the Project.

(b) Prior to undertaking any activities on the Property, the Owner and any of its authorized representatives shall first provide the City certificates of insurance evidencing all insurance policies that the Owner and any of its authorized representatives (including, without limitation, any architects, engineers, general contractors, subcontractors, and consultants) are required to carry hereunder. All such certificates of insurance shall confirm the specific coverage requirements stated above and shall unequivocally state that should any of the above-described policies lapse, be materially changed, or be cancelled before the expiration date thereof, the issuing insurer shall provide thirty (30) days written notice to the City.

(c) All policies of insurance referred to herein shall be written in a form that is reasonably acceptable to the City and by companies that are authorized to do business in the Commonwealth and having a financial strength rating by A.M. Best Company, Inc. of not less than "A-" or its equivalent from another recognized rating agency. The City, in its sole discretion, may waive or modify one or more of the foregoing insurance requirements if the same are not available on commercially reasonably terms. All policies of insurance shall provide that any act or negligence of the Owner shall not prejudice the rights of the City as a party insured under said policies. If requested by the City in writing, the Owner shall furnish the City with certified copies of the insurance policies required hereunder.

2. Policies Non-Cancelable. The Owner agrees that all policies of insurance referred to herein shall not be canceled or allowed to lapse nor shall any material change be made in any such policy which changes, restricts or reduces the insurance provided, nor shall there be a change in the name of the insured, without first giving thirty (30) days notice in writing to the City.

3. Keep in Good Standing. The Owner shall observe and comply with the requirements of all policies of public liability, fire and other policies of insurance at any time in force with respect to the Project and the Owner shall so perform and satisfy the requirements of the companies writing such policies.

4. Waiver of Subrogation. The Owner hereby waives all rights of recovery against the City and its authorized representatives on account of loss or damage to the Property, and to the extent that the Owner obtains an insurance policy for such loss or damage, the Owner shall cause such policy to be endorsed to waive the insurer's rights of subrogation against the City and its authorized representatives.

5. Indemnity. Upon the Effective Date, the Owner shall defend, indemnify and hold harmless the City, its officers, employees and agents ("Indemnified Parties") against any claims, actions, demands, fines, penalties, costs, expenses, damages, losses, obligations, judgments, liabilities, and suits, including reasonable attorneys' fees, reasonable experts' fees and associated court costs ("Liabilities") that arise from or relate in any way to: (i) the validity of this Agreement and all of this Agreement's individual provisions; (ii) the authority of the City to enter into this Agreement; (iii) the validity of the Ballot Question Election and votes cast at the Ballot Question Election; (iv) any threatened or actual litigation arising from the City's participation in this Agreement; (v) the gross negligence or willful misconduct of the Owner, or any of the Owner's authorized representatives in the performance of any activity, undertaking or obligation arising out of this Agreement; and (vi) any breach of or default under this Agreement by the Owner; provided, however, that the Owner shall not be liable for any losses to the extent caused by the gross negligence or willful misconduct of any one or more of the City or its authorized representatives. The foregoing express obligation of indemnification shall not be construed to negate or abridge any other obligation of indemnification running to the City which would exist at common law or under other provisions of this Agreement, and the extent of the obligation of indemnification shall not be limited by any provision of insurance undertaken in accordance with this Agreement. This indemnification shall survive the termination or expiration of this Agreement for a period equal to the applicable statute of limitations period. If any action or proceeding is brought against the City arising out of any occurrence described in this section, upon notice from the City the Owner shall, at its expense, defend such action or proceeding using legal counsel approved by the City, provided that no such action or proceeding shall be settled without the approval of the City.

P. SECURITY FOR OWNER'S OBLIGATIONS

1. Letter of Credit.

(a) To secure the Owner's obligation under this Agreement to make payments of the Community Impact Fee, upon and following the Opening, (i) the Owner shall deliver to the City an original irrevocable standby letter of credit issued by a major money center bank located within the United States reasonably acceptable to the City in the initial sum of Five Million Dollars ($5,000,000) (the "Letter of Credit"). The Letter of Credit shall be issued in accordance with, and subject to, the International Standby Practices (ISP98) International Chamber of Commerce Publication No. 590 and the rules of the Uniform Customs and Practice for Documentary Credits (1993 Revision), International Chamber of Commerce Publication No. 500, as most recently published and/or updated by the International Chamber of Commerce, or any successor code of standby letter of credit practices generally adopted by the issuing bank as may be in effect at the time of issuance (the "Letter of Credit

Standards").

(b) The Letter of Credit shall be in form and substance acceptable to the City in accordance with the Letter of Credit Standards set forth above. The Letter of Credit shall automatically renew. The Owner shall be obligated to maintain the Letter of Credit for the Term of the Agreement.

(c) During the Term, the Letter of Credit shall be renewed or replaced prior to expiry with either a renewal of the then current Letter of Credit or with a replacement Letter of Credit satisfying the other requirements of this Section, in either case extending the expiry of the Letter of Credit for at least twelve (12) months. At least forty-five (45) days prior to the expiration of the then-current Letter of Credit, the Owner shall notify the City in writing of its intention to deliver an original renewal or a replacement Letter of Credit. The Owner shall deliver an original renewal or a replacement Letter of Credit to the City at least thirty (30) days prior to expiration of the then current Letter of Credit. If a satisfactory renewal or replacement Letter of Credit has not been delivered to the City at least thirty (30) days prior to the expiration of the then current Letter of Credit, the City shall be entitled to draw on the then existing Letter of Credit and shall hold the funds in escrow until such time as a replacement Letter of Credit has been provided to the City. The provisions of this Section shall survive the termination or expiration of this Agreement.

2. Late Payment Penalty. If any portion of any payment due to the City under this Agreement is not received by the City as of the due date for such payment, then such portion shall be deemed overdue and shall bear interest of eighteen percent (18.00%) per month from the date that is five (5) business days after the date of notice by the City to Owner of such late payment until received by the City.

Q. AGREEMENT TO BE A CONDITION OF THE OWNER'S GAMING LICENSE

The Owner shall use reasonable efforts to ensure that full compliance with the terms of this Agreement, including, but not limited to, making timely payments to the City of all amounts due under this Agreement, shall be a binding condition of its Gaming License and that any default by the Owner with respect to this Agreement shall constitute an automatic suspension of the Gaming License, with the Owner's "reasonable efforts" to include, but not be limited to, proposing such a condition in its application for a Gaming License. If such a condition is not included in the Owner's Gaming License, the Owner shall promptly notify the City and the Parties shall negotiate in good faith an amendment to this Agreement to mitigate any negative impacts, if any, upon the City as a result.

R. ENFORCEMENT OF PAYMENTS TO THE CITY

In the event that the Owner fails to make any payment hereunder when due, the Owner agrees (unless the Owner and the City are in good faith disputing whether such payment is due) not to object to or oppose any effort by the City to seek a judgment in a court of competent jurisdiction to enforce a payment default under this Agreement and to obtain a judgment lien against the Property.

S. STATUTORY BASIS FOR FEES

The Owner recognizes and acknowledges that the Community Impact Fee and other payments to the City required by this Agreement: (i) are authorized under Section 15(8) of Chapter 23K and M.G.L. c. 40, § 22F; (ii) are being charged to the Owner in exchange for particular governmental services which benefit the Owner in a manner not shared by other members of society; (iii) will be paid by the Owner by choice in that the Owner has voluntarily entered into this Agreement and is voluntarily seeking a Gaming License; and (iv) will be paid primarily not to provide additional revenue to the City but to compensate the City for providing the Owner with the services required to allow the Owner to construct and operate the Project and to mitigate the impact of the Owner's activities on the City and its residents.

T. COVENANTS OF THE OWNER

1. Affirmative Covenants of the Owner. The Owner covenants that throughout the Term, the Owner shall:

(a) Do or cause to be done all things necessary to preserve, renew and keep in full force and effect its legal existence.

(b) Do or cause to be done all things necessary to preserve, renew and keep in full force and effect a Gaming License, and comply with all legal requirements applicable to the operation of its business and other activities, in all material respects, whether now in effect or hereafter enacted.

(c) Furnish to the City upon the request of the City all financial reports and other such written materials provided by Owner to the Commission or to other municipalities.

(d) Make or cause to be made, annual capital expenditures to the Project consistent with Section 21(a)(4) of the Chapter 23K.

2. License Application. The Owner shall:

(a) Promptly, completely and accurately submit to the Commission its completed response to the Commission's RFA-2 (the "RFA-2 Response"), all other information as the Commission may from time to time require from the Owner in connection with its application for a Gaming License, make all payments required under Chapter 23K to be made by an applicant for a Gaming License and use its best efforts to satisfy all criteria necessary to be issued a Gaming License by the Commission;

(b) Furnish to the City a copy of the RFA-2 Response simultaneous with or immediately following its submission to the Commission and reasonably consult with the City in advance of such submission, as to its content;

(c) Consult with the City prior to making any formal presentation to the Commission concerning its RFA-2 Response; and

(d) Prior to the Commission issuing a Gaming License to the Owner, keep the City informed as to all material contacts and communications between the Commission and its staff and the Owner so as to enable the City to evaluate the likelihood and timing of the Commission issuing a Gaming License to the Owner.

3. Negative Covenant of the Owner. The Owner covenants that throughout the Term, the Owner shall not declare or pay any dividends, payments or distributions to any members or shareholders of the Owner upon the occurrence of default of any payment to the City required under this Agreement until such default is cured.

4. Confidentiality of Deliveries. To the extent that Chapter 23K other laws of the Commonwealth, in the reasonable opinion of the City, allow confidential treatment of items Owner is obligated to furnish to the City, the City agrees to keep such items confidential (for so long as they are entitled to confidential treatment) and shall not disclose them except (i) to such City officials and consultants on a need-to-know basis; and/or (ii) pursuant to a court order. Further, to the extent that the Owner requests confidential treatment of any documentation or information required to be provided to the City under this Agreement, and such documentation and information may be protected from disclosure by the City under applicable law, the City shall maintain such documentation and information confidential to the extent permitted by applicable law. In the event that the City is not able to assure the confidential treatment of any of any of the items required under this section, then Owner may satisfy its obligations under this section by making such items available for in-person review and inspection by the City without obligation to deliver printed copies to the City.

U. REPRESENTATIONS AND WARRANTIES OF THE OWNER

The Owner represents and warrants to the City that each of the following statements is true and accurate as of the Effective Date:

1. The Owner is a duly formed limited liability company organized under the laws of the Commonwealth of Massachusetts and is in good standing and qualified to do business under the laws of the Commonwealth of Massachusetts;

2. The Owner has taken all actions required by law to approve the execution of this Agreement;

3. The Owner's entry into this Agreement and/or the performance of the Owner's obligations under this Agreement do not violate any contract, agreement or other legal obligation of the Owner;

4. The Owner's entry into this Agreement and/or the performance of the Owner's obligations under this Agreement do not constitute a violation of any state or federal statute or judicial decision to which the Owner is subject;

5. There are no pending lawsuits or other actions or proceedings which would prevent or impair the timely performance of the Owner's obligations under this Agreement;

6. The Owner has the legal right, power, and authority to enter into this Agreement and to consummate the obligations contemplated hereby, and the execution, delivery and performance of this Agreement have been duly authorized and no other action by the Owner is requisite to the valid and binding execution, delivery, and performance of this Agreement, except as otherwise expressly set forth herein, and this Agreement is enforceable against the Owner;

7. The individual executing this Agreement on behalf of the Owner is authorized to execute this Agreement on behalf of the Owner; and

8. This Agreement is binding on the Owner and is enforceable against the Owner in accordance with its terms, subject to applicable principles of contract, equity and insolvency laws.

SECTION 3. RESPONSIBILITIES AND UNDERTAKINGS BY THE CITY

A. BINDING VOTE ON A BALLOT QUESTION

Upon the Owner's request (the "Election Request"), the City shall schedule the Ballot Question Election. In accordance with and subject to the provisions of Section 15(13) of Chapter 23K, the City shall hold the Ballot Question Election not less than sixty (60) days but not more than ninety (90) days from the date that the Owner's request for the Ballot Question Election is received by the City.

B. LOCAL PERMITTING

To the extent permissible by law, the City (i) agrees to expedite all permitting, zoning relief and other entitlements necessary for the Owner's development of the Project (and all future phases of the Project), (ii) commits to support tax incentive financing for the Owner or any of its affiliates in connection with the development or redevelopment of any land owned by the Owner or any of its affiliates in the City, including Wonderland, so long as such development is not a part of the Project, (iii) agrees to expedite all permitting, zoning relief and other entitlements necessary for the Owner's affiliate's future development of Wonderland, and (iv) commits to support infrastructure investment incentive financing for the development or redevelopment of any land owned by the Owner or any of its affiliates in the City, including Wonderland, so long as such development is not a part of the Project.

C. EXCLUSIVITY

During the term of this Agreement, the City shall not sign another Host Community Agreement with any other gaming license applicant, gaming licensee or owner of a gaming establishment other than the Owner and will only enter into a Surrounding Community Agreement relating to another Applicant if required by the Commission. To the extent permissible by law, the City (i) shall support the Owner's application for a Category 1 License for the Project as the sole application within the City for a license to operate any gaming establishment, and (ii) shall not support the application or proposal of any other person to obtain a license to operate any gaming establishment.

D. SUPPORT FOR THE PROJECT

To the extent permissible by law, the City shall informally advise the Owner concerning, and shall actively cooperate with and publicly support, the Owner's efforts to obtain from the appropriate municipal, state and federal bodies and agencies, all such permits, licenses and approvals as may be necessary to carry out the Project, including without limitation the Owner's Gaming License.

E. ZONING AMENDMENTS

The City wishes to encourage the Owner to develop additional future phases of the Project on the Revere Property for the purpose of generating additional tax revenue and creating further jobs and economic development. To facilitate such future possible development, the City shall cause the Mayor to file and support zoning amendments as may be requested by the Owner.

F. REPRESENTATIONS AND WARRANTIES OF THE CITY

The City represents and warrants to the Owner that each of the following statements is true and accurate as of the Effective Date:

1. The City is a validly existing municipal corporation and has all requisite power and authority to enter into and perform its obligations under this Agreement, and all other agreements and undertakings to be entered into by the City in connection herewith;

2. This Agreement is binding on the City and is enforceable against the City in accordance with its terms, subject to applicable principles of equity and insolvency laws;

3. The City's entry into this Agreement and/or the performance of the City's obligations under this Agreement do not violate any contract, agreement or other legal obligation of the City;

4. The City's entry into this Agreement and/or the performance of the City's obligations under this Agreement do not constitute a violation of any state or federal statute or judicial decision to which the City is subject;

5. There are no pending lawsuits or other actions or proceedings which would prevent or impair the timely performance of the City's obligations under this Agreement; and

6. The individual executing this Agreement on behalf of the City is authorized to execute this Agreement on behalf of the City.

SECTION 4. GENERAL PROVISIONS

A. RECITALS

The Recitals set forth above are incorporated herein by reference as though fully set forth herein.

B. BINDING AGREEMENT

This Agreement is binding upon and enforceable against, and inures to the benefit of, the Parties hereto and their successors and assigns (including, without limitation, any successor owner or owners of the Project, but excluding mortgagees of the Project or those claiming through mortgagees of the Project, unless said mortgagee obtains title to the Property and proceeds with the development of a gaming establishment on the Property). This Agreement shall remain binding upon and enforceable against the Parties hereto and their successors and assigns in the event that the Commission, some other duly authorized governmental agency or a court of competent jurisdiction determines that the City is not a Host Community for the purposes of Chapter 23K.

C. REGULATIONS OF THE COMMISSION

The Parties shall negotiate in good faith an amendment or amendments to this Agreement to incorporate any terms, provisions or subjects required to be included in this Agreement by the Commission or to make any provision of this Agreement consistent with the Commission's regulations or policies.

D. NO LIABILITY FOR APPROVALS AND INSPECTIONS

No approval to be made by the City under this Agreement or any inspection of the Project by the City shall render the City liable for failure to discover any defects or non-conformance with this Agreement, or a violation of or noncompliance with any federal, Commonwealth or local statute, regulation, ordinance or code.

E. TIME IS OF THE ESSENCE

All times, wherever specified herein for the performance by the Owner of its obligations hereunder, are of the essence of this Agreement.

F. NO PARTNERSHIP

No relationship between the City and the Owner of partnership or joint venture is intended to be created hereby, and any such relationship is hereby disclaimed.

G. RECORDING

The Parties shall cooperate in recording and filing a copy of a customary form of notice of agreement with the Suffolk County Registry of Deeds and Suffolk County Registry District of the Land Court. Upon the termination of this Agreement, the Parties shall cooperate in recording and filing a customary form of a notice of termination of notice of agreement with the Suffolk County Registry of Deeds and Suffolk County Registry District of the Land Court. The

costs of recording the notice of agreement and notice of termination of notice of agreement shall be paid by the Owner.

H. TRANSFER OF INTERESTS

The Owner shall have continually the right to grant a mortgage or mortgages on all or any portion of the Property, and to transfer its interest herein to any such mortgagee, to the purchaser at a foreclosure sale or otherwise in connection with the exercise of remedies under any such mortgage. In addition, the Owner shall have the right to transfer or assign its rights and interests under this Agreement, provided that:

(i) at the time of such transfer or assignment, the Owner has made all payments then due and payable under this Agreement;

(ii) if a Gaming License has been issued for the Project or any portion of the Property, the transfer or assignment is in connection with a transfer or assignment of such Gaming License and such transfer or assignment is permitted or has been approved pursuant to Chapter 23K;

(iii) the successor or assignee shall expressly assume and agree to perform and comply with all of the covenants and agreements of this Agreement to be performed by the Owner; and

(iv) the Owner shall deliver to the City prior to or promptly after such transfer or assignment, a copy of the instrument or instruments evidencing any such assignment to and assumption by the successor or assignee.

The liability of the Owner or its successors or assigns (including, without limitation, mortgagees) arising under this Agreement shall be limited solely to the interests of the Owner in the Project, and no trustee, officer, director, manager, member, owner, agent, representative or employee of the Owner, or their respective successors or assigns, or any person or entity directly or indirectly holding any interests in any of the foregoing from time to time, or any such person's or entity's separate assets or property shall have or be subject to any personal or individual liability with respect to any obligation or liability hereunder, nor shall any person or entity be answerable or liable hereunder in any equitable proceeding or order beyond the extent of its interest in the Project. No holder of a mortgage on any or all of the buildings or portions of the Project, as the case may be, shall be liable to perform, or be liable in damages for failure to perform, any of the obligations of the Owner hereunder unless and until such holder acquires title to the Project by foreclosure or deed in lieu of foreclosure and pursues the completion of the Project in accordance with the provisions hereof.

I. REPRESENTATIVES AND AGENTS NOT INDIVIDUALLY LIABLE

No member, official, employee, agent, or other authorized representative of the City shall have any personal interest, direct or indirect, in this Agreement, nor shall any such member, official, employee, agent, or representative participate in any decision relating to this Agreement

which affects his or her personal interests or the interests of any corporation, partnership, or association in which he or she is, directly or indirectly, interested. No member, official, employee, agent, or other authorized representative of the City shall be personally liable to the Owner, or any successor in interest, in the event of any default or breach by the City or for any amount which may become due to the Owner or its successor or on any obligations under the terms of this Agreement. No stockholder, member, indirect or direct owner, director, manager, officer, employee, agent, or other authorized representative of the Owner or of Caesars Massachusetts Management Company, LLC shall be personally liable to the City, or any successor in interest, in the event of any default or breach by the Owner or for any amount which may become due to the City or its successor or on any obligations under the terms of this Agreement.

J. NOTICES

All notices and other communications required or permitted under this Agreement shall be in writing, signed by a duly authorized officer or representative of the City or the Owner, as the case may be, and shall be (i) delivered by nationally recognized overnight delivery service, or (ii) mailed by certified or registered mail, return receipt requested, postage prepaid, to the Parties at the following addresses or such other addresses as each may have specified to the other by such a notice:

City:
Mayor of Revere
Office of the Mayor
281 Broadway
Revere, Massachusetts 02151
Attention: The Honorable Daniel Rizzo

with copies to:
City of Revere City Solicitor
Office of the City Solicitor
281 Broadway
Revere, Massachusetts 0151
Attention: Paul Capizzi, Esq.

And

Mirick, O'Connell, DeMallie & Lougee, LLP
100 Front Street
Worcester, Massachusetts 01608
Attention: Brian R. Falk, Esq.

Owner:
Sterling Suffolk Racecourse, LLC
525 McClellan Highway
East Boston, Massachusetts 02128
Attention: William J. Mulrow

with a copy to: DLA Piper LLP (US)
33 Arch Street, 26th Floor
Boston, Massachusetts 02110
Attention: Charles A. Baker III, Esq.

Any such notice shall be deemed to have been given on the date received or refused during normal business hours. The City specifically acknowledges that the Owner may change its designated street address.

K. SEVERABILITY

If any term or provision of this Agreement, or the application thereof to any person or circumstance, shall to any extent be determined to be invalid and unenforceable, the remainder of this Agreement, or the application of such terms to persons or circumstances other than those to which it is invalid or unenforceable, shall not be affected thereby, and each term and provision of this Agreement shall be valid and shall be enforced to the extent permitted by law; provided, however, that the City shall have the right to seek special legislation in order to validate any term or provision of this Agreement.

L. GOVERNING LAW

This Agreement shall be governed and construed by the laws of the Commonwealth of Massachusetts, without regard to conflict of law principles.

M. AMENDMENTS

This Agreement may be amended only by a written instrument signed by the Parties.

N. TERM

The term of this Agreement shall commence on the Effective Date and expire on the earlier of (a) the expiration or earlier termination of the Owner's Gaming License, including any extensions or renewals thereof, and subject to any assignment or reissuance thereof to a successor owner or operator of the Project; (b) the date on which the Owner notifies the City that the Owner has been rejected as an applicant by the Commission during any phase of the Commission's licensing process, with any appeals having been decided against the Owner and/or all appeal periods applicable to the licensing process having expired; or (c) the date on which Owner notifies the City that an applicant other than the Owner has received a "Category 1 License" for so called "Region A" , as those terms are defined and used in Chapter 23K, with all appeals having been decided in that applicant's favor and/or all appeal periods applicable to the license having expired, provided that (i) the Owner has not previously been awarded a Category 1 License for Region A, (ii) the Owner has not previously been awarded any other gaming license from the Commission, and (iii) the Owner is not an applicant for any other gaming license from the Commission.

If this Agreement is terminated or expires pursuant to the terms hereof, then the Owner is relieved from all obligations under this Agreement, excepting therefrom any obligations that by their terms expressly state they shall survive expiration or termination of this Agreement.

O. EXECUTION IN COUNTERPARTS / MULTIPLE ORIGINALS

This Agreement may be executed in counterparts. All such counterparts shall be deemed to be originals and together, shall constitute but one and the same instrument. The Parties have agreed to execute multiple original copies of this Agreement.

P. ENFORCEMENT

It is the intention of the Parties that the provisions of this Agreement may be enforced only by the Parties hereto, and that no other person or persons shall be authorized to undertake any action to enforce any provisions hereof without the prior written consent of the Parties. Notwithstanding the preceding sentence, the Commission may enforce this Agreement to the extent that this Agreement shall be a binding condition of the Owner's Gaming License.

Q. DISPUTE RESOLUTION

1. Unless an alternative means of dispute resolution is mutually elected by both of the Parties as provided herein, the Parties reserve the right, either in law or equity, by suit, and complaint in the nature of specific performance, or other proceeding, to enforce or compel performance of any or all provisions of this Agreement.

2. The Parties may seek to resolve a dispute regarding this Agreement (a "Dispute") pursuant to Sections 4.Q.2 through 4.Q.6 of this Agreement if (i) a Party gives a written dispute notice to the other Party referencing Sections 4.Q.2 through 4.Q.6 and setting forth the grounds for the Dispute (a "Dispute Notice"), and (ii) the Party receiving the Dispute Notice gives written notice to the other Party consenting to resolve the dispute pursuant to Sections 4.Q.2 through 4.Q.6.

3. Within ten (10) days of the date of the Dispute Notice, the Parties shall meet to negotiate in good faith to resolve the Dispute described in the Dispute Notice.

4. In the event that a Dispute is unresolved within sixty (60) days of the date of a Dispute Notice, such Dispute shall be submitted for arbitration by a single arbitrator (the "Arbitrator") qualified the American Arbitration Association (the "AAA"). The Dispute shall be arbitrated in Boston, Massachusetts, before an arbitrator selected pursuant to the AAA's arbitration selection process. Upon such Dispute being submitted to the AAA for resolution, the AAA and the arbitrator shall assume exclusive jurisdiction over the Dispute. The proceedings before the Arbitrator shall be governed by the rules and regulations of the AAA, and the award and determination of the Arbitrator shall be binding and conclusive upon the Parties, and the Parties herewith agree to abide by the Arbitrator's determination.

5. The arbitrator in arriving at his decision shall consider the pertinent facts and circumstances as presented in evidence and be governed by the terms and provisions of this Agreement and applicable law. To the extent any provisions of this Agreement are inconsistent with the AAA Rules, this Agreement shall control.

6. The arbitrator shall not have authority to make an award of equitable relief.

R. CERTIFICATION OF TAX COMPLIANCE

Pursuant to M.G.L. c. 62C, § 49A, the Owner by its duly authorized representative, certifies under penalties of perjury that it has complied with all laws of the Commonwealth of Massachusetts relating to taxes, reporting of employees and contractors, and withholding and remitting of child support.

S. COMPLIANCE REQUIREMENT

Notwithstanding anything in this Agreement to the contrary, and in good faith to remain consistent with all of the terms of this Agreement and in consultation with the City, Owner's obligations hereunder shall be subject to and consistent with (a) the requirements and limitations on the Owner as set forth in this Agreement, and (b) any applicable orders, injunctions, rules, policies or other directives given to the Owner by the Commonwealth of Massachusetts, the Commission, or any other governmental body, agency, authority or commission.

[Signatures to follow on the next page.]

IN WITNESS WHEREOF, the Parties hereto have caused this instrument to be executed in their behalf by their respective officers thereunto duly authorized as of the day and year first above written.

Sterling Suffolk Racecourse, LLC

By: William J. Mulrow
William J. Mulrow, Chair of the Board

City of Revere

By:
Daniel Rizzo
Mayor

Approved as to form:

By:
Paul Capizzi, Esq.
City Solicitor

Exhibit A

[Reserved]

Exhibit B

Boardman Street FlyOver

Four intersections are treated as one in the proposed Project construction program. The proposed improvements include construction of a northbound Route 1A overpass bridging the Boardman Street intersection, meeting grade to the south of Waldemar Avenue. At Waldemar Avenue, a traffic signal would be installed allowing controlled movement between the Route 1A northbound through movement from the overpass and vehicles on an adjacent northbound frontage road serving vehicles proceeding northbound from the Boardman Street corridor. The Route 1A corridor width approaching this traffic signal would be five lanes, one of which would be set for movement to Waldemar Avenue. Continuing northbound, the intersection of Tomasello Drive (a private way) and Route 1A would be signalized with four northbound lanes provided, one of which will be for right turns into Tomasello Drive. The three remaining lanes will continue northerly several hundred feet through an upgraded traffic signal referred to as the "Jughandle" (at or near the Boston/Revere City Line) where the existing traffic signal would be upgraded and then the third lane would be dropped, tapering the existing two northbound lanes north of the Jughandle in Revere. Southbound, two through lanes would be maintained approaching the Jughandle, and extend through the Tomasello Drive intersection. Two additional left turn only lanes would be added approaching Tomasello Drive for access to the Project. The Route 1A SB corridor would then be widened to three through lanes from Tomasello Drive southerly to and through the Boardman Street intersection, extending for a distance several hundred feet beyond the Boardman Street intersection and then taper to two lanes. A fourth lane will be provided approaching Boardman Street for left turns under the flyover to access Orient Heights and U-turns on the southbound approach to the new northbound frontage road.

All of the associated widening required for this work will be completed on the easterly side of the Route 1A corridor. Boardman Street westbound will be widened to allow for three lanes to approach Route 1A, consistent with the proposal advanced as part of the proposed hotel development at the intersection of Route 1A and Boardman Street. Waldemar Avenue will be maintained as one lane in each direction. Tomasello Drive will be widened to provide two lanes departing from Route 1A (entering the Project), and four lanes approaching Route 1A (exiting the Project - three for left turns and one for right turns). This plan is subject to the approval of MassDOT, City of Boston Transportation Department (BTD) and the City of Boston Public Improvement Commission (PIC).

Route 1A Boardman to Jughandle – Planning

The Owner will study in the Draft Environment Impact Report and Expanded Public Notification Form to be filed for the Project the segment of Route 1A to the Jughandle. The study will be in the nature of a long-range plan for this highway segment based on current needs and following on the long range plans for this area developed in the North Shore Transportation Study by the Central Transportation Planning Staff. The plan is limited to a study of the merits of the design and does not include a full review of the environmental planning process nor final design plans.

Exhibit C

Route 1/Route 16 Intermediate Improvements

The improvements are intended to provide missing movements to an important regional highway access point. Under existing conditions, access from Route 1 SB to Route 16 EB and from Route 16 WB to Route 1 NB are not provided, and there is redundant ramp access from Route 16 WB to Route 1 SB provided less than 1,500 feet from the existing interchange, or approximately 600 feet west of Webster Avenue. The proposed build condition would include closure of the Route 16 WB access to Route 1 SB within the existing interchange and a diversion of that movement farther to the west beyond Webster Avenue. The current on/off ramp configuration to and from Route 1 SB would become a four lane off ramp to Route 16 East and west with a median break on Route 16 and installation of a traffic signal. This ramp will provide the opportunity to significantly reduce left lane and left/U-turn congestion at the Route 16/Webster Street intersection. The on-ramp to Route 1 NB from Route 16 WB would be developed with a second Route 16 median break on the easterly side of Route 1 together with construction of a left turn lane, The left turn movement to Route 1 NB would be signal controlled and would tie into the existing EB to NB loop ramp through an open in-field area. Both signals would operate in two phases (Route 16 east and west and the Route 1 SB off at the off-ramp location and the eastbound through and westbound left to Route 1 NB at the second site). Note that there would be no stopping of the westbound through movement at the proposed signal to the northbound on-ramp movement. The interchange work would also include an update the Route 16, Webster Avenue, Garfield Avenue intersection, and pavement area reduction where acceleration lanes are no longer required. The improvements are subject to the approval of DCR, MassDOT, and cities of Revere and Chelsea.

Exhibit D

Blue Line Access /Construct Suffolk Downs Station upgrades

Discussions with the MBTA regarding the specific improvements to be made to Suffolk Downs Station remain preliminary and subject to change. At this point in the negotiation, the proposed improvements consist of the following concepts:

- Maintenance Improvements: The proposed improvements include concrete restoration and repair of the existing structure, ramps, stairs, overpass and platform. The existing structure will also be repainted;
- Elevators: The proposed improvements include installation of 2 new ADA compliant elevators, together with the associated foundations, structure and improvements;
- Turnstiles: The proposed improvements include installation of 3 new turnstiles at the station;
- Site Improvements: The proposed improvements include installation of new sidewalks, ramps, railings, lighting, way finding ($50,000 allowance) and landscaping from the station to the entrance to the Project. A pedestrian shelter will be provided at the entrance to the Project.

The Owner shall ensure that should work continue at this MBTA station after the first Impact Fee Year, the Owner shall ensure full functionality and a clean and safe environmental for patrons with adequate wayfinding signage.

These improvements are subject to the MBTA's approval.

Bicycle Access – Provide Bike Lanes on Bennington Street

These improvements call for a "Constitution Beach to Revere Beach" bicycle connection. Bicycle lanes will be marked along the Bennington Street corridor from Saratoga Street in East Boston to Winthrop Parkway in Revere. The bicycle route will start at the northerly end of Constitution Beach Park, proceed northerly along Barnes Avenue (shared lanes) to Saratoga Street, and follow Saratoga Street easterly to Bennington Street also as a shared lane given width limitations on Saratoga Street over the MBTA Blue Line. From Saratoga, to the Boston/Revere City Line, a five foot minimum bicycle lane will be provided with one lane established for through movement northbound. Parking will generally be permitted along the curb line, except approaching the Bennington Street, Leyden Street Walley Street extended intersection area where two travel lanes will be designated, one for left turns and one for through movement. Within an area from 250 feet south of Leyden Street through Palermo Street, parking will be restricted. Parking restrictions, and/or painted median area or two-way left turn lane (TWLT lane) will be considered from Leverett Avenue to the Boston/Revere City Line. Southbound from the Revere/Boston City Line to the Suffolk Downs T Station parking will be restricted (matching northbound). Southerly from the T Station, one travel lane will be maintained with on street parking and the bicycle lane to an area between Ashley and Antrim Streets, where lane

sharing will be provided to Saratoga Street. Initial plans in Revere would provide for a three lane corridor (one through/right lane in each direction with a two-way center left turn lane) with parking both sides at the curb and five foot minimum turn lanes from the City Line to Crescent Street. From Crescent Street to Winthrop Avenue, lanes would be shared in both directions. From Winthrop Avenue to Winthrop Parkway, one travel lane would be removed, maintaining one travel lane, parking and the bicycle lane. Approvals will be required from the Cities of Boston and Revere, as well as MassDOT and DCR.

Exhibit E

The Owner's Quality Job Creation and Employment Commitments

The Owner shall impose a local hiring program for both construction and permanent jobs at the Project that will include the following components:

Construction Jobs:

- Host and maintain a central job bank website (in English and Spanish) as a micro-site within the larger Project website.
- The Owner shall demonstrate to the City its efforts to provide construction employment opportunities to City residents.
- The Owner will utilize best efforts to use the existing labor force in the Commonwealth, and in particular the existing labor force in the City, when hiring for new construction jobs, as required by Chapter 23K.
- During the Term of this Agreement, the Owner will hold job fairs at the Property to make City residents aware of job opportunities available at the Project.
- In furtherance of specific goals for the utilization of minorities, women and veterans on construction jobs, the Owner shall send to each labor union or representative of workers with which the Owner has a collective bargaining agreement or other contract or understanding, a notice advising the labor union or workers' representative of the Owner's commitments, as required by Chapter 23K.

Permanent Jobs:

- Establish, fund and maintain human resource hiring and training practices that promote the development of a skilled and diverse workforce and access to promotion opportunities through a workforce training program that: (i) establishes transparent career paths with measurable criteria within the gaming establishment that lead to increased responsibility and higher pay grades that are designed to allow employees to pursue career advancement and promotion; (ii) provides employee access to additional resources, such as tuition reimbursement or stipend policies, to enable employees to acquire the education or job training needed to advance career paths based on increased responsibility and pay grades; and (iii) establishes a program or partnership to provide off-site child day-care, all as required by Chapter 23K.
- Host and maintain a central job bank website (in English and Spanish) as a micro-site within the larger Project website.
- The Owner will provide City residents with advance notice of hiring activities by publishing announcements in local newspapers approximately four (4) to eight (8) consecutive weeks prior to initial hirings.

- Residents of the City (together with residents of host and surrounding communities (as defined in Chapter 23K)) will be given first priority to apply for jobs during a specified "advance period," such advance period to be established jointly by the Owner and the City.

- Written flyers in English and Spanish will be distributed to local community-based organizations in the City to inform people about local advance period hiring and the Owner shall use best efforts to otherwise notify residents in the low income neighborhoods in the City proximate to the Project of potential job opportunities.

- The Owner maintain a minimum of two (2) computers on-site to ensure that residents without computers can research and apply online for jobs at the Project.

- During the Term of this Agreement, the Owner will hold job fairs at the Property to make City residents aware of job opportunities available at the Project.

- The Owner will utilize best efforts to use the existing labor force in the Commonwealth, and in particular the existing labor force in the City, when hiring for new jobs, as required by Chapter 23K.

- The Owner will make best efforts to ensure that ten percent (10%) permanent employees at the Project are City residents, as more particularly set forth in the Agreement.

- In furtherance of specific goals for the utilization of minorities, women and veterans permanent jobs, the Owner shall send to each labor union or representative of workers with which the Owner has a collective bargaining agreement or other contract or understanding, a notice advising the labor union or workers' representative of the Owner's commitments.

- During the Term of this Agreement, the Owner shall use best efforts to work with the City's schools to establish school to work programs for hospitality jobs.

- During the Term of this Agreement, the Owner shall support the efforts of and actively engage with the Commission and community colleges to develop the Massachusetts Community College Workforce Training Institute and Massachusetts Casino Careers Training Institute at community colleges in the Commonwealth.

- During the Term of this Agreement, upon request by the City, the Owner shall provide the Community Advisory Board with information regarding its contracts with organized labor, including hospitality services, the number of employees employed at the gaming establishment, including detailed information on the pay rate and benefits for employees and contractors, and the Owner's plans to ensure labor harmony during all phases of the construction, reconstruction, renovation, development and operation of the gaming establishment.

- Consistent with the corporate policy of the Owner to provide equal opportunity for all applicants and employees, the Owner will not discriminate on the basis of race, color,

religion, sex, national origin, age, disability, sexual orientation, gender identity or expression, or veteran status. This policy applies to all areas of employment including recruitment, hiring, training, promotion, compensation, benefits, transfers and social and recreational programs.

The Owner shall implement a training and development program for permanent jobs at the Project that will include the following components:

- Provide opportunities for team members to pursue personal and professional growth, to enjoy satisfying careers, to participate in training and development programs and to celebrate success including rewards and recognition for superior performance against measurable goals.

- Provide new employees with learning programs such as the "Empire Series." The Empire Series is Caesars' best-in-class and award winning learning program for all new employees. This program offers a lively and engaging environment that uses cutting-edge technology. In addition to such learning program, the Owner shall provide specialized training courses customized to meet employee learning needs.

- If a position requires serving alcoholic beverages, authorizing complimentary alcoholic beverages, or managing a food and beverage operation, that employee must obtain an alcohol awareness certification card. All table games employees, valet attendants, limo drivers and security team members must also possess this certification.

- Provide an educational assistance program that reimburses employees ninety percent (90%) of tuition costs up to a maximum of $3,000 per year for pre-approved undergraduate classes or up to a maximum of $4,000 per year for pre-approved graduate study at an accredited college or university.

- Provide regulatory and compliance training such as Skillsoft, which is Caesars' online learning platform used to deliver all regulatory and compliance training in addition to numerous professional development courses.

- Implement the Caesars Code of Commitment, which includes a commitment to all employees to treat them with respect and provide satisfying career opportunities to invest in employees by providing excellent pay and valuable benefits, including health insurance and a retirement plan, and to share financial success through bonuses for frontline employees, to encourage professional and personal growth through tuition reimbursement, on-the-job training, career development, and promotion from within, to actively seek and respond to employee opinions on all aspects of their jobs, from the quality of their supervisors to the quality of the casinos, and to value employees from every possible background, and who approach issues and problems from different perspectives.

Attachment C

Water Transportation Analysis

CAESARS RESORT AT SUFFOLK DOWNS

WATER TRANSPORTATION OPTIONS

BOSTON INNER HARBOR, CHELSEA CREEK, AND THE ORIENT HEIGHTS / BELLE ISLE EMBAYMENT

Prepared by:

EPSILON ASSOCIATES, INC.

September 10, 2012

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ATTACHMENT A: FIGURES A-1

Figure 1 Aerial Locus Map
Figure 2 Potential Water Transportation Routes

Figure 3 Potential Water Transportation Routes (via Chelsea Creek and Boston Inner Harbor)
Figure 4 Potential Water Transportation Routes (via Orient Heights / Belle Isle Embayment)
Figure 5 Boston Harbor Passenger Water Transportation Routes and Docks
Figure 6 Potential Landside Public Transportation Connections
Figure 7 Chelsea Creek Detail
Figure 8 Boston Inner Harbor Detail

1.0 Purpose and Approach

Sterling Suffolk Racecourse, LLC proposes to redevelop the Suffolk Downs racetrack property straddling East Boston and Revere, Massachusetts as "Caesars Resort at Suffolk Downs," a gaming venue of two casinos with associated improvements, including hotels, entertainment space, restaurants and retail space (the Project). The purpose of this paper is to assess the viability of including water transportation from the downtown Boston and Seaport waterfronts as a component of public transportation to the Project site. This paper does not address transportation in conjunction with entertainment motifs, such as harbor cruises with a final destination being the Project site, although the information presented herein may offer insight to the potential for such operations.

The viability of any transportation system depends upon several key components, not the least of which includes reliability, comfort, and accessibility of the system, and the coincident reliability, comfort, and accessibility of any necessary interconnections. Of equal importance is the convenience of the system and the ability of the system to offer a more direct and timely connection than alternative modes of transportation. The following paper presents an overview of the existing Boston Inner Harbor water transportation infrastructure in relation to the proposed Project, and offers a preliminary assessment of the potential to utilize and/or expand such infrastructure in support of transportation to and from the Caesars Resort at Suffolk Downs.

2.0 Project Summary

Sterling Suffolk Racecourse, LLC proposes to redevelop the 161-acre Suffolk Downs racetrack property straddling East Boston and Revere, Massachusetts as "Caesars Resort at Suffolk Downs," a gaming venue of two casinos, more than 300 guestrooms, a multi-purpose entertainment space, dedicated covered parking, fine dining, bars and retail space. Specific Project elements include:

- Two hotels of approximately 300 and 150 rooms, respectively;
- entertainment venues;
- up to 10 restaurants, including six fine dining concepts, food court, and sports bar;
- approximately 200,000 square feet of gaming space containing 4,000 to 5,000 slot machines, 200 table games, and a World Series of Poker™ room;
- approximately 30,000 square feet of retail space; and
- a 2,500-space, seven-story parking garage and 2,100-space surface parking lot.

The Project also incorporates continued operations at the Suffolk Downs racetrack.

2.1 Project Setting

The site of the proposed Caesars Resort at Suffolk Downs is shown on Figure 1, *Aerial Locus Map*. Of the 161 acres comprising the site, approximately 116 are located in Boston and 45 are located in Revere. The site is bordered to the west by the Global Revere fuel yard and terminal and the McClennan Highway (Route 1A), to the south by the Orient Heights residential neighborhood, to the west by properties fronting Bennington Street, and to the north by Winthrop Avenue and the Revere Beach Parkway.

The primary access point to the site is from Route 1A via Tomesello Road at the southwest corner of the property, with a secondary access point from the Winthrop Avenue/Revere Beach Parkway intersection at the northeast end of the property. The site is also served by two Massachusetts Bay Transportation Authority (MBTA) Blue Line rapid transit system stops; specifically the Suffolk Downs Station at the southeast corner of the property and the Beachmont Station at the northeast end of the property. As discussed below, these stations are also served by MBTA buses.

While not abutting the site directly, Chelsea Creek is located approximately 500 feet to the west of Route 1A, opposite the site's main entrance. Chelsea Creek is a navigable waterway that extends northward from Boston Inner Harbor to a point northwest of the site. Meanwhile, the Belle Isle Marsh, a tidal marsh associated with the Boston Harbor estuarine system is located immediately to the east of the site opposite Bennington Street. While tidal creeks within the marsh are navigable by small craft such as kayaks and canoes, most of these creeks lie above mean low water and are therefore exposed mud flats for significant portions of the tidal cycle. The Belle Isle Marsh has been designated as the Rumney Marshes Area of Critical Environmental Concern (ACEC) by the Massachusetts Secretary of the Executive Office of Energy and Environmental Affairs. Intertidal waters are found at the inlet to the Belle Isle Marsh at Saratoga Street in Winthrop, approximately 3,000 feet south of the site, as discussed below.

2.2 Potential Water Access Routes

The Project site does not directly abut a waterway of a scale that could support commercial water transportation access directly to the site. However, there are essentially three routes to the Project site that could potentially incorporate water transportation for a segment of the access routes from the downtown Boston and Seaport waterfronts. These include Chelsea Creek, Boston Inner Harbor (the Logan Airport Dock and the Boston Harbor Shipyard & Marina), and the Orient Heights / Belle Isle embayment north of Logan Airport. As noted above, Chelsea Creek, and to a lesser degree the Orient Heights / Belle Isle embayment, are located within relatively close proximity to the Project site. Meanwhile, the Boston Inner Harbor routes to the Logan Airport Dock and the Boston Harbor Shipyard & Marina offer a direct connection across the Boston Inner Harbor via existing water transportation routes, but a longer landside connection to the Project site. The water segments for each of these routes are shown on Figure 2, *Potential Water Transportation*

Routes, Figure 3, *Potential Water Transportation Routes (via Chelsea Creek and Boston Inner Harbor)* and Figure 4, *Potential Water Transportation Routes (via Orient Heights / Belle Isle Embayment)* and are reviewed below.

2.2.1 Chelsea Creek (River)

The Route 1A entrance to the Project site lies within 500 feet of the navigable sections of Chelsea Creek. Chelsea Creek is heavily utilized by commercial/industrial maritime traffic associated with the many fuel tank farms located along its banks. It includes a designated federal channel which extends from the Boston Inner Harbor to a point immediately west of the Project site. The federal channel in Chelsea Creek is part of the existing Boston Harbor navigation project which, as described by the US Army Corps of Engineers, calls for a channel 38 feet deep and generally 175 feet to 225 feet wide from the mouth of Chelsea Creek at the head of the Boston Inner Harbor to the Chelsea Street Bridge, and 250 to 430 feet wide above the bridge, with a maneuvering basin 35 feet deep and generally 800 feet wide by 1,000 feet long at the channel's terminus.[1] The Creek and the lands east to the McClennan Highway (Route 1A) have been designated as Designated Port Area (DPA) by the Massachusetts Office of Coastal Zone Management.

The actual width of Chelsea Creek is often twice that of the channel, but depths quickly become quite shallow away from the dredged channel. Extensive intertidal mud flats are found on either side of Chelsea Creek, and particularly within any of the small embayments located off the main stem of the channel (see Figure 3).

2.2.2 Boston Inner Harbor

The Boston Inner Harbor is serviced by numerous water taxi and/or water ferry docks on the downtown Boston and South Boston Seaport side of the Harbor, but by only two such facilities on the East Boston, or Project side, of the Harbor. For the purpose of consistent analysis, the multiple ferry and water taxi docks of the Long Wharf/Central Wharf area are utilized herein as representing the Boston starting point for potential water transportation service to the Project site. However, given the relative proximity of the many piers of the downtown Boston waterfront, the results of this analysis would be similar for any starting location between approximately Lewis Wharf on the downtown Boston waterfront and the World Trade Center in the Seaport section of South Boston.

While there are numerous water taxi and/or water ferry docks on the downtown Boston and South Boston Seaport side of the Harbor, only two such water transportation docking facilities are located on the East Boston, or "Project side" of the Harbor. These are the

[1] Department of the Army, New England Division, Corps of Engineers, Project Maps, Boston Harbor, 30 September 1986. Note: The USACOE is currently in the process of evaluating a proposed increase in the depth of the Chelsea River navigation channel from the current 38-foot depth to 40 feet.

MBTA water transportation landing at the Logan Airport Dock on Harborside Drive and the water taxi dock at the Boston Harbor Shipyard & Marina (see Figures 2 and 3). Each of these East Boston facilities are located only a mile or less from the downtown Boston and Seaport waterfronts and approximately two miles south of the entrances to the Project site. These facilities offer established waterfront infrastructure on the Project side of the Harbor. However, the potential exists for the establishment of other such landings along the East Boston waterfront at underdeveloped or undeveloped piers, and in particular those located closer to the existing public transportation system, as discussed below.

2.2.3 Orient Heights / Belle Isle Embayment

The Orient Heights / Belle Isle embayment lies approximately 3,000 feet south of the Winthrop Street entrance to the Project site. While only two and one half miles northeast of the Boston waterfront in a straight line, by water route the embayment is almost eight miles from the downtown Boston and Seaport waterfronts (see Figure 4). The embayment is accessed by way of Boston Harbor and channels leading around the Governor Island Flats and the Logan Airport runway safety lights, across the mouth(s) of Winthrop Harbor and through the Belle Isle narrows between the Town of Winthrop and Logan Airport runways. Charted water depths are generally 10 feet or greater at mean low water throughout this run, although shifting shoals associated with Governors Island Flats require strict adherence to the buoyed channels. The most recent edition of the US Department of Commerce *Coast Pilot I* references a "least depth of 3 feet" (mean low water) for the channel approach between the Governors Island Flats and the Deer Island Flats to the east.[2]

3.0 Existing Water Transportation System/Infrastructure

Figure 5, *Boston Harbor Passenger Water Transportation Routes and Docks*, is from the current Massachusetts Port Authority (Massport) web site and shows the distribution of MBTA Rapid Transit stations, MBTA water transportation routes and landings, and designated water taxi docks within the Boston Inner Harbor. As can be seen, public water transportation connections are concentrated in the Charlestown, North End, downtown Boston waterfront and the South Boston Seaport sections of the Harbor. Two taxi landings are identified on the East Boston side of the Harbor, one of which is the Logan Airport Dock. As discussed below, seasonal passenger ferry service is offered between Rowes Wharf in Boston and the Town of Winthrop Town Pier by a private commercial operator. Meanwhile, all but one of the existing piers along Chelsea Creek serve marine industrial purposes, while all of the existing piers in the Orient Heights / Belle Isle embayment are either private yacht clubs/marinas or private residential docks.

[2] National Oceanic and Atmospheric Administration, 2012, *Coastal Pilot I – Atlantic Coast Eastport to Cape Cod,* US Department of Commerce, National Ocean Service (42nd Edition).

3.1 MBTA Commuter Ferries

The MBTA runs commuter ferry service with 149-person capacities between Long Wharf and the Logan Airport Dock at Logan Airport on a regular schedule and as part of the larger Quincy-Hull-Logan-Boston public water transportation service. Similarly, the MBTA runs a service between Long Wharf and the Charlestown Navy Yard at Constitution Wharf utilizing passenger ferries with 149- and 190-person capacities. Commuter ferry run times between Long Wharf and the Logan Airport Dock are approximately 10 minutes. Commuter ferry run times between Long Wharf and the Charlestown Navy Yard dock are also on the order of 10 minutes.

3.2 Water Taxis

At least four commercial providers operate water taxi services within the Boston Inner Harbor, as well as outer harbor destinations. Generally these are on-call operations operating between established water taxi destinations, although all will also service private marinas. Generally the fleet consists of boats with capacities of 12 to 40 persons. Many of the smaller boats have open-sided, covered cabins to which clear plastic tarps can be attached in inclement or winter weather. Travel times between Long Wharf and Logan Airport Dock average seven minutes (a few minutes quicker than the MBTA commuter ferries). Most of the water taxi services also offer private or pre-scheduled sightseeing or party cruises throughout Boston Harbor.

3.3 Harbor Tours / Tourist Boats

There are a number of private tour boats operating within the inner and outer harbors, offering a range of boating services from small vessel water taxi service to large vessel charter cruises. At least one cruise line, Boston Harbor Cruises, also operates a commuter ferry service, including a summer season (May to October) passenger service between Rowes Wharf and the Winthrop Town Pier in Winthrop Harbor (see Figure 2). This service, which operates seven days a week, has a run time of approximately 35 minutes.

4.0 Water Transportation Considerations

The Boston Inner Harbor is generally well sheltered and often remains essentially ice free throughout the winter. Hence, public and commercial water transportation within the Inner Harbor is available year-round and has become a well-established mode of transportation to certain destinations. Of particular note within the Inner Harbor are the water shuttle routes between downtown Boston and Logan Airport, the Seaport District and the Charlestown Navy Yard. Constraints to establishing water transportation in the upper reaches of the Inner Harbor, and in particular Chelsea Creek and the Orient Heights / Belle Isle embayment include limited bathymetric and overhead clearances, a lack of existing landings, the potential for shipping conflicts (Chelsea Creek) and lack of landside services

and support. Time of travel can also pose a practical limitation on water transportation when timeliness is of concern.

4.1 Navigational Considerations

Key considerations in assessing the viability of water transportation, and navigation in general, include water depths (bathymetry), overhead clearances, and the potential for conflict with other boating/shipping interests on the water.

4.1.1 Bathymetry

Water depths within the Boston Inner Harbor are generally adequate for navigation in close proximity to the current "shoreline," due in large part to the historic filling of the Inner Harbor. Typical of a mesotidal estuary (tidal range 6 to 12 feet), the original Boston Harbor shoreline was often fronted by extensive inter-tidal zones, with beaches and mud flats exposed at mid and low tides. Over time, and with the intent of accommodating shipping, the edges of the shoreline were filled out to sub-tidal depths. Hence, today there is little exposed beach or shallows to be found within the Inner Harbor and many of the Inner Harbor wharves and piers have adequate depths for boating access throughout the tidal cycle.

The above tends to be less true in the upper reaches of the Boston Harbor tidal estuary, and in many cases boat access in these areas has required repeated channel dredging and/or the construction of long individual piers extending into the main channels of the tidal creeks and embayments. As noted above, Chelsea Creek has been maintained as a US Army Corps of Engineers navigation project, which includes a 38-foot deep channel to the headwaters for the Creek near the Project site. Meanwhile, at low tide mudflats are exposed 100 feet or more seaward of the southern side of Chelsea Creek north of the Chelsea Street Bridge. This is of some importance when contemplating the construction of new piers or wharves, as the placement of permanent in-water structures (i.e. docks and piers) is generally prohibited within certain distances of a federal channel. The New England Division of the US Army Corps of Engineers has established a "typical setback" for such structures of three times the design depth of the channel which, in Chelsea Creek, equates to a 114 foot setback from the designated federal channel.[3] Should dredged depths be increase to 40 feet as currently proposed, this channel setback would increase to 120 feet.

While not part of the federal Boston Harbor navigation project, the entranceways to Winthrop Harbor and the Orient Height / Belle Isle embayment have been dredged

[3] US Army Corps of Engineers, New England District, July 1996, *Guidelines: For the placement of fixed and floating structures in navigable waters of the United States by the Regulatory Program of the New England District, U.S. Army Corps of Engineers*

numerous times, and mudflats ring the entirety of the approach and basin. Away from these flats water depths in the embayment are generally on the order of 20 feet. However, charted depths over the Governor Island and Deer Island Flats at the mouth to Winthrop Harbor and leading to the Orient Heights / Belle Island embayment beyond are shown as generally 10 feet or less. As noted above, the most recent edition of the *Coastal Pilot I* reports a "least depth of 3 feet" at mean low water (MLW) along this route.

4.1.2 Overhead Clearances

Navigation in certain upper reaches of the Boston Inner Harbor is constrained by overhead clearances. The construction of automobile and/or rail bridges has resulted in limited navigational clearances in all of the major channels of the Inner Harbor, including portions of the Reserved Channel, the Fort Point Channel, the Charles River, the Mystic River and Chelsea Creek.

Two drawbridges cross Chelsea Creek; specifically, the Andrew P. McArdle Bridge at the mouth of Chelsea Creek and the recently replaced Chelsea Street Bridge 0.8 miles upstream (see Figure 3). The McArdle Bridge is a bascule type bridge with a closed clearance at high tide of 20 feet. The new Chelsea Street Bridge is a lift type bridge, with a closed clearance of only 7 feet at high tide, as reported in the above referenced *Coastal Pilot I*.

Opening operation procedures for the drawbridges of Chelsea Creek are dictated by Tile 33 of the Code of Federal Regulations, Part 117, Drawbridge Operation Regulations, and more specifically Part 117.593 which states:

> *All drawbridges across the Chelsea River shall open on signal. The opening signal for each drawbridge is two prolonged blasts followed by two short blasts and one prolonged blast. The acknowledging signal is three prolonged blasts when the draw can be opened immediately and is two prolonged blasts when the draw cannot be opened or is open and must be closed.*

Chelsea Street serves approximately 20,000 automobiles on an average weekday and operation of the lift bridge generally takes 20 minutes.

No bridges span the approaches to the Orient Heights / Belle Isle embayment, but the Saratoga Street Bridge in Winthrop has a fixed clearance of 6 feet at high tide, which prevents navigation by all but the smallest of vessels northward into the Belle Isle Marsh (see Figure 4).

4.1.3 Marine Traffic

Boston Harbor is the largest seaport in New England. The Inner Harbor is particularly noteworthy for its boating traffic and associated infrastructure, which includes the extensive network of private and public water transportation terminals described above, bulk cargo and fisheries piers within the Inner Harbor, bulk cargo and fuel terminals upstream of the

Inner Harbor on the Mystic River and Chelsea Creek, and numerous public and private boat launches and marinas within the Inner Harbor and upstream on the Mystic and Charles Rivers. All three of the potential water transportation routes to the Project site will encounter this condition. However, as discussed below, the Chelsea Creek and Orient Heights / Belle Isle Embayment segments are of note in that boat traffic on the former is almost entirely marine industrial, while on the later is generally limited to pleasure craft.

4.2 Dockside Amenities

The dockside infrastructure necessary to support water transportation depends on a number of factors, including the mode of transportation, the passenger base and the target destination(s). Dockside support for commuter ferries generally includes covered terminals with waiting rooms, public restrooms, and ticketing facilities, while taxi terminals may require only a landing platform and ramp. In all cases certain improvements, such as compatibility with Americans with Disabilities Act (ADA) and Massachusetts Architectural Access Board (MAAB) requirements and guidelines, are a necessity.

As noted in the BRA 2002 *Boston Inner Harbor Passenger Water Transportation Plan*, Boston Harbor ferry and water taxi operations are served by a wide variety of public and private terminal/dock facilities that have evolved over time.[4] As a result, the amenities at these terminals and docks vary greatly in terms of both required and desirable attributes. In order to address this issue the above plan identifies "specific terminal facility design guidelines" to be adopted by existing and proposed landings. These guidelines include, in part, the following:

- **Consistent Freeboard Heights.** Low freeboard (2 feet) for water taxis and public landings, medium freeboard (3.5 to 4.0 feet) for side loading ferries, and high freeboard (6.0 to 7.5 feet) for end loading ferries.

- **ADA Access (required)** and **Universal Design Access (recommended)**. Access to meet MAAB and ADA requirements from sidewalk and deck levels to boarding docks/floats for a mean tide range of 9.5 feet. Maximum ramp slopes of 1:12 to 1:20. Similar access from floats to vessels.

- **Dock/Ramp Amenities.** Standard equipment to include lighting and convenience outlets, non-skid surfaces, covered ramps, bollards, cleats, fenders, snow removal equipment, life preservers, ladder from water to float surface, schedule/information board.

[4] Boston Redevelopment Authority, January 2000, *Boston Inner Harbor Passenger Water Transportation Plan*, prepared by TAMS Consultants, Inc with Bourne Consulting Engineering.

- **Deck/Pier Amenities.** Standard equipment to include lighting and convenience outlets, non-skid surfaces, covered waiting area, emergency phone, schedule/information board.

- **Intermodal Connections.** Although requirements will vary by site, certain intermodal amenities are desirable from a functionality perspective. These include proximity to public transportation; specifically, MBTA/rail links - 5 minute walk, bus curbside capacity - 3 minute walk, taxi curbside capability at nearest public way, direct sidewalk or Harborwalk connection to first public way, service/public safety access to dockside, and directional signage between mode points.

While such consistency can be assumed for most of the existing Inner Harbor ferry terminals and taxi landings, there are no designated landings in Chelsea Creek and, with the exception of the ferry terminal in Winthrop Harbor, the landings in Orient Heights / Belle Isle Embayment are limited to private marinas. Presumably any future public landings will be required to meet or exceed these standards.

4.3 Landside Transportation / Intermodal Connections

As noted above, the Project site does not directly abut a waterway of a scale that could support commercial water transportation access to the site. There are three water routes that could potentially incorporate water transportation for a segment of the access routes to the Project site from the downtown Boston and/or Seaport waterfronts. However, some form of water to land transition facility and associated land-based transportation system will be required to complete the connection to (and from) the Project site.

The above-referenced *Boston Inner Harbor Passenger Water Transportation Plan* suggests that reasonable connections for water transportation services include MBTA/rail links within a 5 minute walk, bus curbside capacity within a 3 minute walk, and/or taxi curbside capability at the nearest public way. For the purpose of this discussion no distinction is made between resort-bound passengers and the general public as to the viability of including walking segments as part of a resort transportation access plan.

4.3.1 Existing MBTA Rapid Transit and Bus Services

Figure 6, *Potential Landside Public Transportation Connections*, shows the routes of train and bus routes between the East Boston waterfront and the Project site. As shown, bus service is also available from the Winthrop Town Pier and from areas proximate to the upper reaches of Chelsea Creek.

Public trains accessing the site are limited to the MBTA Blue Line rapid transit which, for the purpose of this analysis, connects the East Boston waterfront via the Maverick Station to the two Blue Line Stations at the Project site. Run times from Maverick Station to the Suffolk Downs and Beachmont Stations are approximately 8 and 10 minutes, respectively. It is of note that the Blue Line also offers direct connection between the downtown Boston

Waterfront and the Project site via Aquarium Station located at Long Wharf/Central Wharf (see Figures 5 and 6). Run times from Aquarium Station to Suffolk Downs Station are approximately 11 minutes.

Public bus service is available from the East Boston waterfront to areas proximate to, if not directly to, the Project site. Specifically, and as shown on Figure 6, the 120 Bus offers outbound service to the Orient Heights MBTA Station via Boardman Street, Waldemar Avenue and Orient Avenue in the Orient Heights neighborhood. The Waldemar Avenue segment of the 120 Bus route borders the Project site, and the Orient Avenue segment intersects Bennington Street within several blocks of the Suffolk Downs Station. Bus run times from the areas of Maverick, Sumner and Meridian Streets in East Boston to Waldemar Avenue and the Orient Avenue/Bennington Street intersection are on the order of 20 to 25 minutes outbound, due primarily to the diversion the 120 Bus route takes through the Orient Heights neighborhood.[5]

To the degree the 120 Bus route includes a segment of Route 1A (McClellan Highway) between Boardman Street and Waldemar Avenue, this route also represents a potential public transportation connection between the upper segment of Chelsea Creek and the Project site, with run times on the order of 5 to 12 minutes.

Finally, there is public bus service from Winthrop, and more specifically the Winthrop Town Pier, to the Orient Heights MBTA station. This bus route passes the Winthrop Town Pier ferry terminal and runs along Saratoga Street immediately north of the Orient Heights / Belle Isle Embayment. However, a third transportation connection by either a bus or train would be required for the final segment from the Orient Heights Station to the Project site.

4.3.2 Commercial and/or Private Intermodal Connections

The option exists to utilize taxi, livery, or dedicated shuttle bus service from a water landing to the Project site. A number of roadway arterials run directly from the East Boston Waterfront to the Project site, including Route 1A and Bennington Street. Automobile travel times from anywhere along the East Boston Inner Harbor waterfront, including the Logan Airport Dock and the Boston Harbor Shipyard & Marina, are generally between 8 and 10 minutes. Automobile travel times from the Winthrop Town Pier area are on the order of 12 minutes.

4.4 Time of Travel

Because there is no direct water connection to the Project site, any use of water transportation between downtown Boston or the South Boston Seaport waterfronts and the

[5] Bus and rail run times from the Massachusetts Bay Transportation Authority, Rider Tools Trip Planner: http://www.mbta.com/rider_tools/trip_planner/.

Project site will require landside transportation support. This may include public transportation in the form of trains or buses, commercial transportation such as taxis and livery services, or private operations such as dedicated shuttle buses. The time of travel between the downtown Boston and Seaport waterfronts and the Project site can be roughly determined by summing the time of travel for each of these components.

Table 1, *Combined Time of Travel to the Project Site*, presents time of travel estimates for existing modes of transportation to the Project site, assuming the first segment entails water transportation from the downtown Boston waterfront. For the purpose of the analyses presented in Table 1 several assumptions have been made regarding time of travel. Specifically, a water transport speed of 8.0 knots has been assumed for the Boston Inner Harbor in the section between the mouth of Chelsea Creek and the west end of Logan Airport. A speed of 4.5 knots is assumed for Chelsea Creek above the McArdle Bridge, while a speed of 15.0 knots is assumed for the outer portions of the Harbor, from the west end of Logan Airport to the entranceway to Winthrop Harbor approach at the Deer Islands Flats. Above this point, an average water speed of 6.0 knots is assumed, recognizing both "No Wake" and specific local speed limits within and proximate to Winthrop Harbor and the Orient Heights / Belle Island embayment. Meanwhile, landside times of travel have been obtained from published schedules for buses and trains, and from on-line travel services. Obviously any and all of these times can be dramatically affected by such factors as weather and traffic, but are considered adequate for comparison purposes. Finally, walking and waiting times between the various modes of transportation are not included in this analysis.

5.0 Assessment of Water Transportation Alternatives

While the Project site does not abut a waterway of a scale that could support commercial water transportation access directly to the site, there are three routes to the Project site that could potentially incorporate water transportation for a segment of the access routes from the Boston Inner Harbor piers area. These are Chelsea Creek, the Inner Harbor (Logan Airport Dock and Boston Harbor Shipyard & Marina) and the Orient Heights / Belle Isle embayment north of Logan Airport. The following sections assess each of these routes in relation to the basic water transportation criteria identified above.

5.1 Chelsea Creek

Chelsea Creek is the closest navigable waterway to the Project site, approaching to within approximately 500 feet of the Tomesello Road entrance to the Project site. Unfortunately, Chelsea Creek is also the most highly constrained water transportation route to the site. Of greatest concern is the potential conflict with commercial marine traffic. As noted in the most recent edition of the *Coast Pilot I,* "Chelsea River has a heavy traffic of deep-draft oil tankers." These tankers and associated tugboats can effectively occupy the entire navigable channel while in transport, and often extend well into the channel when at dock. On a

Table 1: Combined Time of Travel to the Project Site

Route/Sub-Route	Existing Dock	Time of Travel (minutes)				
		Water	Roadway	Train	Bus	Total
Chelsea Creek						
Condor Street	No	19	7	N/A	N/A	**26**
Chelsea Creek at Site	No	33	3	N/A	N/A	**36**
Boston Inner Harbor						
Logan Airport Dock	Water Terminal	7	10	N/A	N/A	**17**
Boston Harbor Shipyard & Marina	Water Taxi	5	9	---	---	**14**
		5	---	8	----	**13**
		5	----	---	21	**26**
Belle Isle Embayment						
Winthrop Harbor	Water Terminal	35	9	N/A		**44**
		35	----	N/A	12	**47**
Belle Isle Embayment	No	46	3	----	---	**49**
		46	---	3	----3	**51**

more practical vein, navigation in the upper half of Chelsea Creek is impeded by the 7-foot clearance of the Chelsea Street Bridge. Navigation beyond the bridge requires the raising of the structure and the associated impact to automobile traffic on Chelsea Street. Currently, there are no existing public docking structures or amenities along the Chelsea Creek shoreline.

5.1.1 Navigational Considerations

Chelsea Creek is part of the US Army Corps of Engineers Boston Harbor navigation project, which calls for a 38-foot deep channel to the headwaters for the Creek near the Project site. Hence, water depths are sufficient for water transportation. However, the 7-foot clearance of the Chelsea Street Bridge poses a hindrance to the establishment of regular water transportation upstream of the bridge.

The shoreline of Chelsea Creek is marked by inter-tidal mud flats which, when combined with the required setbacks for the federal channel; similarly pose constraints to access to the shoreline. Figure 7, *Chelsea Creek Detail*, shows both the limits of the federal navigation channel and the 114-foot setback for fixed and floating structures as dictated by the US Army Corps of Engineers. As shown, the required 114-foot setback from the designated federal channel would generally push the siting of any new landing structure into intertidal mud flats. This, in turn, would require dredging of a side channel into the mud flats in order to establish navigable water depths to the landing. As noted above, this setback may be increase to 120 feet in the near future.

5.1.2 Existing and Potential Water Transportation Landings/Docks

There are no public landings located along Chelsea Creek upstream of the McArdle Bridge. With the exception of a small marina immediately upstream of the McArdle Bridge, all of the existing docks and piers on the south side (Project side) of Chelsea Creek are associated with marine industrial operations and, more specifically, fuel off-loading. These include the Conoco fuel terminal immediately downstream of the Chelsea Street Bridge, and the Global Revere fuel terminal at the headwaters of the federal channel opposite the Project site.

The industrial nature of the southern shoreline of Chelsea Creek offers limited opportunity for the development of water transportation landing facility along the Creek's shoreline. This is particularly true in that section of Chelsea Creek upstream of the Chelsea Street Bridge. As shown in Figure 7, any new landing facility in this section of the Creek would require the dredging of a side channel in order to maintain adequate setbacks from the federal channel while establishing adequate water depths adjacent to the new landing facility. Meanwhile, the landside component of any new landing facility would be constrained by the existing industrial or commercial land uses. Finally, the landside transportation infrastructure along this section of the Creek is also limited, with only internal private roadways located along or proximate to the Creek, no public transportation connections other than the short segment of the 120 Bus route located on the opposite side of Route 1A, and limited vehicle access and/or only one way vehicle access to Route 1A.

The development of water transportation landing facility along the Chelsea Creek shoreline between the McArdle Bridge and Chelsea Street Bridge is similarly constrained by the required federal channel setbacks and the industrial nature of the adjacent land uses. However, there are several open space parcels along this segment of the Creek. Of particular note is the new Condor Street Urban Wild Park built upon the site of a former fuel tank farm on Condor Street and the adjacent MBTA "Car Barn" site on Condor and Eagle Streets. The park protrudes into Chelsea Creek and includes the remnants of a formerly dredged landing on its downstream edge. In contrast, the Car Barn site is located in an indent along the shoreline of Chelsea Creek. Both Condor and Eagle Street are improved roads with limited traffic which, while not proximate to public transportation, are readily accessible by taxi or shuttle bus. The park does not include landside or waterside boat landing facilities, and some maintenance dredging would likely be required in order to

establish a new landing with adequate water depths at this location. The Car Barn site is fronted by an extensive mud flat which would require extensive dredging in order to be made useful for navigation purposes.

The Condor Street Urban Wild park features restored salt marsh and meadow, but includes walking paths, a boardwalk, sculpture, and a viewing platform that protrudes into Chelsea Creek. It was created in a joint effort by the Boston Conservation Commission, the Boston Environment Department, the Boston Parks and Recreation Department, the US Environmental Protection Agency and the Chelsea Creek Action Group, a citizen's advocacy group dedicated to restoring Chelsea Creek and its shoreline. Whether the creation of a boat landing at this location would be deemed desirable by the above parties has not been explored. However, both the 2000 *East Boston Master Plan* [6] and the 2002 *East Boston Waterfront District Municipal Harbor Plan* [7] identified the then vacant and unimproved Condor Street site, as well as the adjacent "MBTA Car Barn" site, as potential water taxi landing sites.

5.1.3 Time of Travel

The Condor Street Urban Wild park is located approximately 2.4 miles from the downtown Boston waterfront via Chelsea Creek; the Project site is 3.6 miles by water. Travel times are on the order of 25 and 33 minutes, respectively, to these sites, the bulk of which is the water transportation component. While these are not necessarily prohibitively long run times, they do not recognize the potential for considerable delays as a result of fuel tanker traffic on the Creek and/or the raising of the drawbridges. As noted above, there are no public transportation services in this area of East Boston; hence the landside transportation component would need to be supplied by taxi, livery or shuttle bus services.

5.2 Boston Inner Harbor

The Boston Inner Harbor routes to the Logan Airport Dock and the Boston Harbor Shipyard & Marina offer direct connections across the Boston Inner Harbor, but a physically longer landside connection to the Project site. These routes have the benefit of existing waterside and landside docking infrastructure, as well as proximity to public transportation and/or direct vehicular connections. The development of additional water taxi or water ferry landings at undeveloped or underdeveloped sites in East Boston that are located closer to existing bus routes and/or the Maverick Station may also be possible.

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[6] Boston Redevelopment Authority, March 2002, *East Boston Waterfront District Municipal Harbor Plan*.

[7] Boston Redevelopment Authority, April 2000, *East Boston Master Plan*.-

5.2.1 Navigational Considerations

There are no depth or clearance limitations for water transportation from the public wharfs and commuter docks along the downtown Boston and Seaport waterfronts and the existing Logan Airport Dock and Boston Harbor Shipyard & Marina in East Boston.

5.2.2 Existing and Potential Water Transportation Landings/Docks

Two significant water transportation landings/docks are located along the East Boston waterfront opposite the downtown Boston and Seaport waterfronts: the Logan Airport Dock and the Boston Harbor Shipyard & Marina. The Logan Airport Dock is a full service facility serving water taxi and commuter water ferry operations. The Boston Harbor Shipyard & Marina offers water taxi landing facilities.

In addition to the existing landings referenced above, there are a number of other sites along the East Boston waterfront that offer the potential as new landing sites (see Figure 8, *Boston Inner Harbor Detail*). Of particular note are the Lewis Mall site at the waterfront end of Lewis Street and the Liberty Plaza/Central Square waterfront area. Both of these sites are specifically recommended in the above-referenced *East Boston Master Plan* and *East Boston Waterfront District Municipal Harbor Plan* as prime locations for the addition of water transportation landings. Indeed, as noted in the Municipal Harbor Plan, "In the mid-1990's the community's desire to restore community-oriented ferry service to Boston resulted in the construction of a new ferry terminal at the end of Lewis Mall with MBTA service to downtown." This service ran in 1995 and 1996 "but failed due to insufficient commuter and non-commuter ridership."

Other sites identified as potential landings or water taxi sites along the East Boston waterfront include the East Boston Piers Park, Pier 1, and the Clippership Wharf site. Currently the East Boston Piers Park floats are restricted for Piers Park sailing vessel use. Public water transportation services will likely be incorporated as a component of any future private development projects proposed at these sites.

5.2.3 Time of Travel

Both the Logan Airport Dock and the Boston Harbor Shipyard & Marina are located approximately one mile directly opposite Boston Inner Harbor from the downtown Boston and Seaport waterfronts. The other potential East Boston water landing sites are similarly located within close proximity to the downtown Boston and Seaport waterfronts. Water travel times to these existing and potential sites are on the order of 5 to 7 minutes.

The Boston Harbor Shipyard & Marina is within walking distance of both MBTA rail service and MBTA bus service, although the existing bus route to the Project site is not direct. The other potential East Boston water landing sites are also within walking distance of these landside services, with the Lewis Mall site having the most direct landside connection to the MBTA Maverick Station. Although the East Boston waterfront is more distant from the

Project site by land than either Chelsea Creek or the Orient Heights / Belle Isle Embayment, the existing roadway infrastructure is such that landside travel to the Project site by vehicle (i.e. taxi, livery service, or shuttle bus) is only 9 to 10 minutes. As a result (and discounting existing bus travel as a component), the combined time of travel to the Project site via the Boston Inner Harbor route(s) is on the order of 13 to 17 minutes.

5.3 Orient Heights / Belle Isle Embayment

The Orient Heights / Belle Isle Embayment is located almost eight miles from the downtown Boston and Seaport waterfronts via water. The first half or more of the route travels the eastern extent of the Boston Inner Harbor, then veers northward past the approaches to Winthrop Harbor and around the eastern edge of Logan Airport. Time of travel and the lack of existing or potential docking facilities constrain the feasibility of utilizing this route for water transportation to the Project site.

5.3.1 Navigational Considerations

While the first half of the water route from the downtown Boston and Seaport waterfronts to the Orient Heights / Belle Isle Embayment is located within the deep waters of the Boston Inner Harbor and the "President Roads" portion of the Outer Harbor, the second half of the route follows a relatively narrow channel between the shoals of the Governors Island Flats and Deer Island Flats, past the shallows of Snake Island in Winthrop Harbor, and through the Belle Isle straights between Chelsea Point in Winthrop and the runway extensions of Logan Airport. The most recent nautical chart for the Governors Island Flats and Deer Island Flats area suggests water depths of 10 feet or more at MLW. However, as referenced above, the most recent edition of the *Coast Pilot I* suggests a "least depth of 3 feet" along this route. The channel width is generally narrow, and decreases to approximately 100 feet through the Belle Isle straights. Meanwhile, the portion of the route east of Logan Airport and within the President Roads is susceptible to adverse wind and weather impacts during storm events.

5.3.2 Existing and Potential Water Transportation Landings/Docks

There are no public landings within the Orient Heights / Belle Isle Embayment. There are three private marinas, two of which extend into the deeper waters of the embayment, and one of which is less readily accessible. There are also numerous private residential docks, particularly along the eastern shoreline of the embayment. A residential neighborhood is located on the north side of the embayment, although the residences are separated from the water's edge by Baywater Street. Constitution Beach, a public beach and park marks the western shore of the embayment.

The residential character of the northern (Project side) of the Orient Heights / Belle Isle Embayment limits the potential for establishing a new landing facility in this area. It may be possible to establish a public access point for water taxi service at one of the existing

marinas, but high volume access with landside vehicular support may create traffic concerns.

As noted above, there is a public ferry boat landing at the Town Pier in Winthrop Harbor. Currently Boston Harbor Cruises operates a seasonal (May to October) commuter ferry service between the Town Pier in Winthrop Harbor and Rowes Wharf. However, individually both the water and the landside transportation segments of this route are as long as or longer than those matching segments of the Boston Inner Harbor and Chelsea Creek routes. There is no direct public transportation from the Winthrop Town Pier to the Project site; rather the connection is to the Orient Heights Station, from which either a second bus or the Blue Line rapid transit can be obtained for the final leg of transport.

5.3.3 Time of Travel

Although boats speeds are generally much greater in the outer portions of the Inner Harbor, the distances to Winthrop Harbor and the Orient Heights / Belle Isle Embayment are such that travel times to the Project site via these routes are twice or three times those of the Chelsea Creek and Boston Inner Harbor routes.

6.0 Summary

In terms of convenience and practicality of utilizing water transportation as a component of transportation to the Project site, the direct route across the Boston Inner Harbor to the waterfront of East Boston, and thence to a ground transportation link, is the most efficient. Both the waterside and landside docking infrastructure is in place, and the landside transportation component includes, or is set to include, multimodal options. Conversely, the Chelsea Creek and Orient Heights / Belle Isle Embayment are without established docking infrastructure, and the location for establishing such infrastructure is not apparent at the terminus of either route. In addition, even if a facility could be constructed at a favorable location along either of these routes, a landside transportation component would still be required. In either case, the necessary landside component would not be significantly different in terms of convenience and practicality than that of the Boston Inner Harbor landside component. Ultimately, there would be no benefit to utilizing either of the longer water transportation routes in the hope of decreasing the landside travel component.

Although the above analysis did not include walking times, the establishment of additional water taxi locations along the East Boston waterfront would likely improve the connection to public transportation service, potentially shortening the walking distance to the Maverick Station. The addition of water ferry service at a point along the waterfront west of the Boston Harbor Shipyard & Marina would add the potential for intermodal connections currently not available from the Logan Airport Dock at the eastern extreme of the East Boston waterfront.

ATTACHMENT A

Figures

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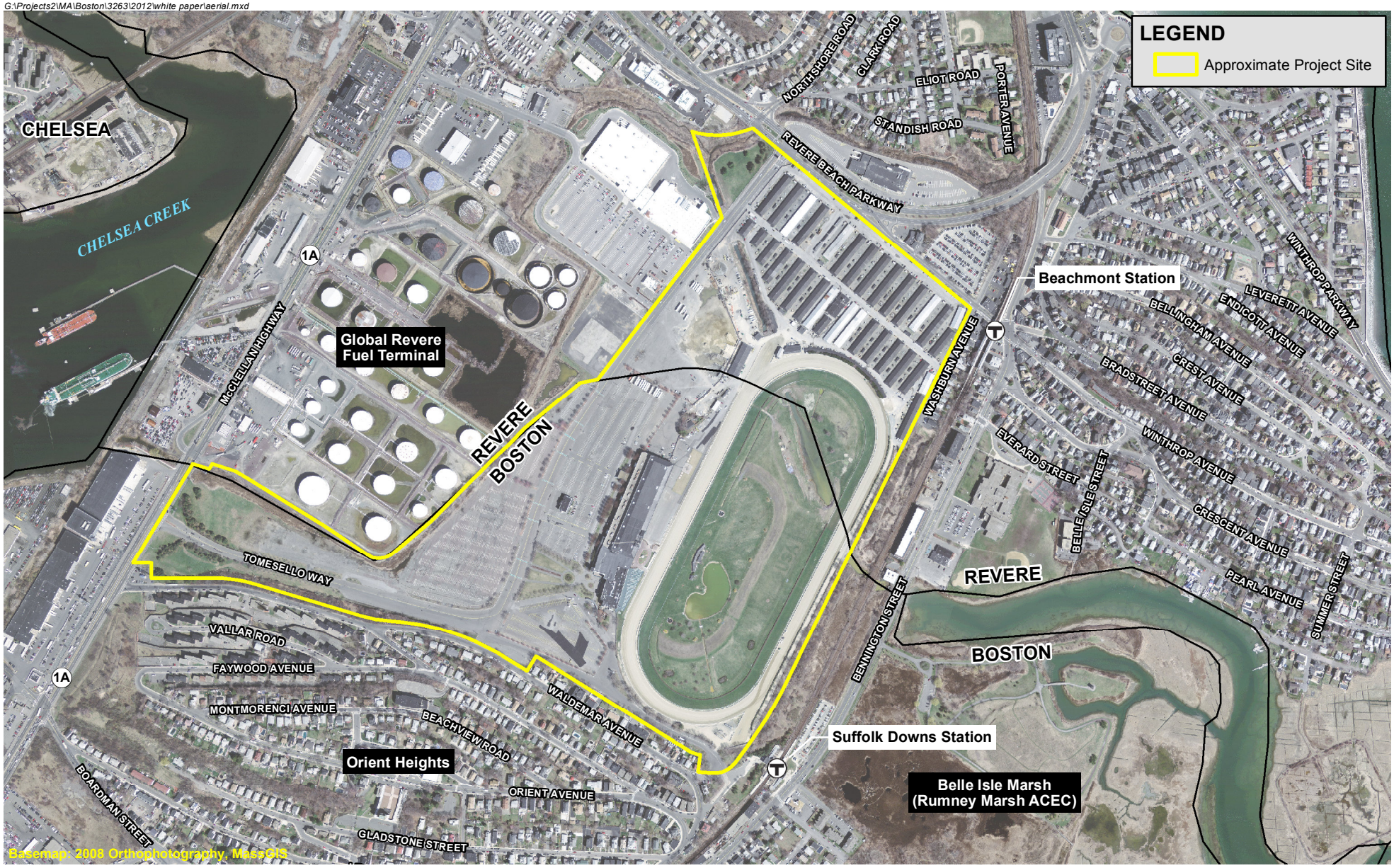

Epsilon Associates Inc.

0 200 400 800 Feet

Aerial Locus Map

FIGURE 1

CAESARS ENTERTAINMENT

SUFFOLK DOWNS

THE RESORT AT SUFFOLK DOWNS

Boston, Massachusetts

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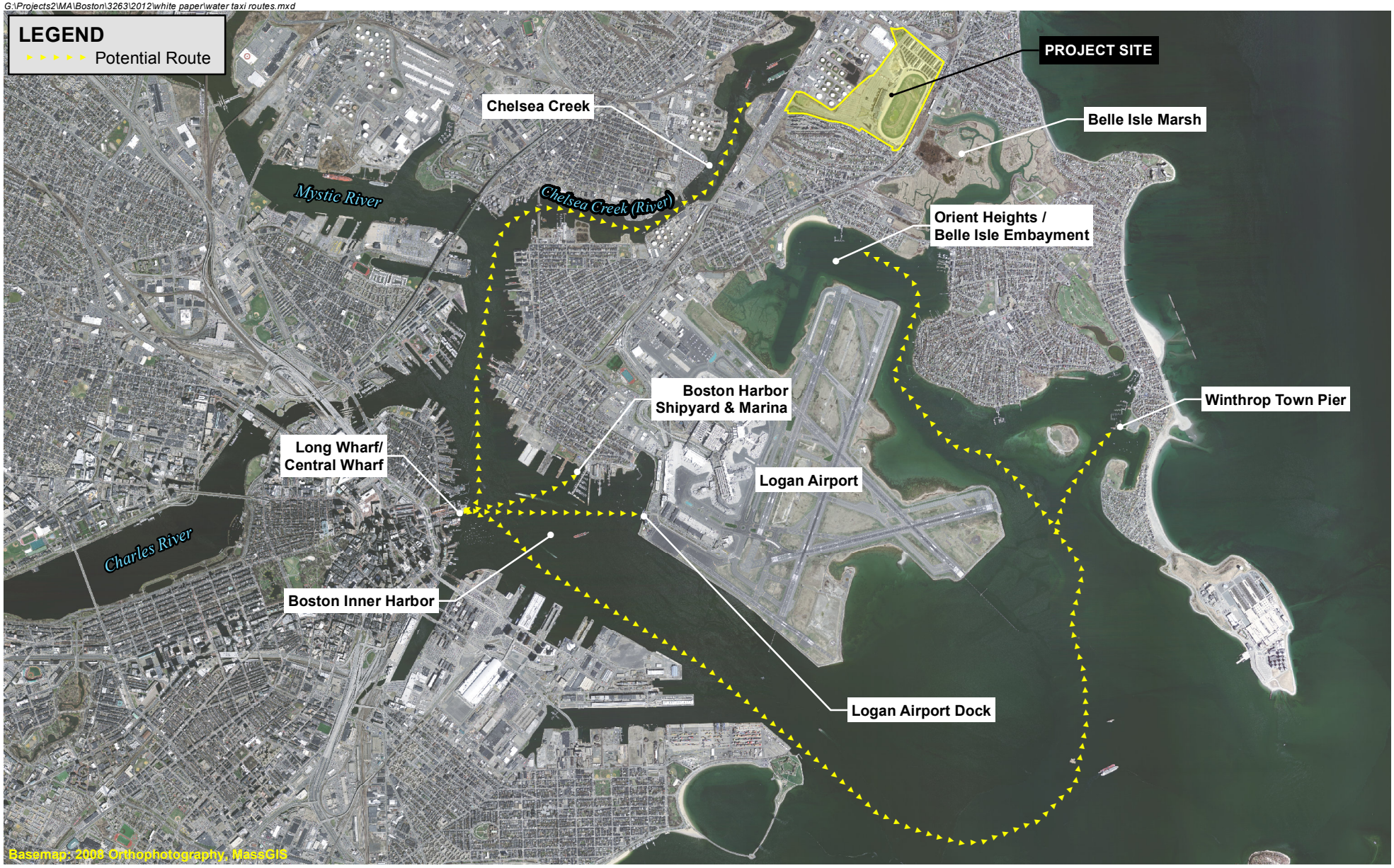

Epsilon Associates Inc.

0 2,100 4,200 Feet

Potential Water Transportation Routes

FIGURE 2

CAESARS ENTERTAINMENT

SUFFOLK DOWNS

THE RESORT AT SUFFOLK DOWNS

Boston, Massachusetts

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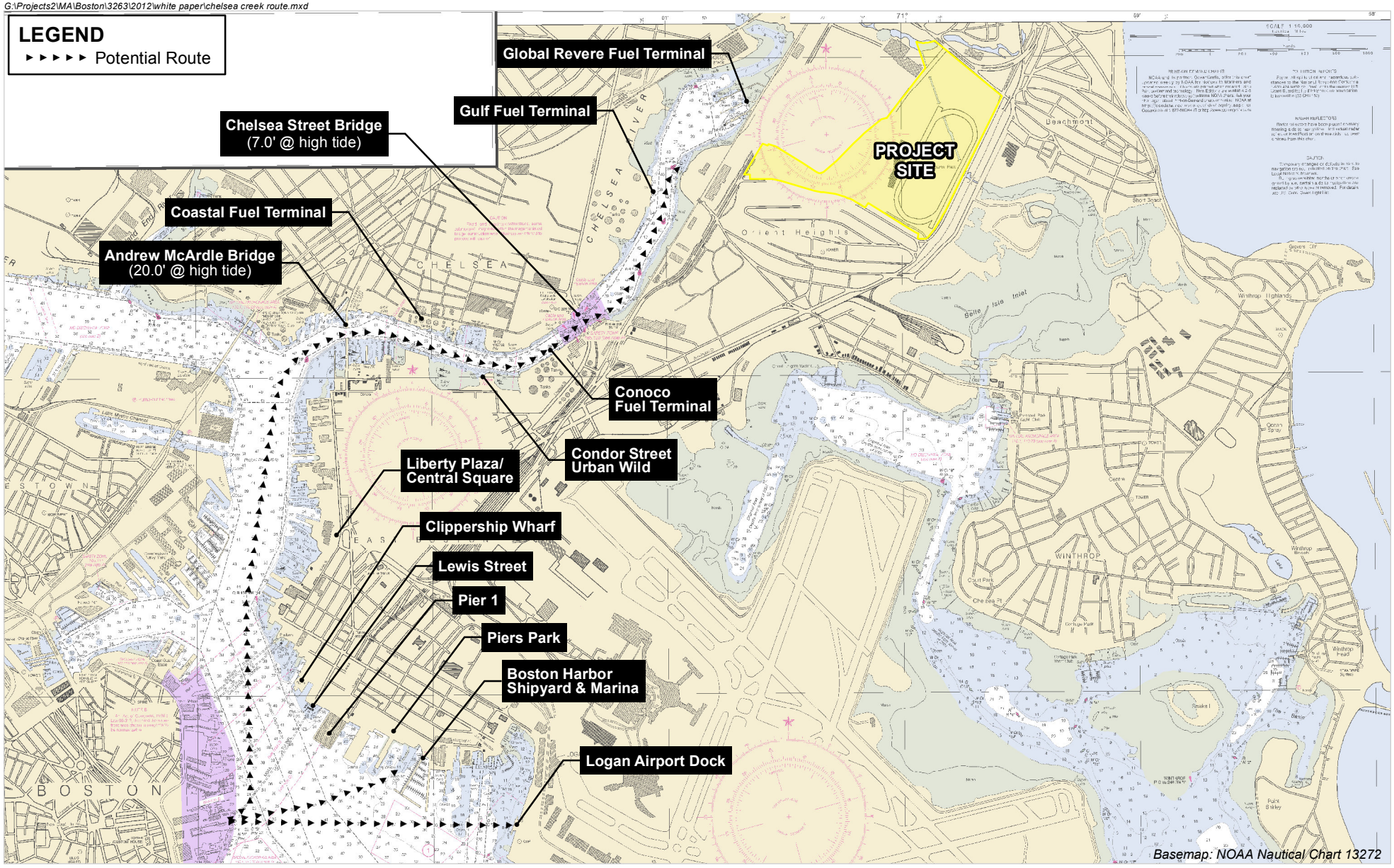

Epsilon Associates Inc.

0 1,300 2,600 Feet

Potential Water Transportation Routes
(via Chelsea Creek and Boston Inner Harbor)

FIGURE 3

CAESARS ENTERTAINMENT

SUFFOLK DOWNS

THE RESORT AT SUFFOLK DOWNS

Boston, Massachusetts

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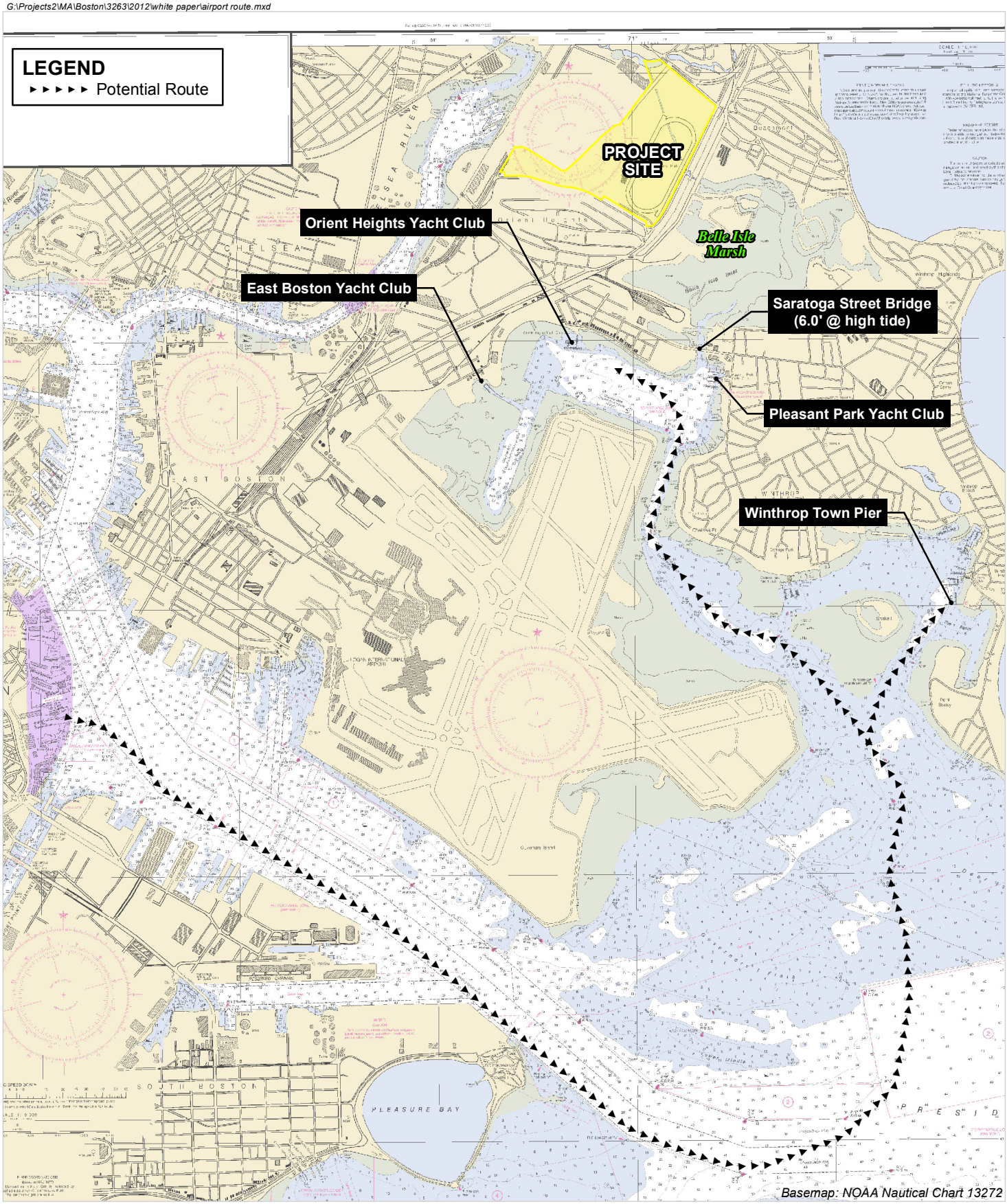

Epsilon Associates Inc.

0 1,750 3,500 Feet

Potential Water Transportation Routes
(via Orient Heights/Belle Isle Embayment)

FIGURE 4

CAESARS ENTERTAINMENT

SUFFOLK DOWNS

THE RESORT AT SUFFOLK DOWNS

Boston, Massachusetts

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Source: Massport, August 2012

Epsilon Associates Inc.

Boston Harbor Passenger Water Transportation Routes and Docks

FIGURE 5

CAESARS ENTERTAINMENT

SUFFOLK DOWNS

THE RESORT AT SUFFOLK DOWNS

Boston, Massachusetts

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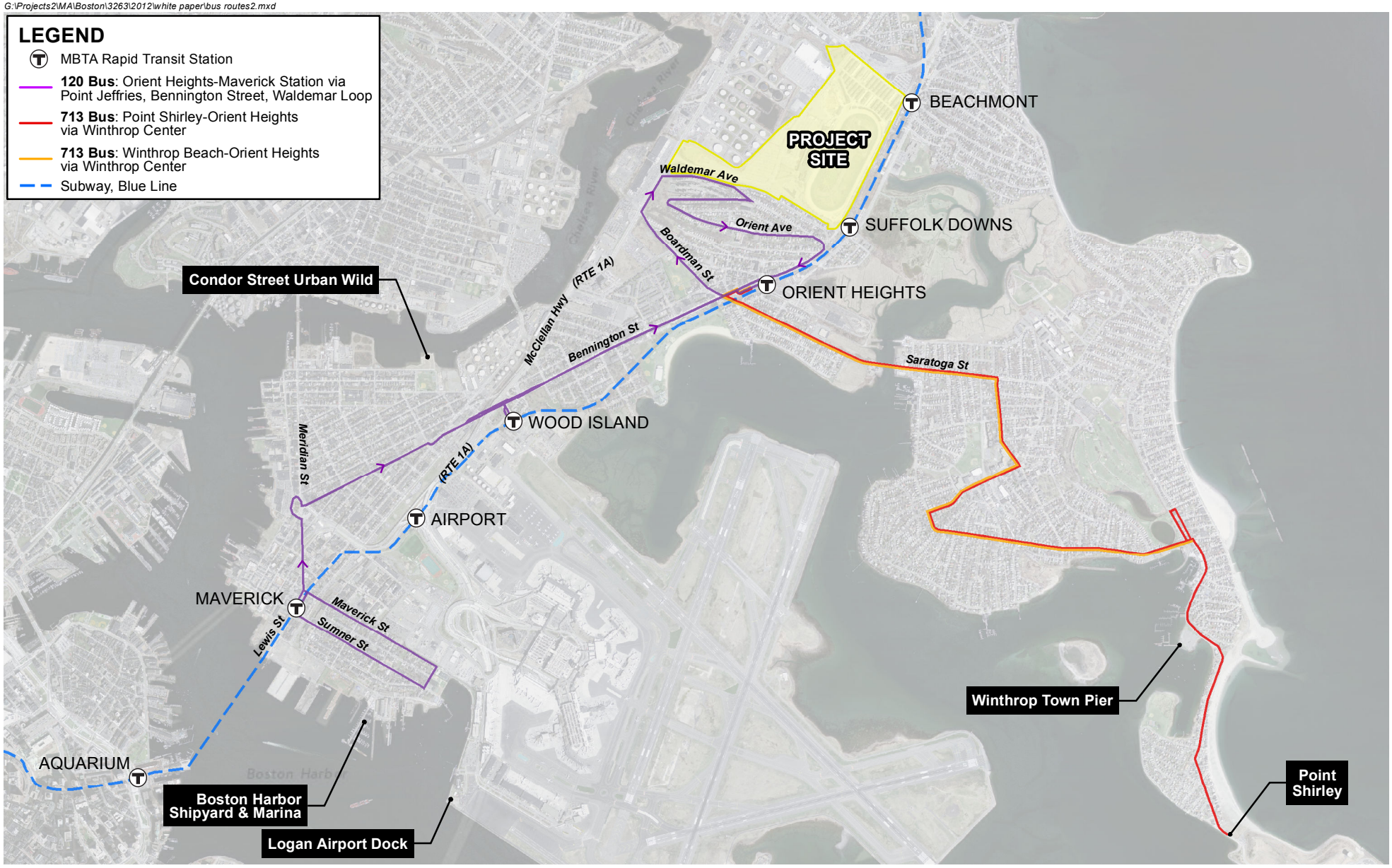

Epsilon Associates Inc.

0 1,400 2,800 Feet

Potential Landside Public Transportation Connections

FIGURE 6

CAESARS ENTERTAINMENT

SUFFOLK DOWNS

THE RESORT AT SUFFOLK DOWNS

Boston, Massachusetts

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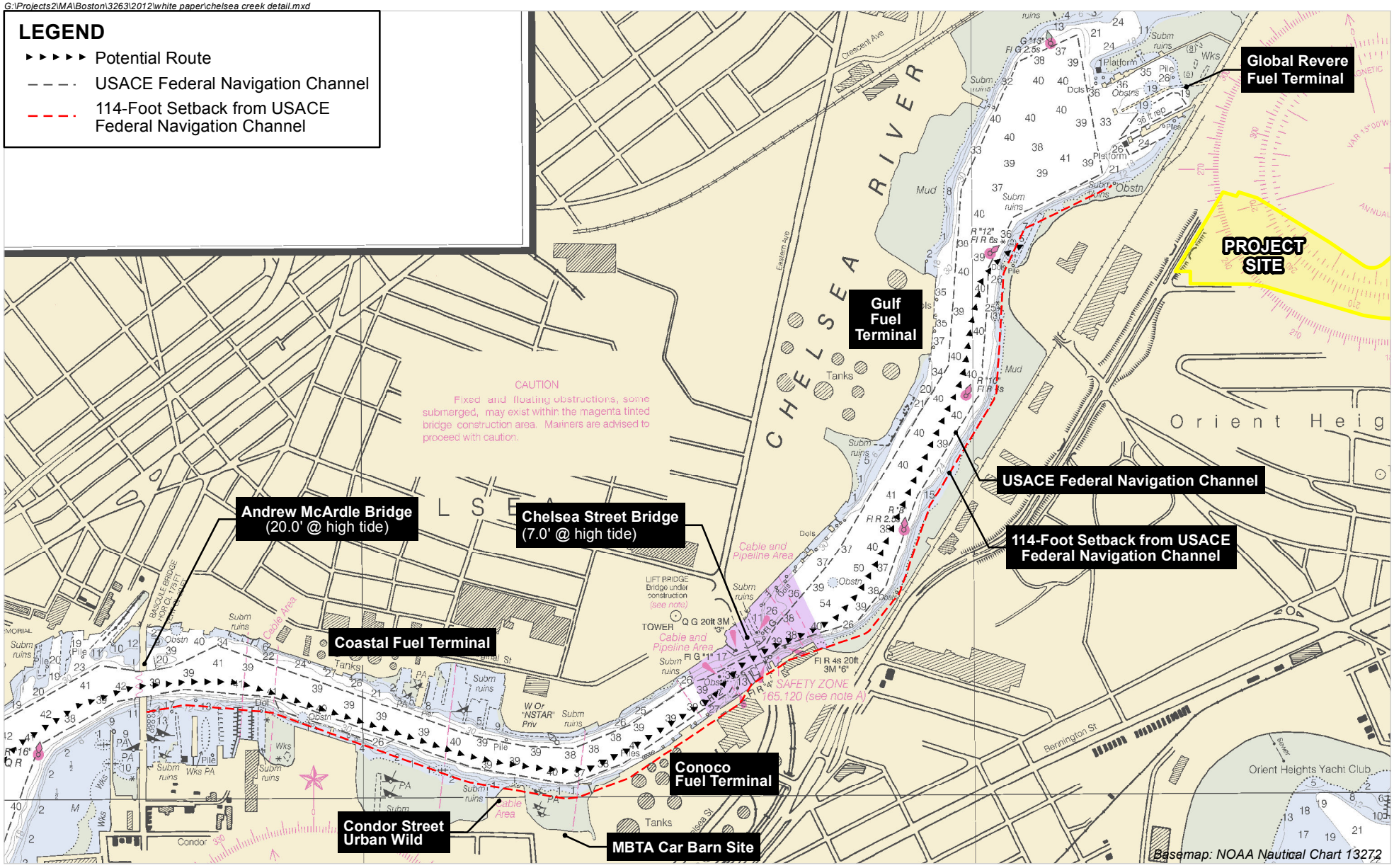

Epsilon Associates Inc.

0 500 1,000 Feet

Chelsea Creek Detail

FIGURE 7

CAESARS ENTERTAINMENT. SUFFOLK DOWNS

THE RESORT AT SUFFOLK DOWNS

Boston, Massachusetts

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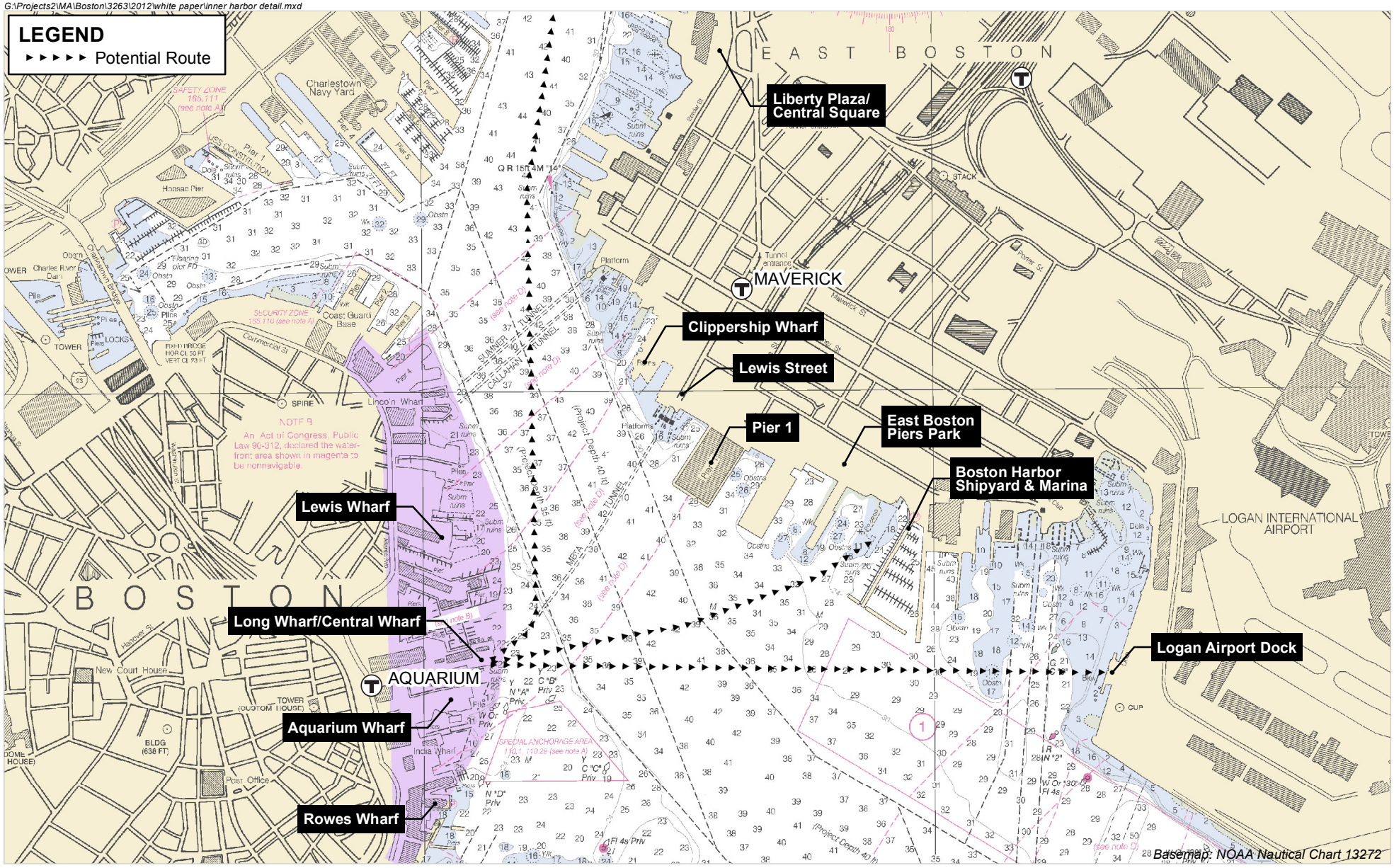

Epsilon Associates Inc.

0 600 1,200 Feet

Boston Inner Harbor Detail

FIGURE 8

CAESARS ENTERTAINMENT

SUFFOLK DOWNS

THE RESORT AT SUFFOLK DOWNS

Boston, Massachusetts

Attachment D

Greenhouse Gas Technical Appendices

ATTACHMENT D
GHG ANALYSIS TECHNICAL SUPPORT DOCUMENTS

D.1 Building Energy Model Input

D.2 Building Energy Model Output

D.3 200 kW CHP

D.4 2.7 MW PV Performance Estimate

D.5 Generation Potential of Kinetic Energy Device

ATTACHMENT D.1
BUILDING ENERGY MODEL INPUT

PROGRAM (MODELED) AREA	CONDITIONED	UNCONDITIONED
Casino I	114,177	
Casino II	104,840	
Misc Hi Density	161,900	
Misc Lo Density	32,380	
Hotel	353,140	
Kitchen	23,559	
Data	4,750	
Grandstand		263,840
Parking (enclosed)		132,500
Parking (exterior)		840,880
TOTAL	794,746	1,237,220

BUILDING ENVELOPE	BASELINE	PROPOSED
Roofs	R20 ci above steel deck, U-0.048	same
Roof SRI		
Roof Reflectivity	0.3	same
Walls - Above Grade	Light weight steel frame, R13 + 7.5 ci, U-0.064	Light weight steel frame, R13 + 14 ci, U-0.045
FENESTRATION	**BASELINE**	**PROPOSED**
Vertical fenestration Area (% of Wall area)	Hotel - 40%, Other 25%	Hotel - 95%, Other - 25%
Vertical Glazing Description	Metal frame and curtain wall	Solarban 72 on Curtain Wall frame
Vertical Glazing U-factor	Curtain Wall - 0.45, other - 0.55	All - 0.44
Vertical Glazing SHGC	All - 0.4	All - 0.29
HVAC - AIR SIDE	**BASELINE**	**PROPOSED**
Primary HVAC Type	Hotel - PTAC Casino - VAV	Hotel - FCU Casino - VAV
Other HVAC Type	Gaming Areas - PSZ-AC Kitchens - VAV (Strict Variable Exhaust Flow Guidelines)	Gaming Areas - VAV Kitchens - VAV
Total Cooling Capacity		N/A
Unitary Cooling Efficiency	PTAC - 9.5 EER	N/A
Unitary Heating Efficiency	80%	N/A
Fan System Operation	On while occupied, cycled otherwise	same
Outdoor Air Design Min Ventilation	62.1-2010	same
HVAC Air-side Economizer Cycle	Yes for VAV and PSZ-AC systems	Yes for VAV systems
Economizer High-Limit Shutoff	70F Drybulb	same
Design Airflow Rates (Conditioned Space)		
Total System Fan Power (Conditioned)	938 kW	967 kW
6.5.3.1.1B Pressure Drop Adjusmtents	Ducted return, Return airflow control, MERV 13 filtration = 1.9" (Gaming VAV gets additional 0.54" credit for mandatory energy recovery)	N/A
Exhaust Air Energy Recovery	Required in most systems. Kitchens are exempt if not recovered in the proposed. Hotel is exempt if largest exhaust source is less than 75% of design ventilation rate.	Yes, for all systems
Demand Control Ventilation[12]	Yes, for all areas with occupant densities greater than 40ppl/1,000 sf, unless energy recovery is required. Additionally required in Kitchens.	same
Supply Air Temperature Reset Parameters	Higher by 5F under min load conditions	same
Thermal Energy Storage	none	in design, but not modeled in Trane

ATTACHMENT D.1
BUILDING ENERGY MODEL INPUT

HVAC - WATERSIDE	BASELINE	PROPOSED
Number of Chillers		3
Chiller Part-Load Controls[1]	Staged in Series	same
Chiller Capacity (Per Chiller)		1500 tons
Chiller Efficiency[2]	Full Load: 5.96 COP (0.59 kW/ton) AND IPLV 0.4 kW/ton	Full Load: 6.56 COP (0.536 kW/ton), IPLV 0.4 kW/ton
Chilled Water Loop Supply Temperature	44F	same
Chilled Water (CHW) Loop Delta-T	12F	14F
CHW Loop Temp Reset Parameters	44F at 80F OA to 54F at 60F OA	None
CHW Loop Configuration[3]	Constant primary, variable secondary	Variable primary
Number of Primary CHW Pumps	One per chiller	1
Primary CHW Pump Power	4 W/GPM	22 W/gpm
Primary CHW Pump Flow	Autosized	same
Primary CHW Pump Speed Control	Constant speed	Variable primary
Secondary CHW Pump Power	18 W/GPM	N/A
Secondary CHW Pump Flow	Autosized	N/A
Secondary CHW Pump Speed Control	Variable speed	N/A
Number of Cooling Towers / Fluid Coolers	One per chiller	same
Cooling Tower Fan Power	38 gpm/hp	60 gpm/hp
Cooling Tower Fan Control	Two speed	Variable speed
Condenser Water Leaving Temperature	85 at design	same
Condenser Water (CW) Loop Delta-T	10F	same
CW Loop Temp Reset Parameters	70F, WB Reset to 85F	None
CW Loop Configuration[3]	Primary only	same
Number of CW Pumps	1	same
CW Pump Power	19 W/gpm	same
CW Pump Flow	Autosized	same
CW Pump Speed Control	Constant speed	same
Number of Boilers	2, equally sized	3 (Hotel, Gaming, Other)
Boiler Part-Load Controls	Staged in Series	same
Boiler Capacity (Per Boiler)	Autosized	same
Boiler Efficiency[2]	84%	97%
Boiler Water Loop Supply Temperature	180F	150F
Hot Water or Steam (HHW) Loop Delta-T	50F	40F
HHW Loop Temp Reset Parameters	180F @ 50F OA to 150F @ 20F	None
HHW Loop Configuration[3]	Primary only	same
Number of Primary HHW Pumps	1	same
Primary HHW Pump Power	19 W/gpm	same
Primary HHW Pump Flow	Autosized	same
Primary HHW Pump Speed Control	Variable speed	same
Water-side Economizer		Yes
Water-side Energy Recovery		No
SERVICE HOT WATER	**BASELINE**	**PROPOSED**
SHW Equipment Type	Storage	same
SHW Storage Tank Capacity	Unknown	same
SHW Heating Input Capacity	1.35 MBtu/h	1.29 MBtu/h
Equipment Efficiency	80% plus standby losses	83%, provided for backup purposes
Condenser Loop Heat Recovery	N/A	same
Thermal Energy Storage	Not required	in design, but not modeled in Trane
CHP	Not required	in design, but not modeled in Trane

ATTACHMENT D.1
BUILDING ENERGY MODEL INPUT

LIGHTING	BASELINE	PROPOSED
Automatic Lighting Shutoff Method	Scheduled	same
Gross Lighted Floor Area	795 ksf	same
Interior Lighting Power Calc Method	Space by space	same
Interior Lighting Power Density (Average)	0.99 W/sf (utility peak)	0.85 W/sf (utility peak)
Interior LPD per space (Space-by-Space)	Gaming: 2.8 W/sf	same
	Conference: 2.23 W/sf	1.8
	Kitchen: 0.99 W/sf	
	Office: 1.98 W/sf	1.7
	Hotel: 2.11 W/sf	1.7
	Garage: 0.19 W/sf (25.2 kW)	same
Additional Lighting Power Allowance	Signage: 0.48 W/sf	same
Automatic Interior Space Shutoff Control in Required Spaces (Section 9.4.1.2)	Automatically Off during unoccupied hours; Occupancy sensors required in more spaces than 2007 (storage, offices, restrooms, locker rooms, copy rooms)	same
Int. Lighting Power Adjustments (Table G3.2)		
Daylight Dimming Controls	Garage, Sidelighted Areas	same
Automatic Exterior Lighting Control	Photocell	same
Total Exterior Lighting Power	0.13 W/sf (109.3 kW)	same
MISCELLANEOUS	**BASELINE**	**PROPOSED**
Receptacle equipment	Gaming: 4.15 W/sf Meeting: 1.2 W/sf Office: 0.8 W/sf Hotel: 0.5 W/sf	same
Escalators and Elevators	Not included	same
Refrigeration equipment	Not included	same
Cooking	19.6 W/sf	same
Data Center & Server Room Loads	25 W/sf	same
Process loads	Not included	Not included

ATTACHMENT D.2
BUILDING ENERGY MODEL OUTPUT

D.2.1 Monthly Energy by End Use

D.2.2 PRM Summary

ATTACHMENT D.2.1
MONTHLY ENERGY BY END USE

DESIGN

Month	Lights kWh	Misc Equip kWh	Chiller / Compressor kWh	Cond/Tower Fans kWh	Auxilary Equip (Other Misc.) kWh	Fan Equipment kWh	Heating Equip (Gas) MMBtu	Garage & Exterior Ltg kWh	TOTAL
Jan	420,145	1,091,004	42	840	1,917	391,327	1,749	62,797	
Feb	379,602	985,346	-	878	1,355	357,933	1,332	56,719	
Mar	427,323	1,094,259	1,734	5,662	2,544	410,295	1,172	62,797	
Apr	405,434	1,054,641	16,572	20,350	6,702	402,603	818	60,771	
May	423,734	1,093,017	156,969	31,525	45,786	410,273	735	62,797	
Jun	412,612	1,060,818	321,059	35,530	72,051	380,863	690	60,771	
Jul	416,556	1,094,503	500,257	52,897	91,931	361,940	702	62,797	
Aug	427,323	1,098,584	437,162	42,013	85,328	370,118	703	62,797	
Sep	405,434	1,056,779	276,916	28,353	66,576	370,967	691	60,771	
Oct	423,734	1,092,226	62,572	28,259	26,990	418,193	777	62,797	
Nov	409,023	1,056,653	10,252	6,666	5,127	394,626	1,020	60,771	
Dec	416,556	1,088,873	3,096	2,475	3,229	396,403	1,499	62,797	
ANNUAL, MWh	4,967	12,867	1,787	255	410	4,666		739	
MMBtu							11,886		99,543

2010 BASELINE

Month	Lights kWh	Misc Equip kWh	Chiller / Compressor kWh	Cond/Tower Fans kWh	Auxilary Equip (Other Misc.) kWh	Fan Equipment kWh	Heating Equip (Gas) MMBtu	Garage & Exterior Ltg kWh	
Jan	477,960	1,100,302	112,454	2,839	1,260	681,735	1,312	62,797	
Feb	431,848	993,099	103,205	2,761	1,052	617,024	1,064	56,719	
Mar	486,761	1,101,096	112,910	3,229	1,056	692,799	967	62,797	
Apr	461,122	1,056,996	93,596	4,041	1,568	667,966	787	60,771	
May	482,361	1,093,886	217,652	16,009	4,679	696,294	775	62,797	
Jun	469,924	1,062,421	436,637	35,611	9,835	674,248	737	60,771	
Jul	473,559	1,096,798	727,419	60,113	14,894	683,752	762	62,797	
Aug	486,761	1,101,257	627,613	52,106	14,266	690,141	762	62,797	
Sep	461,122	1,057,827	352,118	28,327	8,922	663,800	738	60,771	
Oct	482,361	1,092,571	100,447	6,127	2,559	695,537	776	62,797	
Nov	465,523	1,060,617	85,666	3,226	1,316	666,672	858	60,771	
Dec	473,559	1,095,842	95,725	2,759	1,253	681,843	1,134	62,797	
ANNUAL, MWh	5,653	12,913	3,065	217	63	8,112		739	
MMBtu							10,672		115,632

ATTACHMENT D.2.2
PRM SUMMARY

		Baseline		Proposed	
		Energy MMBtu/yr	MWh/yr	Energy MMBtu/yr	MWh/yr
Lighting - Conditioned	Electricity	19,293.2	5,655	16,954.0	4,969
Space Heating	Electricity	19.3	6	14.9	4
	Gas	10,674.9	na	11,889.3	na
Space Cooling	Electricity	10,472.1	3,069	6,116.7	1,793
Pumps	Electricity	184.3	54	1,363.6	400
Heat Rejection	Electricity	741.1	217	871.8	256
Fans - Conditioned	Electricity	27,685.5	8,114	15,923.5	4,667
Receptacles - Conditioned	Electricity	44,071.1	12,916	43,914.0	12,870
Stand-alone Base Utilities	Electricity	2,523.5	740	2,523.5	740
		Energy MMBtu/yr		Energy MMBtu/yr	
Electricity		104,990	30,771	87,682	25,698
Gas		10,675		11,889	
Total		**115,665**		**99,571**	

ATTACHMENT D.3
200 kW CHP

D.3.1 200 kW CHP Performance Estimate

D.3.2 Economic Analysis of 200 kW CHP System

ATTACHMENT D.3.1
200 kW CHP PERFORMANCE ESTIMATE

Problem:

Estimate the annual performance of potential CHP application.

Given:

From Tecogen InVerde 100 Ultra data sheet (x2)

electricity	200	kWe
recovered heat	1.34	MMBtu/hr
combined efficiency	80.0%	HHV

Grid-supplied electricity GHG[1]	780	lbs CO_2/MWh
Natural gas GHG [2]	117	lbs CO_2/MMBtu

[1] 2011 New England Electric Generator Air Emissions Report, Table 5.4, 2011 value

[2] EIA Fuel Emissions Factors, Weighted National Average (1029 Btu/scf)

Assumptions:

CHP is thermal load-following

Annual capacity factor [3]	77%
Annual waste heat utilization	100%
Fired NG boiler efficiency	83%

[3] includes allowances for maintenance and thermal load-following

Calculations:

Fuel input	2.53	MMBtu/hr HHV		
Heat input	17,080	MMBtu/yr	999	tons/yr GHG emitted
Electrical output	1,353	MWh/yr	-528	tons/yr GHG offset
Waste heat utilized	9,060	MMBtu/yr		
Boiler fuel displaced	10,916	MMBtu/yr	-639	tons/yr GHG offset
		net reduction	-167	tons/yr

Annual thermal efficiency	80%

ATTACHMENT D.3.2
Economic Analysis of 200 kW CHP System

System Description

A) Two TECOGEN InVerde Ultra 100 Gas Engine generator sets with hot water waste heat recovery system

   a. 370 kW (HHV) this is 1,262,000 Btu/hr each unit

   b. 100 kW generator output each unit, 200 kW total

   c. unit staging and load following down to 40 percent of full output of single unit.

   d. net electrical efficiency of 27% (HHV-based)

   e. Full thermal load following with storage – continuous run with no excess heat rejection to atmosphere

B) Thermal storage tank with 5 MMBtu usable storage capacity

Basis of System Operation

Input and Output values from the CHP system are based on the following:

a. Thermal load following with no heat rejection to atmosphere

b. Total of 9060 MMBtu (2,655 MWh thermal) of heat from cogen used in facility; 7,780 MMBtu for domestic water heating and 1,280 MMBtu for space heating.

c. 17,094 MMBtu of gas input to CHP

d. 1,352,600 kWh of electric output from CHP

Economic Analysis

Value of electricity:

1,352,600 kWh/year. At $0.0796/kWh, this is worth approximately $107,700/year. If the operation of the cogeneration equipment is sustained throughout the coincident site peak period for each summer month, the value of the peak demand savings will be an additional $14,200 ($23.62/kW x 150 kW x 4 months) for the 4 summer months and could be worth as much as $21,200 ($17.65 x 150 x

8 months) for reducing demand in the winter months. Total Value = $143,100/year (some of the $35,400 of demand charge benefit could be lost due to system operation interruptions)

Value of domestic water and space heating:

The cogeneration system can meet nearly 100 percent of the approximately 7,780 MMBtu of domestic water heating needs for the site. This will offset the need to purchase approximately 9,150 MMBtu of gas for water heating which is worth approximately $73,200 per year with gas at $8.00/MMBtuU and 85% eff. boilers. The cogeneration system can supply approximately 1,280 MMBtu of the projected 9,040 MMBtu of space heating needs for this site. This will offset the need to purchase approximately 1350 MMBtu of gas for space heating which is worth approximately $10,800 per year with gas at $8.00/MMBtu and 95% eff. boilers. Total heat output is 9,060 MMBtu or 2,650 MWh. Total Value = $84,000

Value of Alternative Energy Credits from Cogeneration System:

The Alternative Energy Credits (AEC's) for CHP will provide an annual revenue stream from the efficient use of natural gas to provide both heat and electricity. The credit is presently worth approximately $22/MWh and the AEC's are calculated as follows:

$$AEC's = E_{elect}/0.33 + E_{therm}/0.80 - E_{CHPin}$$

For this installation, the AEC's are expected to be:

$$AEC = 1,352.6/.33 + 2,655/.8 – 5,010 = 2,407 \text{ MWh}$$

The 2,407 MWh of AECs are worth approximately $53,000 per year in incentives from the state program.

Overall value of energy and AEC's:

Electric output =	$143,100 per year
DHW and Space heat =	$84,000
Value of AEC's =	$53,000
Total =	$280,100

Cost of Gas input:

17,094 MMBtu of gas input per year which is worth approximately $136,750 per year.

Cost of Maintenance:

The cost of operating and maintaining the engine/generator, (no SCR, no Boiler & assoc. equip, no absorption chiller) is expected to be approximately $0.0175 per kWh of electrical output from the generator. Based on the proposed load profile outlined above, the cost for operations and maintenance is expected to be $24,000 per year ($0.0175/kWh x 1,352,600 kWh)

Cost of Stand-by Electric Charges:

Cogeneration systems this small on a site this large are exempt from standby charges (for systems over 1,000 kW there are charges of $237/month plus $10.35 per kW of rated output per month for the four summer months and $6.25 per kW per month for the remaining eight months of the year).

Overall Costs:

Gas input =	$136,750 per year
Maintenance =	$24,000
Total Costs =	$160,750

Net benefits = $280,100 – $160,750 = $119,350 per year

Capital Costs

Cogeneration and pollution control Equipment – 200 kW @ $2000/kW = $400,000

Plant space for cogen and Storage Tank 400 sf. @ $400/sf = $160,000

Total cost = $560,000

Rebate from Utility: 200 kW @ 750 per kW = $150,000

Net Install cost = $560,000 - $150,000 = $410,000

Simple payback =$410,000 cost/$119,000 savings/yr = 3.5 years (without financing costs or tax implications).

ATTACHMENT D.4
2.7 MW PV PERFORMANCE ESTIMATE

PVWatts ***** AC Energy & Cost Savings ***** Cautions for Interpreting the Results

Preliminary evaluation of 2.7 MW array at Suffolk Downs

Station Identification	
Cell ID:	0274365
State:	Massachusetts
Latitude:	42.5 ° N
Longitude:	70.8 ° W
PV System Specifications	
DC Rating:	2695.0 kW
DC to AC Derate Factor:	0.800
AC Rating:	2156.0 kW
Array Type:	Fixed Tilt
Array Tilt:	10.0 °
Array Azimuth:	180.0 °
Energy Specifications	
Cost of Electricity:	0.0 ¢/kWh

Results			
Month	Solar Radiation (kWh/m²/day)	AC Energy (kWh)	Energy Value ($)
1	2.04	136192	0.00
2	2.86	176280	0.00
3	4.04	269826	0.00
4	4.58	289009	0.00
5	5.36	336709	0.00
6	5.64	332219	0.00
7	5.58	337811	0.00
8	5.17	315360	0.00
9	4.34	261270	0.00
10	3.27	208328	0.00
11	2.17	132892	0.00
12	1.82	117033	0.00
Year	3.91	2912930	0.03

Output Hourly Performance Data

(Gridded data is monthly, hourly output not available.)

Output Results as Text

Saving Text from a Browser

Run PVWATTS v.2 for another location

Run PVWATTS v.1

Please send questions and comments to Webmaster
Disclaimer and copyright notice.

RReDC home page (http://rredc.nrel.gov)

ATTACHMENT D.5
Generation Potential of Kinetic Energy Device

Calculation of available energy in slowing or lowering vehicles

From basic physics, and applying some typical mechanical efficiencies to each of the components of the system, one can calculate the amount of electricity that can be produced from the available kinetic (change in velocity) or potential energy (change in elevation) of a given vehicle.

When slowing a vehicle down, the change in kinetic energy is calculated from the following:

$$KE_{Available} = KE_{Initial} - KE_{Final} \quad \text{or} \quad KE_{Available} = \tfrac{1}{2} M(V_{Initial}^2 - V_{final}^2)$$

When lowering from one elevation to another, the change in potential energy is calculated from the following:

$$PE_{Available} = PE_{Initial} - PE_{Final}$$

or if we define PE_{Final} as equal to zero,

$$PEAvailable = PEInitial$$

Vehicle Braking

Take an example of a 3200 lb car (a Toyota Corolla or Honda Civic) which has a mass (M) of 100 sl (slug) evenly decelerating from 40 mph (58.6 ft/sec) to 10 mph (14.6 ft/sec) in a distance of 100 feet (30.5 meters). This is a deceleration of -16.1 ft/sec^2 which is equivalent to moderate to firm braking for a vehicle.

$$KE_{Available} = \tfrac{1}{2} M((58.6)^2 - (14.6)^{2)} = 80{,}520 \text{ sl-ft}^2/\text{sec}^2 \text{ or } 80{,}520 \text{ ft-lbs}$$

If there is one car every 6 seconds, or 10 cars every minute, the amount of energy available in slowing the cars down this much is:

10 cars/min x 80,520 ft/lb per car or 805,200 ft-lb/min

At 33,000 ft-lb/min per horsepower, the 805,200 ft-lb/min calculated above is equivalent to 24.4 maximum available horsepower (18.2 kW).

Lowering a Vehicle from a Parking Ramp

For a parking ramp example which would harvest the potential energy of lowering cars from one elevation to another, the total available energy is:

PE = force x distance or weight x height: 3200 lb x 10 ft = 32,000 ft-lb/car

If we again had 10 cars per minute that would pass over approximately 100 ft of this device at a 10% grade, we would have 9.7 hp or 7.2 kW (3200 lb x 10 ft x 10 cars/min/33,000 ftlb/min x 0.746 kW/hp) available.

Converting Available Energy to Electricity

Since all mechanical and electrical devices have conversion losses, not all of this available energy will be converted to electricity. Typical efficiency ranges for components in this system are as follows:

Electric generator in the 10 to 20 kW size = 85 to 90% - choose 90%

Inverter to connect to grid in a 10 to 20 kW size = 88 to 94% - choose 94%

Hydraulic motor – 80 to 90% - choose 88%

Hydraulic accumulator – 90 to 95% - choose 95%

Hydraulic cylinder – 90 to 95% - choose 95%

Hydraulic piping/hoses/valve losses – 90 to 95% - choose 95%

Assume no vehicle braking with friction brakes, i.e., that all energy change in vehicle speed or vehicle elevation change is accomplished with this device. Then based on the generous component conversion efficiencies chosen above, the overall conversion efficiency for the system will be:

Net conv. eff. = 0.90 x 0.94 x 0.88 x 0.95 x 0.95 x 0.95 = 64%

From the 18.2 kW available from slowing 10 cars per minute, we can generate approximately 11.6 kW with one of these devices with this device when slowing the vehicles from 40 mph to 10 mph. If we had a continuous stream of cars (at one every 6 seconds) for 15 hours per day and 365 days per year that would decelerate through this single device (3.285 million cars/yr - not very realistic for this, or any, facility), the amount of electricity generated would be 63,500 kWh/yr.

Attachment E

Draft LEED NC V2009 Scorecard

LEED for New Construction and Major Renovation 2009
Project Scorecard

Project Name: Suffolk Downs
Project Address: Boston MA
Last Updated: 6/13/2013
NOTE: Regional Priority Credits are underlined
LEED Rating: Gold

	Yes	likely	not likely	No		
Phase	21	2	1	2		**Sustainable Sites**
C	Y				Prereq 1	**Construction Activity Pollution Prevention**
D				1	Credit 1	**Site Selection**
D	5				Credit 2	**Development Density & Community Connectivity**
D	1				Credit 3	**Brownfield Redevelopment**** RP
D	6				Credit 4.1	**Alternative Transportation,** Public Transportation Access
D			1		Credit 4.2	**Alternative Transportation,** Bicycle Storage & Changing Rooms
D	3				Credit 4.3	**Alternative Transportation,** Low-Emitting & Fuel-Efficient Vehicles
D	2				Credit 4.4	**Alternative Transportation,** Parking Capacity
C		1			Credit 5.1	**Site Development,** Protect or Restore Habitat
D	1				Credit 5.2	**Site Development,** Maximize Open Space
D		1			Credit 6.1	**Stormwater Design,** Quantity Control *** RP
D	1				Credit 6.2	**Stormwater Design,** Quality Control
C	1				Credit 7.1	**Heat Island Effect,** Non-Roof*** RP
D	1				Credit 7.2	**Heat Island Effect,** Roof*** RP
D				1	Credit 8	**Light Pollution Reduction**

	Yes	likely	not likely	No		
	4	1	2	3		**Water Efficiency**
D	Y				Prereq 1	**Water Use Reduction, 20%** Reduction
D	2				Credit 1.1	**Water Efficient Landscaping,** Reduce by 50%
D				2	Credit 1.2	**Water Efficient Landscaping,** No Potable Use or No Irrigation
D			2		Credit 2	**Innovative Wastewater Technologies**
D	2	1		1	Credit 3	**Water Use Reduction**

x	30% Reduction
?	35% Reduction
	40% Reduction

	Yes	likely	not likely	No		
	17	4	8	6		**Energy & Atmosphere**
C	Y				Prereq 1	**Fundamental Commissioning of the Building Energy Systems**
D	Y				Prereq 2	**Minimum Energy Performance**
D	Y				Prereq 3	**Fundamental Refrigerant Management**
D	5	2	6	6	Credit 1	**Optimize Energy Performance**

	12% New Buildings or 8% Existing Building Renovations
	14% New Buildings or 10% Existing Building Renovations
	16% New Buildings or 12% Existing Building Renovations
	18% New Buildings or 14% Existing Building Renovations
x	20% New Buildings or 16% Existing Building Renovations
	22% New Buildings or 18% Existing Building Renovations
	24% New Buildings or 20% Existing Building Renovations
	26% New Buildings or 22% Existing Building Renovations
	28% New Buildings or 24% Existing Building Renovations
	30% New Buildings or 26% Existing Building Renovations
	32% New Buildings or 28% Existing Building Renovations
	34% New Buildings or 30% Existing Building Renovations
	36% New Buildings or 32% Existing Building Renovations
	38% New Buildings or 34% Existing Building Renovations
	40% New Buildings or 36% Existing Building Renovations
	42% New Buildings or 38% Existing Building Renovations
	44% New Buildings or 40% Existing Building Renovations
	46% New Buildings or 42% Existing Building Renovations
	48% New Buildings or 44% Existing Building Renovations

D	5	2			Credit 2	**On-Site Renewable Energy *** RP**
						1% Renewable Energy
						3% Renewable Energy
						5% Renewable Energy
						7% Renewable Energy
					x	9% Renewable Energy
						11% Renewable Energy
						13% Renewable Energy
C	2				Credit 3	**Enhanced Commissioning**
D			2		Credit 4	**Enhanced Refrigerant Management**
C	3				Credit 5	**Measurement & Verification**
C	2				Credit 6	**Green Power**

Yes	likely	not likely	No	
4	1	2	7	**Materials & Resources**

D	Y				Prereq 1	**Storage & Collection of Recyclables**
C				3	Credit 1	**Building Reuse**
C				1	Credit 1.2	**Building Reuse:** Maintain 50% of Interior Non-Structural Elements
C	1				Credit 2.1	**Construction Waste Management,** Divert 50% from Disposal
C	1				Credit 2.2	**Construction Waste Management,** Divert 75% from Disposal
C				1	Credit 3.1	**Materials Reuse, 5%**
C				1	Credit 3.2	**Materials Reuse,10%**
C	1				Credit 4.1	**Recycled Content, 10%** (post-consumer + ½ pre-consumer)
C		1			Credit 4.2	**Recycled Content, 20%** (post-consumer + ½ pre-consumer)
C	1				Credit 5.1	**Regional Materials, 10%** Extracted, Processed & Manufactured Regionally
C			1		Credit 5.2	**Regional Materials, 20%** Extracted, Processed & Manufactured Regionally
C				1	Credit 6	**Rapidly Renewable Materials**
C			1		Credit 7	**Certified Wood**

Yes	likely	not likely	No	
7	1	1	6	**Indoor Environmental Quality**

	Y				Prereq 1	**Minimum IAQ Performance**
	Y				Prereq 2	**Environmental Tobacco Smoke (ETS) Control**
D	1				Credit 1	**Outdoor Air Delivery Monitoring**
D				1	Credit 2	**Increased Ventilation**
C	1				Credit 3.1	**Construction IAQ Management Plan,** During Construction
C			1		Credit 3.2	**Construction IAQ Management Plan,** Before Occupancy
C	1				Credit 4.1	**Low-Emitting Materials,** Adhesives & Sealants
C	1				Credit 4.2	**Low-Emitting Materials,** Paints & Coatings
C				1	Credit 4.3	**Low-Emitting Materials,** Flooring Systems
C	1				Credit 4.4	**Low-Emitting Materials,** Composite Wood & Agrifiber Products
D	1				Credit 5	**Indoor Chemical & Pollutant Source Control**
D				1	Credit 6.1	**Controllability of Systems,** Lighting
D				1	Credit 6.2	**Controllability of Systems,** Thermal Comfort
D	1				Credit 7.1	**Thermal Comfort,** Design
D		1			Credit 7.2	**Thermal Comfort,** Verification
D				1	Credit 8.1	**Daylight & Views,** Daylight 75% of Spaces
D				1	Credit 8.2	**Daylight & Views,** Views for 90% of Spaces

Yes	likely	not likely	No	
6	0	0	0	**Innovation & Design Process**

D	1				Credit 1.1	**Innovation in Design: Green Cleaning**
D	1				Credit 1.2	**Innovation in Design: Building as an Educational Tool**
D	1				Credit 1.3	**Innovation in Design: Low Mercury Lighting**
C	1				Credit 1.4	**Innovation in Design: SSc4.1 Exemplary Performance**
C	1				Credit 1.5	**Innovation in Design: TBD**
C	1				Credit 2	**LEED® Accredited Professional**

Yes	likely	not likely	No	
3	1	0	0	**Regional Priority Credits**

Boston

1				Credit 1.1	**Regional Priority Credit:** SSc3
	1			Credit 1.2	**Regional Priority Credit:** SSc6.1
1				Credit 1.3	**Regional Priority Credit:** SSc7.2
1				Credit 1.4	**Regional Priority Credit:** SSc7.1

Yes	likely	not likely	No	
62	10	14	24	**Project Totals (Certification Estimates)**

Certified: 40-49 points, **Silver:** 50-59 points, **Gold:** 60-79 points, **Platinum:** 80+ points

Attachment F

Draft Stormwater Pollution Prevention Plan and Drainage Report

Nitsch Engineering

July 3, 2013

STORMWATER REPORT

ATTACHMENT TO
DRAFT ENVIRONMENTAL IMPACT REPORT

For

RESORT AT SUFFOLK DOWNS
525 McClellan Highway
East Boston, MA 02128

Prepared for:

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Nitsch Project #9180

Building better communities with you.

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1.0 INTRODUCTION

Nitsch Engineering has prepared this Stormwater Report to support the permit applications for the Resort at Suffolk Downs Casino in Boston and Revere, Massachusetts (subsequently referred to as the Project). The Project site is located at the existing Suffolk Downs site located at 525 McClellan Highway, East Boston, Massachusetts (subsequently referred to as the "Site"). The majority of the site (approximately 67%) is located in East Boston, and the remaining land is located in Revere. The Project consists of two distinct gaming areas (Casino I and Casino II), up to 450 guestrooms in two hotels, a multi-purpose meeting/entertainment space, dedicated covered parking, fine dining, and retail space. The Project includes a stormwater management system, which has been designed to comply with and exceed the requirements of the City of Boston, City of Revere, and the Massachusetts Department of Environmental Protection (DEP) Stormwater Management Standards.

The Project includes a substantial reduction in impervious ground cover which is considered a Low Impact Development (LID) practice. Reduction of impervious ground cover alone will significantly improve stormwater quality, reduce peak rates and volumes during storm events, and will promote ground water recharge by allowing rainwater to infiltrate into the restored areas. In addition to the reduction in impervious area, the Project will replace the existing stormwater management system which provides no storm water quality and peak rate mitigation. The existing system, which was constructed in the 1930s, will be replaced with a system that will exceed the requirements of the current Massachusetts Stormwater Standards improving the runoff which is ultimately conveyed to Sales Creek and the Belle Isle Marsh Inlet.

The characteristics of the existing site and existing stormwater system provide the Project an opportunity to significantly improve the stormwater conditions. The stormwater runoff from a large portion of the site flows to Sales Creek which flows to the Rumney Marshes Area of Critical Environmental Concern. The stormwater runoff from the entire site ultimately discharges to the Boston Harbor which has an associated draft Total Maximum Daily Load for pathogens. The site characteristics also provides the Project with an opportunity for protecting the onsite resource areas such as the 100-year flood plain and wetland resource areas.

2.0 EXISTING CONDITIONS

The Suffolk Downs facility is located adjacent to Route 1A in Revere and East Boston, Massachusetts. The vast majority of the site, including the buffer zone to delineated wetland resource areas, is heavily developed with a thoroughbred race track, ancillary facilities and structures, paved parking lots and areas of urban fill. The site is bordered to the north by Winthrop Avenue and residential development, to the east by Washburn Avenue, and beyond it the MBTA Blue Line tracks and Bennington Street as well as a mix of residential and commercial developments, to the south by Waldemar Avenue and residential developments, and to the west by Route 1A, a large fuel storage facility with numerous above ground storage tanks, and a retail shopping plaza.

Currently the developed site contains one (1) main building that contains the grandstand and simulcast operations and other smaller outbuildings; five (5) parking lots and other paved areas totaling to approximately 92 acres of impervious area; a horse racing track; and a Concentrated Animal Feeding Operation (CAFO) area. Portions of the CAFO area have been excluded from the Stormwater Calculations. See Section 2.7 for additional information.

The hydrologic analysis area includes off-site areas that contribute surface flow to the site and excludes a large portion of the ground surface area within the CAFO as shown on the

Predevelopment Drainage Map (Figure C.DR.01) since this flow is directed to the sanitary system. The roofs of the CAFO area have been included in the analysis since they generate stormwater runoff that flows to Sales Creek. The total analysis area for the site is 153.51 acres. See Section 2.7 for further discussion of the CAFO area.

2.1 Existing Drainage Infrastructure

Stormwater generated by the existing Suffolk Downs site is collected using catch basins and is piped via closed drainage systems to three (3) general design point locations. The design points, which remain consistent in the post-development stormwater design, are a culvert under Route 1A, Sales Creek, and a wetland to the east of the horse track. The majority of the existing stormwater management system was constructed in the 1930's prior to the promulgation of MassDEP Stormwater Management Standards. The majority of the stormwater management system provides negligible peak flow attenuation, water quality treatment, and groundwater recharge. Improvements were made to the existing CAFO system which include collecting stormwater that falls in the barn and stable area, conveying it to a settling pond within the race track infield, and then pumping this water directly to the BWSC sanitary sewer system.

2.2 NRSC Soil Designations

The Soil Classification Summary (Table 1) outlines the Natural Resources Conservation Services (NRCS) designation of the soil series at the Site. The majority of soils are classified as Udorthents, wet substratum without a hydrologic soil group (HSG) rating, indicating that the soils are comprised of loamy fill soils likely from the general vicinity. The soils to the southeast of the horse track in the wetland are classified as Ipswich mucky and are HSG D (minimal infiltration). Upland soils in the vicinity of the site include Newport silt loam and Newport-Urban land complex, which are classified as HSG C.

The onsite wetlands are considered HSG D and the upland areas are considered HSG C in the HydroCAD calculations. The HSG C designation of the Udorthents was confirmed during on-site soil investigations.

Table 1: NRCS Soil Classification Summary

On-site soil

Soil Unit	Soil Series	Hydrologic Soil Group
655	Udorthents, wet substratum	---
65	Ipswich mucky peat 0-1% slopes	D

Off-site soils for Udorthents determination

Soil Unit	Soil Series	Hydrologic Soil Group
325D	Newport silt loam 15 to 25% slopes	C
627C	Newport-Urban land complex 3-15% slopes	C

2.3 On-Site Soil Investigations

Approximately 30 test pits were performed on the Suffolk Downs Site in 2012 by Haley and Aldrich, Inc. The depth of the test pits range from 4-feet to 13-feet, with most of the depths to 6-feet. The results of the test pits were generally consistent throughout the Site. The soil test pit logs indicate the soil classification based on the Unified Soil Classification System (USCS). Throughout the entire site, the soil in the test pit logs is considered fill. Generally, the top 24-inches of soil are classified as either poorly graded sand (SP) or silty sand (SM). Below 24-inches the soil is mostly unclassified fill, SP, SM, or clayey sand (SC). In test pits close to Route 1A, silt (ML) and organic silt (OL) was found below 24-inches.

Test borings were also performed at the project site. Based on these borings and borings previously completed by others, subsurface soil conditions underlying the Project Site are expected to be characterized by the general soil profile as shown in Table 2 below.

Historical measurements of observation wells have indicated groundwater levels at the Project site to be between 0.5 and 16 feet below ground surface, and are generally on the order of two (2) to six (6) feet below grade. In recent test pit explorations completed for this Project, groundwater was observed typically at depths of 2.5 to 7 feet below site grades. Seasonal fluctuations in groundwater levels can also be expected.

Table 2: General Soil Profile Expected Under the Project Site

On-site soil

Generalized Description	Approximate Thickness of Layer (Feet)
Fill	3.8 to 20.8
Estuarine/Organic Deposits	5 to 55.5
Marine Deposits	7 to 57
Glacial Till	3 to 14
Bedrock (Cambridge Argillite	Depth to Rock of 50 to 110

2.4 Wetland Resource Areas including Flood Plain

On April 24 through 26 and May 3, 2012, wetland and soil scientists from Epsilon Associates, Inc. delineated wetlands and other resource areas within an approximately 200-acre study area on and immediately adjacent to the Project site. The purpose of the delineation and evaluation efforts was to define the extent of wetlands resource areas and associated buffer zones regulated under the Massachusetts Wetlands Protection Act (WPA) (MGL Ch. 131 § 40), Sections 401 and 404 of the U.S. Clean Water Act (33 U.S.C. 1344), and local wetland ordinances in the cities of Boston and Revere.

Wetland systems play an important role in the natural environment for the treatment of stormwater runoff; however, the existing wetland systems will not be used for water quality treatment. All water quality treatment provided by the proposed stormwater management system will take place prior to discharge to the existing wetlands.

The Project will protect the interests of the Wetlands Protection Act through the development of a comprehensive stormwater system that is compliant with the Massachusetts Department of Environmental Protection Stormwater Management Guidelines.

<u>100-year Floodplain</u>

Portions of the Project site are located within the 100-year floodplain as delineated by the Federal Emergency Management Agency (FEMA). In the case of the Project site, the floodplain has been classified as BLSF (see previous Orders of Conditions issued for recent other unrelated activities at the site: Order of Conditions 061-0620 and 006-1276). The BLSF on the Project site generally encompasses the existing paved entrance drive, paved parking areas adjacent to Sales Creek, the horse stable area, and the racetrack and infield. BLSF has no buffer zone.

Impacts to the BLSF from the Project will be mitigated by providing a one to one ratio of compensatory storage on a foot by foot basis.

Riverfront Area

Sales Creek, which in the Project site is primarily a manmade drainage channel, is depicted as a perennial stream on the applicable USGS quadrangle map. According to 310 CMR 10.58(2)(a)1a, a river or stream shown as perennial on the current USGS quadrangle or more recent map provided by MassDEP is perennial. Perennial streams (i.e., rivers) have an associated Riverfront Area that is defined as the area of land between a river's mean annual high-water line and a parallel line located 200 feet away, except that the parallel line is located 25 feet away in Boston and 25 feet away in densely developed areas as designated by the Executive Office of Energy and Environmental Affairs (EEA) Secretary pursuant to 301 CMR 10.00 (see 310 CMR 10.58(2)(a)3). On March 12, 1999, the EEA Secretary designated those portions of Sales Creek not within the City of Boston and the surrounding environs on the Project site as a densely developed area. Accordingly, the Riverfront Area on the Project site that is associated with Sales Creek is 25 feet wide. Riverfront Area does not have a 100 foot buffer zone.

Bordering Vegetated Wetlands (BVW)

According to the WPA regulations (310 CMR 10.55), BVWs are freshwater wetlands which border on creeks, rivers, streams, ponds and lakes. The types of freshwater wetlands are wet meadows, marshes, swamps and bogs. Bordering Vegetated Wetlands are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants.

Epsilon delineated a total of eight (8) separate areas on the Project site that meet the regulatory definition of BVW. BVW has a 100 foot buffer zone under the WPA regulations. The BVWs delineated by Epsilon border on intermittent streams (drainage channels), Sales Creek or are otherwise hydologically connected to other BVWs via culverts and pipes. From a functions and values perspective, the BVWs on the Project site are generally degraded given their juxtaposition in a heavily developed urban environment. The primary function of these BVWs appears to be flood control, storm damage prevention and pollution attenuation. The BVWs are comprised primarily of invasive herbaceous and woody plant species including but not limited to common reed (Phragmites australis), multiflora rose (Rosa multiflora), buckthorn (Frangula alnus), and purple loosestrife (Lythrum salicaria). Non-invasive species include but are not limited to sweetgale (Myrica gale) and various sedges, rushes and grasses.

Two artificial man-made stormwater detention/retention basins located in the City of Revere were not classified as BVW or other jurisdictional wetland resource areas under the WPA (310 CMR 10.00) regulations because they do not meet the criteria to be regulated as inland wetland resource areas. In addition, the up-gradient intermittent stream that flows into the jurisdictional pond located in the racetrack infield in the City of Boston was also not classified as a WPA-jurisdictional wetland resource area per the definition of “stream” in 310 CMR 10.04.

Inland Bank and Land Under Water Bodies and Waterways

Inland Bank (310 CMR 10.54) and Land Under Water Bodies and Waterways (LUW) (310 CMR 10.56) on the Project site are associated with intermittent streams / drainage ditches, Sales Creek and the pond located in the center of the racetrack infield.

2.5 Total Maximum Daily Load (TMDL)

The project site discharges to the Chelsea River and Sales Creek, which are located within the Boston Harbor watershed. MassDEP has issued a Draft Pathogen Total Maximum Daily Load (TMDL) for the Boston Harbor Watershed (excluding the Neponset River). The TMDL addresses bacterial and other fecal-related pollution in the watershed. The proposed stormwater management system and long-term pollution prevention measures will minimize the discharge of pathogens to adjacent Resource Areas.

The proposed project will reduce impervious area and will not have any illicit sewer/septic discharges, thereby minimizing potential pathogen sources.

To reduce pathogens in the stormwater discharging from the project site a reduction in impervious area, bioretention basins, biofiltration swales, pervious pavers, and rainwater harvesting tanks are proposed. The proposed project meets the intent of the Draft TMDL to reduce pathogens discharging within the Boston Harbor Watershed.

2.6 Area of Critical Environmental Concern (ACEC)

An ACEC is an area designated by the EEA Secretary in accordance with 301 CMR 12.00 of the Coastal Zone Management (CZM) regulations. Sales Creek is associated with the Belle Isle Inlet that is within the Rumney Marshes ACEC. The ACEC extends through the Project site from approximately the northwest corner, passing between the proposed construction and the existing horse barns, through the northern portion of the racing track infield, and continuing east of the Project site.

2.7 Concentrated Animal Feeding Operation (CAFO)

Stormwater generated by the CAFO area ground surfaces is collected by a closed drainage system that is outed to a settling pond located in the infield of the racetrack. Water collected by this pond is then pumped to a sewer manhole located near the Suffolk Downs T station. Approximately 2.3 acres of CAFO will be converted to parking as part of the Project and stormwater from the new ground surface will no longer flow to the settling pond and sanitary sewer system. To represent this in the pre-development calculations, a 2.3 acre area of the CAFO ground surface is included in Subcatchment E3. This 2.3 acre area does not tie in to the site stormwater runoff discharge in the Pre-development calculations. In the post-development calculations, the runoff from this area will be incorporated into the stormwater management system.

Reducing the size of the CAFO ground surface will reduce the sanitary flows generated at the ground surface effectively increasing the capacity of the existing CAFO treatment system. This will contribute to the improvement of the Sales Creek water quality.

3.0 PROPOSED CONDITIONS

3.1 Project Description

Caesars Resort at Suffolk Downs is a redevelopment proposed on approximately 161 acres of land that will contain two distinct gaming areas (referred to herein as “Casino Area I” and “Casino Area II”), approximately 450 guestrooms in two hotels, a multi-purpose meeting/entertainment space, dedicated covered parking, fine dining, and retail space. The Proponent proposes to construct substantial infrastructure improvements on Route 1A in the vicinity of the Project site as an integral part of the Project. The Project elements are more specifically listed below:

- Two hotels: an approximately 300-room Hotel I and an approximately 150-room Hotel II;
- Multi-purpose meeting/entertainment space;
- Dining: approximately 16 restaurants including fine dining concepts, casual outlets, and a food court;
- Gaming Space: approximately 200,000 square feet of gaming space containing 4,000-5,000 slot machines, 200 table games, and a World Series of Poker™ room;
- Retail: approximately 30,000 square feet;
- Central Utility Plant (CUP); and
- Surface and structured parking.

The Project also involves continued operations at the Suffolk Downs racetrack including the operation of a horse barn and stable area.

The Project is anticipated to decrease the overall impervious area for the site by approximately 14 acres. Refer to Table 3 for a comparison of the existing and proposed land use for the Site.

Table 3. Proposed land use for the Project Site (in acres)

Land Use	Existing Site (acres)	Proposed Site (acres)	Change
Buildings	13.97	19.76	+5.79
Site Pavement	62.36	42.42*	-19.94
Gravel surface	11.97	10.48	-1.49
Grass/Open Space	52.11	64.10	+11.99
Woods	10.42	9.32	-1.10
Water Surface	2.68	2.68	-
Bioretention Basin	-	4.75**	+4.75
Total	153.51	153.51	---

*The Project includes porous pavement, which is conservatively included in the impervious area.
**The Project includes Bioretention Basins, which is conservatively modeled as CN=98.

3.2 Stormwater Management System

The Site will include the installation of a stormwater management system that is being designed to meet and exceed the MassDEP Stormwater Management Standards, the City of Boston stormwater requirements, and the City of Revere stormwater requirements. As a redevelopment, the Project is required to improve existing conditions to the maximum extent practicable. However, the project will result in a reduction in peak flows, removal of over 80% of Total Suspended Solids, the collection and infiltration of the equivalent of the 1" storm event over the proposed impervious area. The project will reduce the impervious area on the site by 14 acres, which is the most significant improvement to the stormwater management. In addition to the reduction in impervious area, the stormwater management system will incorporate water quality and treatment and infiltration.

The Project has been designed using environmentally sensitive site design and LID techniques. This design prevents the generation of stormwater and non-point source pollution by reducing

impervious surfaces, disconnecting flow paths with biofiltration swales, treating and infiltrating stormwater at bioretention basins, and protecting natural processes taking place in the surrounding resource areas. Stormwater systems have been designed to model natural hydrologic features, including promoting infiltration throughout the site.

The proposed stormwater management system for the Project Site will include three sizable rainwater harvesting cisterns capable of collecting up to 270,000 gallons, porous pavers, deep sump and hooded catch basins, infiltrating bioretention basins with sediment forebays, biofiltration swales, and proprietary water quality structures. Overflow from the proposed BMPs will be discharged to the existing design points using stormwater outfalls. Stormwater outfalls that discharge to Sales Creek will include rip rap aprons to prevent erosion, and the outfalls at the wetland design points will use level spreaders to promote sheet flow between the outfall and wetland resource area.

The existing drainage system in the CAFO area will be protected and maintained. The recent stormwater improvements associated with the site including the horse track improvements, and the sediment sump parallel to Sales Creek to the north of the horse track will be protected and maintained.

Reduction in Impervious Area

The reduction in impervious area from the pre-development to post-development condition will significantly improve stormwater runoff from the site by reducing rates and volume of runoff leaving the site. The reduction in volume directly contributes to an increase in groundwater recharge. The annual recharge from the post-development site will exceed the annual recharge from pre-development conditions solely by reducing the impervious area. By reducing runoff volume and increasing recharge volume, there will be more infiltration which will provide water quality treatment improving the quality of water entering Sales Creek. In other words, in the post-development condition, there will be more groundwater base flow entering Sales Creek and less ground cover generated runoff.

Bioretention Basin with Sediment Forebay

Six (6) bioretention basins are proposed to treat stormwater runoff where feasible on the proposed site. This includes stormwater runoff generated by the southern half of the proposed Tomasello Road, the south parking lot, the drop-off circle at the building main entrance, and surrounding walkways and plaza areas. The bioretention basins include a minimum 30-inch media filter to provide TSS and nutrient pollutant removal and will provide infiltration.

Pretreatment for the bioretention basin will be provided by deep sump and hooded catch basins and a sediment forebay. The sediment forebays are designed in accordance with the MassDEP Stormwater Management Handbook to provide a water quality volume (WQV) equivalent to 0.1 inches per impervious acre.

Biofiltration Swales

Biofiltration swales (or Grassed Channels) will be used to break up the impervious area and provide pretreatment in the north parking lot. Due to the level of activity in this parking lot, the biofiltration swales will be lined to prevent infiltration. Therefore, the biofiltration swales will provide water quality treatment only.

Porous Pavers

Porous pavers are proposed in areas that will not be highly trafficked. These areas will be used as pedestrian areas with minimal vehicle activity. Porous pavers are not proposed in the high intensity

use parking areas. The porous pavers will replace traditional impervious concrete and allow runoff to be treated and infiltrated within the pavement section.

Rainwater Harvesting

Stormwater runoff from the roofs of the buildings and some parking garage areas will be collected and stored in three large rainwater harvesting tanks. Rainwater harvesting tanks are located in three areas. Tank 1 will be located to the front of Casino II and will be sized to collect up to 80,000 gallons. This tank will collect stormwater generated from the roof of Casino II and be used for irrigation water. Tank II will be located in the plaza area between the garage and Casino I and will be sized to collect up to 130,000 gallons. It will collect stormwater generated by the proposed garage and approximately half of Casino I. This water will be used to supply cooling tower water as well as irrigation water. Tank III will be located between Casino I and the track. Tank II will collect up to 60,000 gallons per day and will supply water to be used for irrigation water and track watering. The proposed tanks will be capable of storing up to 270,000 gallons and is estimated to reduce potable water demand by up to 4.5 million gallons per year.

The level water in the rainwater harvesting tanks will be variable at the time of rainfall events, therefore, to provide a conservative analysis the tanks are considered full for the purposes of HydroCAD calculations.

Deep Sump and Hooded Catch Basins

Deep sump and hooded catch basins are proposed to provide pretreatment in the impervious areas of the parking lot and roadway. Catch basins will also be installed within the bioretention areas as overflow devices.

Stormceptor® Water Quality Structures

Stormceptor® water quality structures will be used for water quality pretreatment in areas of the Site where space is limited or additional pretreatment is required prior to discharge. These BMPs have been designed to remove greater than 80% TSS. Generally, Stormceptor water quality units will be used to treat runoff generated by the parking area that discharge directly to Sales Creek.

Stormwater Discharge with Level Spreader

A level spreader will be included at stormwater discharge locations near BVWs. These level spreaders will receive concentrated flow and convert it to sheet flow so it can disperse uniformly across a stable slope. The level spreaders will improve the efficiency of all other BMPs on site.

Refer to the TSS Removal spreadsheets in Appendix A for TSS removal summaries for each treatment train.

3.3 Stormwater Management During Construction

The Site Contractor will be responsible for stormwater management of the active construction site and is required to adhere to the conditions of the 2012 Construction General Permit under the Environmental Protection Agency. A draft SWPPP has been prepared in accordance with the MassDEP Stormwater Management Standards and the 2012 Construction General Permit (Appendix E).

3.4 Low Impact Development (LID)

An important principle of LID is minimizing impervious area in order to manage stormwater as close to the source as possible. The Project site reduces the total impervious cover by 14 acres, thereby restoring a significant portion of the existing site to natural ground covers which help treat stormwater as a resource rather than a waste product. The main treatment BMP's used to treat

stormwater runoff from the proposed impervious area are Bioretention Basins. Bioretention Basins treat stormwater closer to the source than other treatment options and use designed soil media to mimic the natural movement of water within the soil profile for treatment and groundwater recharge. Other elements of the site design that treat runoff close to or at the source are porous pavers and biofiltration swales. Because the project site is considered a LUHPPL the biofiltration swales will be lined and considered a pretreatment BMP.

3.5 City of Boston Stormwater Requirements

The City of Boston requires that a volume of stormwater runoff equivalent to one (1) inch times the impervious area of the proposed site be captured for infiltration or use on site. The Project Bioretention Basins are designed to have a static holding capacity that meets this regulation (See Appendix A: Standard 3 Recharge Volume Calculations). In addition, a series of rainwater harvesting cisterns are proposed that will have a capacity of 270,000 gallons.

There are no new connections proposed to the Boston Water and Sewer Commission storm drain or sewer system.

4.0 STORMWATER MANAGEMENT ANALYSIS

4.1 Methodology

Nitsch Engineering completed a hydrologic analysis of the existing project site utilizing Soil Conservation Service (SCS) Runoff Curve Number (CN) methodology. The SCS method calculates the rate at which the runoff reaches the design point considering several factors: the slope and flow lengths of the subcatchment area, the soil type of the subcatchment area, and the type of surface cover in the subcatchment area. HydroCAD Version 10.00 computer modeling software was used in conjunction with the SCS method to determine the peak runoff rates and runoff volumes for the 2-, 10-, 25-, 50-, and 100-year, 24-hour storm events. The proposed project site is being analyzed with the same methodology.

The Site was divided into multiple drainage areas, or subcatchments, which drain to the design points along the property boundary and within the site. For each subcatchment area, SCS Runoff Curve Numbers (CNs) were selected by using the cover type and hydrologic soil group of each area. The peak runoff rates and runoff volumes for the 2-, 10-, 25- and 100-year 24-hour storm events were then determined by inputting the drainage areas, CNs, and time of concentration (T_c) into the HydroCAD model.

4.2 HydroCAD Version 10.00

The HydroCAD computer program uses SCS and TR-20 methods to model drainage systems. TR-20 (Technical Release 20) was developed by the Soil Conservation Service to estimate runoff and peak discharges in small watersheds. TR-20 is generally accepted by engineers and reviewing authorities as the standard method for estimating runoff and peak discharges.

HydroCAD Version 10.00 uses up to four types of components to analyze the hydrology of a given site: subcatchments, reaches, basins, and links. Subcatchments are areas of land that produce surface runoff. The area, weighted CN, and T_c characterize each individual subcatchment area. Reaches are generally uniform streams, channels, or pipes that convey water from one point to another. A basin is any impoundment that fills with water from one or more sources and empties via an outlet structure. Links are used to introduce hydrographs into a project from another source or to provide a junction for more than one hydrograph within a project.

The time span for the model was set for 0-48 hours in order to prevent truncation of the hydrograph.

Modeling of Porous Pavers Section

For a conservative analysis approach the porous pavers are considered impervious with a CN of 98.

Modeling of Rainwater Harvest Cisterns

The HydroCAD model assumes that the cisterns are full at the time of a storm event, therefore the rainwater flow entering the tank is equal to the flow exciting the tanks at the overflows.

Modeling of Bioretention Basins

The surface area of the Bioretentino Basins are conservatively assumed to have a CN of 98.

4.3 Precipitation Data

Nitsch Engineering, Inc. used Technical Paper 40 by the National Weather Service to estimate the rainfall for the 2-year, 10-year, 25-year, 50-year, and 100-year 24-hour storms. The rainfall values for Suffolk County that are used are as follows:

Table 4. Suffolk County Rainfall

Storm Event	24-hour rainfall (inches)
2-year	**3.2**
10-year	**4.6**
25-year	**5.5**
50-year	**6.0**
100-year	**6.6**

4.4 Existing Hydrologic Conditions

As summarized in Table 4, Nitsch Engineering delineated the project site into three (3) on-site subcatchment (watershed) areas discharging to three (3) design points utilizing an existing conditions survey and on-site observations (See Figure C.DR.01). Table 5 summarizes the design point, location and area of each watershed. The design points (DP) are defined as the culvert under route 1A (DP1), the wetland to the southeast of the track (DP2), and the Sales Creek (DP3). The HydroCAD model for existing conditions is provided in Appendix B.

Table 5. Existing Drainage Area Summary

Design Point	Subcatchment	Area (acres)	Description
DP1	E1	33.25	Area to culvert under Route 1A
DP2	E2	16.95	Area to wetland southeast of track
DP3	E3	103.31	Area to Sales Creek

Total Area	**153.51**

Route 1A Culvert Discharge – Design Point

Stormwater runoff from a western portion of the site identified as Subcatchment E1 discharges from the site via a culvert under Route 1A and a subsequent channel which conveys runoff to the Chelsea River.

Runoff from the existing parking lots in in E1 travels overland over pavement directly to one of two wetland systems located within the subcatchment. The wetland systems are hydraulically connected via a 24-inch pipe. There is no peak flow attenuation, water quality treatment and negligible groundwater recharge prior to discharging to the wetland systems.

Sales Creek – Design Point

Stormwater runoff from the majority of the site discharges from the site via Sales Creek. The area that contributes to this discharge is represented as Subcatchment E3. Sales Creek flows through the site via a series of 96-inch culverts. Downstream from the site, Sales Creek passess under the MBTA Blue Line tracks and passes tidal gates upstream from Bennington Street in Revere. Sales Creek discharges to Bell Isle Inlet downstream of Bennington Street. Sales Creek and Bell Isle inlet are within the Rumney Marshes Area of Critical Environmental Concern (ACEC). See Section 2.6 for additional discussion on this ACEC.

Runoff from the horse track in is collected and conveyed to a series of sand filters for treatment prior to discharge to Sales Creek. These sand filters are part of a recent stormwater improvement project and will be protected and maintained in the post-development condition. See Section 2.7 for additional information. Runoff generated in this subcatchment that does not enter the sand filter system travels overland directly to Sales Creek, or to the pond located in the infield of the horse track.

Runoff that is generated from either roof area of the existing simulcast/ grandstand building or the area between this building and the horse track and the ground surface in this area is collected with a closed drainage system via roof drains or surface inlets and is conveyed to a discharge in Sales Creek.

Runoff that is generated by the roof area located in the CAFO is conveyed and discharged to Sales Creek. Ground surface area in the CAFO was excluded from the stormwater calculations. Runoff generated at the ground surface is discharged to the sanitary sewer system as part of a recent stormwater improvement project. A relatively small portion of the CAFO (approximately 2.3 acres) will be developed in the post-development condition. This area was included in the pre-development calculations to account for the increase in total analysis area.

Runoff from a parking lot and a paved maintenance area travels overland to a sediment forebay that is part of the recent stormwater improvement project. The sediment forebay discharges to Sales Creek. The sediment forebay will be protected and maintained in the post-development condition.

Wetland South of Track

Stormwater runoff from a southern portion of the site identified as Subcatchment E2 discharges to a wetland on the southeast side of the horse track. The wetland is located between the horse track and the MBTA Blue line tracks and is hydraulically connected to Sales Creek.

4.5 Proposed Hydrologic Conditions

The proposed project has been designed to mitigate the change in stormwater runoff at each of the design points as required by the DEP Stormwater Management Standards. The existing watershed areas were modified to reflect the proposed topography, storm drainage structures and BMPs, and roof areas.

Table 6. Proposed Drainage Area Summary

Design Point	Watershed	Area (acres)	Description	Proposed Treatment BMP(s)
DP1	P1	35.01	Area to culvert under Route 1A	Bioretention Basins
DP2	P2	16.95	Area to wetland southeast of track	Bioretention Basins
DP3	P3	101.55	Area to Sales Creek	Bioretention Basins or Stormceptors
Total Area		153.51		

4.6 Peak Flow Rates

The proposed stormwater management system is expected to reduce the proposed peak runoff rates to at or below the existing rates for Design Points DP1, DP2, and DP3. Tables 6 through 10 below summarize the existing and proposed hydrologic analyses for the site at each design point.

Table 6 – Peak Rates of Runoff for Design Point DP1 (in cfs)

Storm Event	2-year	10-year	25-year	100-year
Existing	73.89	121.60	152.44	190.04
Proposed	68.42	117.74	150.10	189.78

Table 7 – Peak Rates of Runoff for Design Point DP2 (in cfs)

Storm Event	2-year	10-year	25-year	100-year
Existing	39.20	63.60	79.30	98.42
Proposed	37.67	61.99	77.71	96.88

Table 8 – Peak Rates of Runoff for Design Point DP3 (in cfs)

Storm Event	2-year	10-year	25-year	100-year
Existing	238.91	387.62	483.35	599.88

Proposed	225.67	371.69	465.58	580.40

Table 9 – Peak Rates of Runoff for Total Site (in cfs)

Storm Event	2-year	10-year	25-year	100-year
Existing	351.99	572.82	715.10	888.34
Proposed	331.75	551.12	693.38	867.05

Table 10 –Volumes of Runoff for Total Site (in acre-feet)

Storm Event	2-year	10-year	25-year	100-year
Existing	25.32	41.82	52.74	66.28
Proposed	23.82	40.00	50.78	64.19

5.0 MassDEP Stormwater Management Standards

The Project is a development on a previously developed site that will result in a *decrease* in impervious area, and therefore is considered a ***redevelopment*** as defined in the MassDEP Stormwater Management Standards.

Since the project is a redevelopment project, it will be required to meet the following Stormwater Management Standards to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges will comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

The Site will be designed to meet and exceed the MassDEP Stormwater Management Standards as summarized below:

Standard 1: *No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.*

Compliance: The Project will not discharge any untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth. Stormwater from the Site will be collected and treated in accordance with the MassDEP Stormwater Management Standards and stormwater outfalls will be stabilized to prevent erosion. This is a significant improvement from existing conditions.

Water quality treatment BMPs have been incorporated into the stormwater management system to provide increased TSS removal over the existing conditions. Bioretention basins, deep sump and hooded catch basins, proprietary hydrodynamic seperators, and biofiltration swales have been incorporated into the design and sized to provide at least 80% TSS removal. The BMP sizing calculations are included with this report in Appendix A. The rip rap at the new outfalls will be designed so there is no erosion or scour at the outfall and into the wetlands or Sales Creek.

Standard 2: *Stormwater management systems shall be designed so that the post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.*

Compliance: The proposed stormwater management system will be designed so that the post-development peak discharge rates do not exceed pre-development peak discharge rates at the design points and for the site as a whole. To prevent storm damage and downstream flooding, the proposed stormwater management practices will mitigate peak runoff rates for the 2-, 10-, 25-, 50- and 100-year, 24-hour storm events.

The reduction in impervious area in the post-development condition will also reduce the volume of stormwater being discharged from the site for the 2-, 10-, 25-, 50-, and 100-year, 24-hours storm event, exceeding the requirements of Standard 2.

Standard 3: *Loss of annual recharge to groundwater shall be eliminated or minimized through the use of environmentally sensitive site design, low impact development techniques, stormwater BMPs, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.*

Compliance: The project will comply with this standard. The Site was designed using environmentally-sensitive site design, low impact development techniques, and stormwater BMP treatment trains to improve the recharge to groundwater. The annual recharge from the post-development site will exceed the annual recharge from pre-development conditions based on soil type using the guidelines provided in the MassDEP Stormwater Management Handbook.

The Project will improve groundwater recharge on site. The Project will not create more impervious area on site and therefore no groundwater recharge is required based on the MassDEP Stormwater Management Standards. However, the use of low impact development techniques will provide groundwater recharge. Also, the bioretention basins are designed to retain and infiltrate 1-inch times the impervious area of the site in order to meet the City of Boston Stormwater requirements.

Table 11 – Proposed Recharge Volumes for Stormwater BMPs

Infiltration BMP	Recharge Volume (cf)
Bioretention Basin 1	52,219
Bioretention Basin 2	50,614
Bioretention Basin 3	15,247
Bioretention Basin 4	29,414
Bioretention Basin 5	49,160
Bioretention Basin 6	26,004
Total	**222,658**

Standard 4: *Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This standard is met when:*

Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained; Structural stormwater BMPs are sized to capture the required water quality volume as determined in accordance with the Massachusetts Stormwater Handbook; and Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.

Compliance: The proposed stormwater management system will be designed to remove greater than 80% of the average annual post-construction load of Total Suspended Solids (TSS). Structural stormwater BMPs including deep sump and hooded catch basins, bioretention basins, porous pavers, biofiltration swales and Stormceptor® water quality units are sized to capture the required water quality volume (1 inch over the project site impervious area) and remove a minimum of 80% of total suspended solids.

The project is a redevelopment and therefore the pretreatment and structural best management practice requirements of Standard 4 shall be met to the maximum extent practical.

The proposed water quality treatment BMPs are subject to the 44% TSS removal pretreatment requirement and the 1-inch rule for calculating water quality volumes because the site is considered a land uses with higher potential pollutant loads (see Standard 5).

Pretreatment for all infiltration BMPs will meet or exceed the 44% TSS removal requirement. The treatment train for runoff that is not directed to an infiltration BMP will include at a minimum deep sump hooded catch basins, and a proprietary treatment device to remove at least 80% TSS prior to discharge to Sales Creek. Lined biofiltration swales will also be used in parking lot islands prior to the deep sump hooded catch basins where enough space is available. TSS removal calculation spreadsheets and Stormceptor® sizing calculations are provided in Appendix A.

Source control and pollution prevention measures, such as vacuum cleaning, street sweeping, proper snow management, and stabilization of eroded surfaces, are included in the Long-Term Pollution Prevention Plan and Operation and Maintenance Plan (Appendix E).

Standard 5: *For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If, through source control and/or pollution prevention, all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L.c. 21, §§ 26-53 and the regulations promulgated there under at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.*

Compliance: The parking lots associated with the site are considered high-intensity-use and Land Uses with Higher Potential Pollutant Loads (LUHPPLs) as defined by MassDEP. These areas of the project are classified as a LUHPPL based on average daily vehicle trips anticipated to be generated by the proposed Project.

The project is a redevelopment and therefore the pretreatment and structural best management practice requirements of Standard 5 shall be met to the maximum extent practical.

The treatment train for the portions of the parking lot that do not flow to the bioretention areas include Stormceptor proprietary treatment devices which capture sediments as well as free oil.

The treatment trains for the remaining parking lot areas include deep sump hooded catch basins and sediment forebays prior to the bioretention areas.

Standard 6: *Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1. or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00.*[1] *Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of the public water supply.*

Compliance: The Project discharges to Sales Creek which is part of the Rumney Marshes Area of Critical Environmental Concern.

The project is a redevelopment and therefore the pretreatment and structural best management practice requirements of Standard 6 shall be met to the maximum extent practical.

The pretreatment Best Management Practices were selected from Table CA 2: Standard 6 of the Massachusetts Stormwater Handbook and include deep sump hooded catch basins, sediment forebays, and biofiltration swales in selected portions of the project. Table CA 2 indicates appropriate BMP's for use on sites with stormwater discharges to Outstanding Resource Waters. The main treatment BMP's are exfiltration Bioretention Basins, which are included in Table CA 2.

Standard 7: *A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.*

Compliance: Since the Project is a redevelopment project, the following Stormwater Management Standards will be met to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6 (see compliance narrative for Standards 2, 3, 4, 5, and 6). Existing stormwater discharges will comply with Standard 1 only to the maximum extent practicable (see compliance narrative for Standard 1). This project will comply with all other requirements of the Stormwater Management Standards and improve existing conditions (see compliance narratives for Standards 8, 9, and 10).

Standard 8: *A plan to control construction-related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.*

[1] If an NPDES Construction General Permit or Multi-Sector General Permit is required for a discharge to an ORW, DEP must approve the Stormwater Pollution Prevention Plan (SWPPP).

Compliance: The project will comply with this standard. Sedimentation and erosion controls will be incorporated as part of the design of this project and employed during site construction. Land disturbance will be kept to a minimum and the phasing of the work will be planned so that only the areas actively being developed are exposed. All other areas should have natural vegetation preserved, have good temporary cover, or permanent vegetation established. Permanent structures, temporary or permanent vegetation, and mulch/erosion netting should be employed, as quickly as possible after land is disturbed. Disturbed areas will be protected from stormwater runoff by installing erosion control or stormwater management measures to prevent water from entering and running over disturbed areas, and to prevent erosion damage to downstream facilities. Perimeter control practices will be installed to isolate the construction site from surrounding areas. Siltation fence, temporary covers for drainage structures, and temporary settlement basin will be utilized where applicable.

Since the Project will disturb more than one (1) acre of land, a Notice of Intent will be submitted to the Environmental Protection Agency (EPA) for coverage under the National Pollution Discharge Elimination System (NPDES) Construction General Permit. As part of this application the Applicant is required to prepare a Stormwater Pollution Prevention Plan (SWPPP) and implement the measures in the SWPPP. The SWPPP, which is to be kept on site, includes erosion and sediment controls (stabilization practices and structural practices), temporary and permanent stormwater management measures, Contractor inspection schedules and reporting of all SWPPP features, materials management, waste disposal, off-site vehicle tracking, spill prevention and response, sanitation, and non-stormwater discharges. A draft SWPPP is provided in Appendix E.

Standard 9: *A Long -Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.*
Compliance: A post-construction operation and maintenance plan has been prepared and will be implemented to ensure that stormwater management systems function as designed. Source control and stormwater BMP operation requirements for the academic campus are summarized in the Long-Term Pollution Prevention Plan and Operation and Maintenance Plan provided in Appendix D.

Standard 10: *All illicit discharges to the stormwater management system are prohibited.*
There will be no illicit discharges to the stormwater management system associated with the Project. An Illicit Discharge Compliance Statement is provided in Appendix A.

6.0 CLOSED DRAINAGE SYSTEM DESIGN

The proposed closed drainage system will consist of deep sump and hooded catch basins, drainage manholes, and proprietary water quality treatment units connected with corrugated polyethylene pipe. The closed drainage system will be designed to convey the 10-year storm event using the Rational method.

7.0 CONCLUSION

In conclusion, the Project's stormwater management system will reduce peak runoff rates and volumes, and increase the stormwater quality. In addition, the peak runoff rates and volumes will be further reduced and the water quality increased through the use of stormwater Best Management Practices. Environmentally sensitive site design and low impact development techniques will be implemented throughout the Site. The Project is being designed to meet and exceed the MassDEP Stormwater Management Standards City of Boston, and City of Revere regulations.

FIGURES

C.DR.01 Pre-development Drainage Map
C.DR.02 Post-development Drainage Map
C.DR.03 BMP Location Diagram

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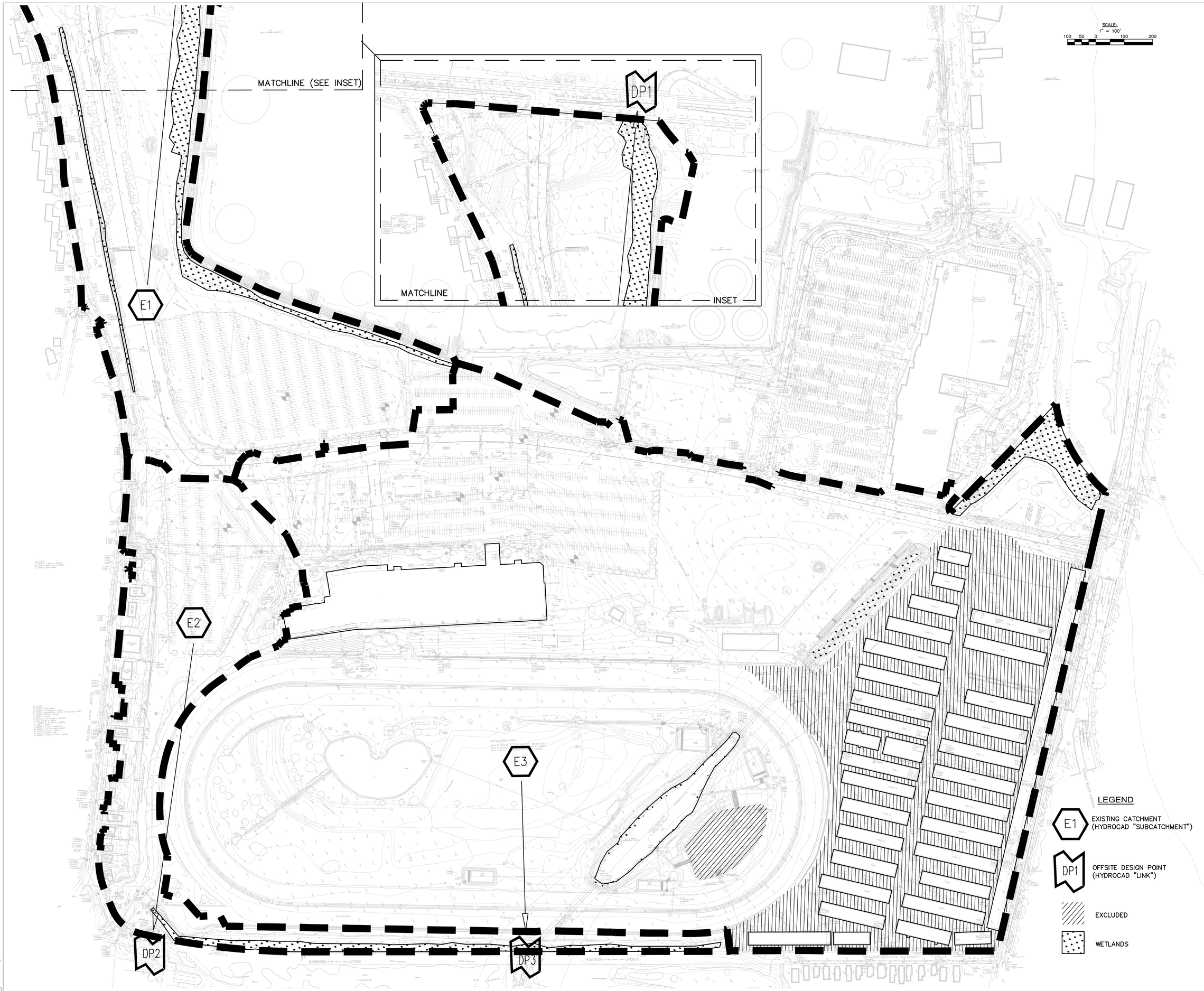

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PROJECT NUMBER: 11143 (NITSCH 9180)

DATE: July 3, 2013

REVISIONS:

SCALE: 1"=120'

DRAWING NAME:

PRE-DEVELOPMENT
DRAINAGE MAP

DRAWING NUMBER:

C.DR.01

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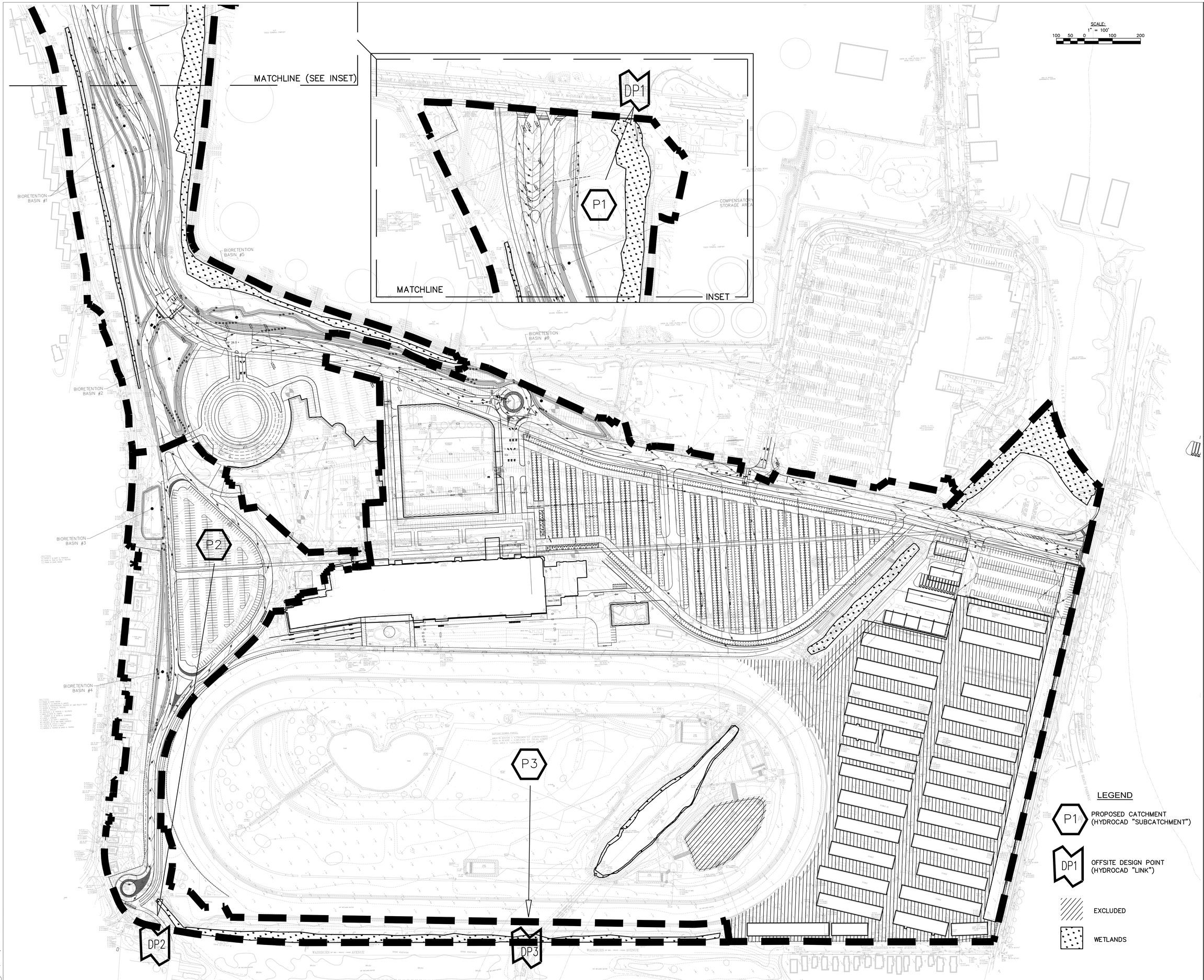

SCALE:
1" = 100'
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PROJECT NUMBER: 11143 (NITSCH 9180)

DATE: July 3, 2013

REVISIONS:

SCALE: 1"=120'

DRAWING NAME:

POST-DEVELOPMENT DRAINAGE MAP

DRAWING NUMBER:

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PROJECT NUMBER: 11143 (NITSCH 9180)

DATE: July 3, 2013

REVISIONS:

SCALE: 1"=120'

DRAWING NAME:

BMP LOCATION DIAGRAM

DRAWING NUMBER:

C.DR.03

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APPENDIX A

Stormwater Management Standards Documentation

MassDEP Checklist for Stormwater Report

Standard 3: Recharge Volume Calculations

Standard 4: Water Quality Volume Calculations

Standard 4: TSS Removal Calculations

Standard 4: Proprietary Water Quality Structure Calculations

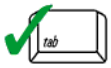
Standard 10: Illicit Discharge Compliance Statement

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.





A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☒ Reduced Impervious Area (Redevelopment Only)

☐ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☐ Use of "country drainage" versus curb and gutter conveyance and pipe

☒ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☒ Grass Channel

☐ Green Roof

☐ Other (describe): _____

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

☒ Site is comprised solely of C and D soils and/or bedrock at the land surface

☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000

☐ Solid Waste Landfill pursuant to 310 CMR 19.000

☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☐ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☒ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☒ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☐ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☒ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☒ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☒ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☒ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☒ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☒ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☒ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☒ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

☐ Limited Project

☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.

☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area

☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff

☐ Bike Path and/or Foot Path

☒ Redevelopment Project

☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☒ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☒ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

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Form S3-B: Standard #3 – Recharge
Required Recharge Volume/City of Boston Recharge

Project Name: **Suffolk Downs**	Nitsch Project #: **9180**
Location: **Boston, MA**	Checked by: **ST**
Prepared by: **NGG/TJM**	Sheet No. **1 of 1**
Date: **6/27/2013**	

The project is a redevelopment and therefore requires Standard 3: Required Recharge Volume to be met to the maximum extent practical. The Project includes a reduction in impervious area and therefore will comply with this standard by exceeding the approximate annual recharge volume as compared to the pre-development site.

This calculation demonstrates that the proposed bioretention basins hold a static volume that exceeds a volume equal to 1.0-inch times the total proposed impervious area to meet City of Boston stormwater regulations. The proposed impervious area excludes the roofs from the CAFO area. The CAFO roof stormwater drainage system will not be modified as part of this project.

$$Total\ Proposed\ Impervious\ Area = 65.01\ ac$$
$$CAFO\ Roof = 8.87\ ac$$
$$65.01\ ac - 8.87\ ac = 56.14\ ac$$

City of Boston Recharge Volume:

$$1.0\ in \times (56.14\ ac \times 43{,}560\ sf/ac) = 203{,}800\ cf$$

Proposed Recharge Volumes for Stormwater BMPs

Infiltration BMP	Recharge Volume (cf)
Bioretention Basin 1	52,219
Bioretention Basin 2	50,614
Bioretention Basin 3	15,247
Bioretention Basin 4	29,414
Bioretention Basin 5	49,160
Bioretention Basin 6	26,004
Total Proposed	**222,658**

$$222{,}658\ cf > 203{,}800\ cf \quad OK$$

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Form S3-B: Standard #4 – WQV
Water Quality Volume

Project Name: **Suffolk Downs**	Nitsch Project #: **9180**
Location: **Boston, MA**	Checked by: **ST**
Prepared by: **NGG/TJM**	Sheet No. **1 of 1**
Date: **6/27/2013**	

Step No.			
1	Impervious area (excluding CAFO roofs):	2,445,588	sf
	Proposed Roof Area:	405,126	sf
	Treated Impervious Area:	2,040,463	sf
	Water Quality Depth:	1.0	in
2	Water Quality Volume =	170,039	cf

Water Quality Depth of 1.0" selected based on discharge to a Critical Area and LUHPPL.

Bioretention Basins and Stormceptors are the primary treatment BMPs. The Stormceptors will be sized to treat the flow rate from 1.0" of runoff within the units' catchment area. The Bioretention Basins will be sized to capture a volume of 1.0" over the proposed impervious area per City of Boston Requirements which will exceed the required Water Quality Volume.

Proposed Water Quality Volume

Main Treatment BMP	Non-roof Impervious area in watershed (sf)	Water Quality Depth (in)	Required Design Water Quality Volume (cf)	Total Static Treated Volume (cf)	Check
Bioretention Basins	915,386	1.0	76,282	222,658	OK
Stormceptors	1,530,203	1.0	127,517	SEE NOTE	OK
		TOTAL	**203,799**	**222,658**	OK

NOTE: Stormceptors will be sized based on flow rate from 1" of runoff, and will treat runoff from the site that does not enter a Bioretention Basin.

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Form S4-C: Standard 4 – Water Quality
TSS Worksheet

Project Name: **Suffolk Downs**	Nitsch Project #: **9180**
Location: **Boston, MA**	Checked by: **ST**
Prepared by: **NGG/TJM**	Sheet No.1 of **4**
Date: **6/27/2013**	

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: General to Bioretention Areas

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Sediment Forebay	0.25	0.75	0.19	0.56
Bioretention Area	0.90	0.56	0.51	0.06
	0.00	0.06	0.00	0.06
	0.00	0.06	0.00	0.06

Total TSS Removal = 94%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: Suffolk Downs
Prepared By: NGG/TJM
Date: 6/27/2013

*Equals remaining load from previous BMP (E) which enters the BMP

TSS WORKSHEET *from Volume 2, Chapter 3, Table 4, TSS Removal*

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Form S4-C: Standard 4 – Water Quality
TSS Worksheet

Project Name: **Suffolk Downs**	Nitsch Project #: **9180**
Location: **Boston, MA**	Checked by: **ST**
Prepared by: **NGG/TJM**	Sheet No. 2 of **4**
Date: **6/27/2013**	

The TSS removal rate shown for the "Proprietary Treatment Practice" is the minimum required to achieve at least 80% removal.

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: General to Stormceptor

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Proprietary Treatment Practice	0.73	0.75	0.55	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20

Total TSS Removal = 80%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: Suffolk Downs
Prepared By: NGG/TJM
Date: 6/27/2013

*Equals remaining load from previous BMP (E) which enters the BMP

TSS WORKSHEET *from Volume 2, Chapter 3, Table 4, TSS Removal*

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Form S4-C: Standard 4 – Water Quality
TSS Worksheet

Project Name: **Suffolk Downs**	Nitsch Project #: **9180**
Location: **Boston, MA**	Checked by: **ST**
Prepared by: **NGG/TJM**	Sheet No. 3 of **4**
Date: **6/27/2013**	

The TSS removal rate shown for the "Proprietary Treatment Practice" is the minimum required to achieve at least 80% removal.

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: General to Stormceptor with Biofiltration Swale

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Grass Channel	0.50	1.00	0.50	0.50
Deep Sump and Hooded Catch Basin	0.25	0.50	0.13	0.38
Proprietary Treatment Practice	0.47	0.38	0.18	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20

Total TSS Removal = 80%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: Suffolk Downs
Prepared By: NGG/TJM

*Equals remaining load from previous BMP (E)

TSS WORKSHEET *from Volume 2, Chapter 3, Table 4, TSS Removal*

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Form S4-C: Standard 4 – Water Quality
TSS Worksheet

Project Name: **Suffolk Downs**	Nitsch Project #: **9180**
Location: **Boston, MA**	Checked by: **ST**
Prepared by: **NGG/TJM**	Sheet No.4 of **4**
Date: **6/27/2013**	

LUHPPL Pretreatment 44% TSS Removal prior to Bioretention Basins.

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Pretreatment to Bioretention Areas

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Sediment Forebay	0.25	0.75	0.19	0.56
	0.00	0.56	0.00	0.56
	0.00	0.56	0.00	0.56
	0.00	0.56	0.00	0.56

Total TSS Removal = 44%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: Suffolk Downs
Prepared By: NGG/TJM
Date: 6/27/2013

*Equals remaining load from previous BMP (E) which enters the BMP

TSS WORKSHEET *from Volume 2, Chapter 3, Table 4, TSS Removal*

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Massachusetts Stormwater Evaluation Project

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MASTEP Technology Review

Technology Name: Stormceptor

Studies Reviewed: Final NJCAT Technology Verification Stormceptor STC900 September 2004; Coventry University Study, 1996; Technology Assessment, University of Massachusetts, 1997; SeaTac Stormceptor Performance report 2001; SWAMP report Ontario 2004; Phoenix Group Edmonton report 1995; Stormceptor 1200 Field Evaluation report 2004; Applied Hydrology Associates Denver report 2003; Rinker Materials Como Park St. Paul MN report 2002; VA DOT / UVA "Testing of Ultra-Urban Stormwater Best Management Practices" report 2001.

Date: November 23, 2007

Reviewer: Jerry Schoen

Rating: 2

Brief rationale for rating: This rating is primarily based on the 2005 NJCAT Technology Verification study. In general, this was a well-conducted test, which in large part followed NJDEP test guidelines for laboratory studies, which MASTEP considers as the laboratory equivalent of TARP field protocols. Issues of concern: the study measured suspended sediment concentration (SSC) rather than total suspended solids (TSS). Although SSC is considered by many scientists to be the preferred method, it is at odds with Massachusetts stormwater regulations, which are based on TSS treatment. Comparing SSC and TSS results is considered an inexact science. The test was conducted with higher influent sediment concentrations than is preferred, but results were fairly consistent across all ranges studied. The particle size distribution also appears to be slightly higher than the target test range. There are additional field studies that in general support the results obtained in this laboratory studies. These studies do not satisfy TARP protocols, but they do not contradict results obtained in the NJCAT study.

TARP Requirements Not Met*:

- Measurements in TSS.
- Influent sediment concentration is 100 – 300 mg/l: actual was 153-460.
- No documentation of a Quality Assurance Project Plan
- Third party studies are preferred. This was conducted by Stormceptor personnel, with sample analyses conducted by an external laboratory.

* Criteria also based on NJDEP laboratory testing guidelines.

*This Stormceptor sizing report is preliminary and represents a typical Stormceptor sizing calculation. Stormceptor units are used for water quality treatment in all locations where Bioretention Basins are not feasible.

Stormceptor Sizing Detailed Report

PCSWMM for Stormceptor

Project Information

Date	7/1/2013
Project Name	Resort at Suffolk Downs
Project Number	9180
Location	Boston, MA

Stormwater Quality Objective

This report outlines how Stormceptor System can achieve a defined water quality objective through the removal of total suspended solids (TSS). Attached to this report is the Stormceptor Sizing Summary.

Stormceptor System Recommendation

The Stormceptor System model STC 7200 achieves the water quality objective removing 74% TSS for a Fine (organics, silts and sand) particle size distribution.

The Stormceptor System

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for all rainfall events, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.

Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Stormceptor is the only oil and sediment separator on the market sized to remove TSS for a wide range of particle sizes, including fine sediments (clays and silts), that are often overlooked in the design of other stormwater treatment devices.

Small storms dominate hydrologic activity, US EPA reports

"*Early efforts in stormwater management focused on flood events ranging from the 2-yr to the 100-yr storm. Increasingly stormwater professionals have come to realize that small storms (i.e. < 1 in. rainfall) dominate watershed hydrologic parameters typically associated with water quality management issues and BMP design. These small storms are responsible for most annual urban runoff and groundwater recharge. Likewise, with the exception of eroded sediment, they are responsible for most pollutant washoff from urban surfaces. Therefore, the small storms are of most concern for the stormwater management objectives of ground water recharge, water quality resource protection and thermal impacts control.*"

"*Most rainfall events are much smaller than design storms used for urban drainage models. In any given area, most frequently recurrent rainfall events are small (less than 1 in. of daily rainfall).*"

"Continuous simulation offers possibilities for designing and managing BMPs on an individual site-by-site basis that are not provided by other widely used simpler analysis methods. Therefore its application and use should be encouraged."

– US EPA Stormwater Best Management Practice Design Guide, Volume 1 – General Considerations, 2004

Design Methodology

Each Stormceptor system is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology from up-to-date local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective.

The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing (summary of analysis presented in Appendix 2):

- Site parameters
- Continuous historical rainfall, including duration, distribution, peaks (Figure 1)
- Interevent periods
- Particle size distribution
- Particle settling velocities (Stokes Law, corrected for drag)
- TSS load (Figure 2)
- Detention time of the system

The Stormceptor System maintains continuous positive TSS removal for all influent flow rates. Figure 3 illustrates the continuous treatment by Stormceptor throughout the full range of storm events analyzed. It is clear that large events do not significantly impact the average annual TSS removal. There is no decline in cumulative TSS removal, indicating scour does not occur as the flow rate increases.

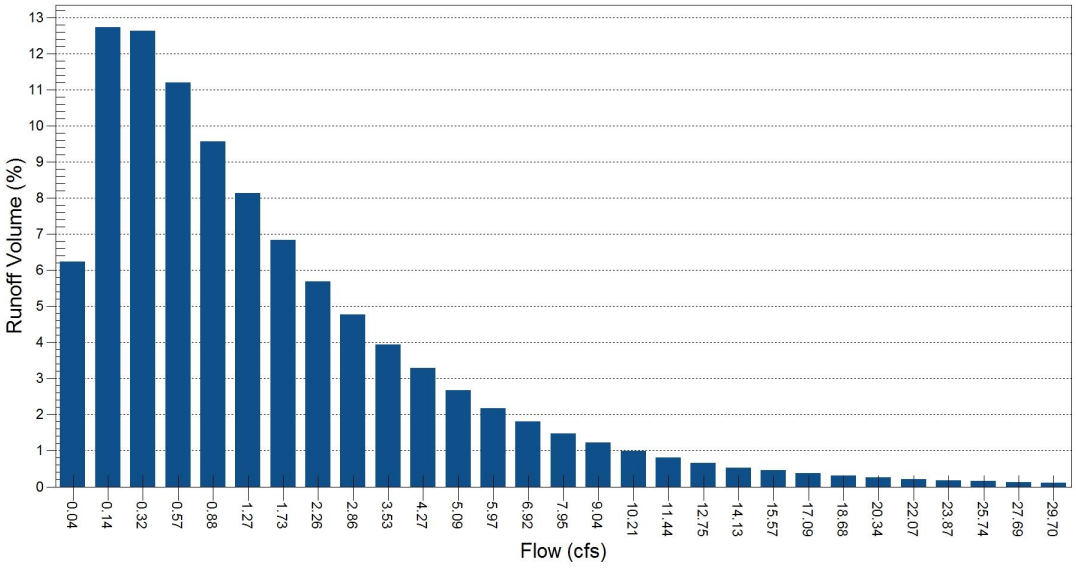


Figure 1. Runoff Volume by Flow Rate for BOSTON WSFO AP – MA 770, 1948 to 2005 for 10 ac, 98% impervious. Small frequent storm events represent the majority of annual rainfall volume. Large infrequent events have little impact on the average annual TSS removal, as they represent a small percentage of the total annual volume of runoff.

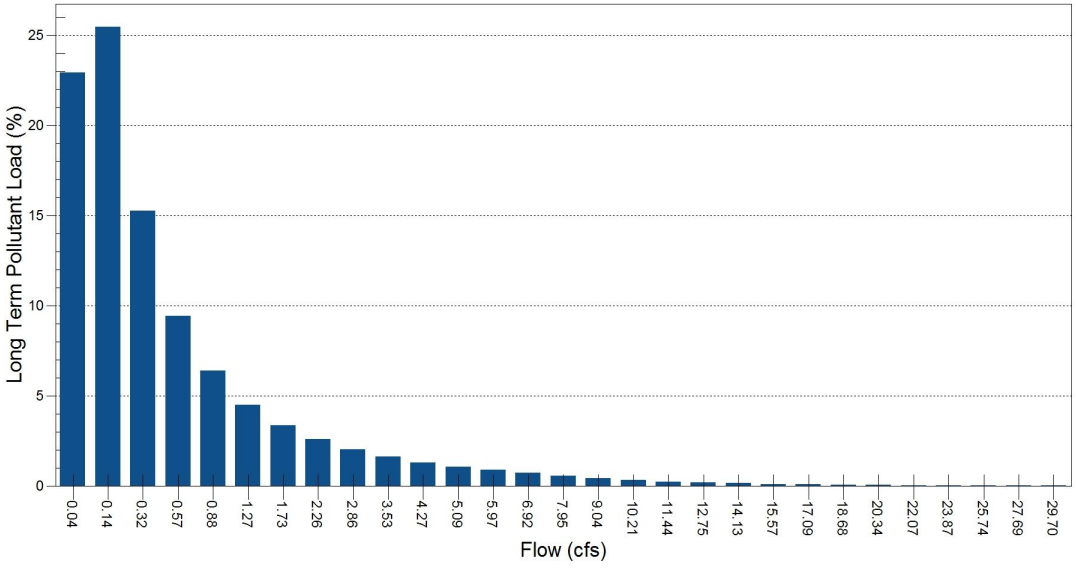
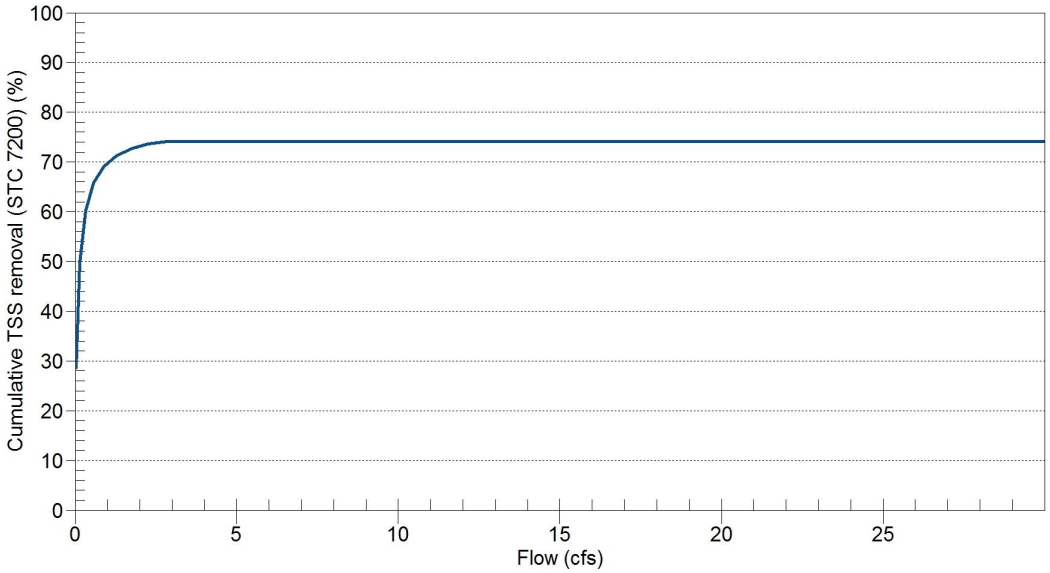


Figure 2. Long Term Pollutant Load by Flow Rate for BOSTON WSFO AP – 770, 1948 to 2005 for 10 ac, 98% impervious. The majority of the annual pollutant load is transported by small frequent storm

events. Conversely, large infrequent events carry an insignificant percentage of the total annual pollutant load.



Stormceptor Model	STC 7200	Drainage Area (ac)	10
TSS Removal (%)	74	Impervious (%)	98

Figure 3. Cumulative TSS Removal by Flow Rate for BOSTON WSFO AP – 770, 1948 to 2005. Stormceptor continuously removes TSS throughout the full range of storm events analyzed. Note that large events do not significantly impact the average annual TSS removal. Therefore no decline in cumulative TSS removal indicates scour does not occur as the flow rate increases.

Appendix 1
Stormceptor Design Summary

Project Information

Date	7/1/2013
Project Name	Resort at Suffolk Downs
Project Number	9180
Location	Boston, MA

Designer Information

Company	Nitsch Engineering
Contact	N/A

Notes

N/A

Drainage Area

Total Area (ac)	10
Imperviousness (%)	98

The Stormceptor System model STC 7200 achieves the water quality objective removing 74% TSS for a Fine (organics, silts and sand) particle size distribution.

Rainfall

Name	BOSTON WSFO AP
State	MA
ID	770
Years of Records	1948 to 2005
Latitude	42°21'38"N
Longitude	71°0'38"W

Water Quality Objective

TSS Removal (%)	73

Upstream Storage

Storage (ac-ft)	Discharge (cfs)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	40
STC 900	53
STC 1200	58
STC 1800	58
STC 2400	64
STC 3600	65
STC 4800	70
STC 6000	70
STC 7200	**74**
STC 11000	79
STC 13000	79
STC 16000	82

Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)

Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s
20	20	1.3	0.0013					
60	20	1.8	0.0051					
150	20	2.2	0.0354					
400	20	2.65	0.2123					
2000	20	2.65	0.9417					

Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 450i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences

Inlet Pipe Configuration	STC 450i	STC 900 to STC 7200	STC 11000 to STC 16000
Single inlet pipe	3 in.	1 in.	3 in.
Multiple inlet pipes	3 in.	3 in.	Only one inlet pipe.

- Design estimates are based on stable site conditions only, after construction is completed.
- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local Stormceptor representative.
- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
- For pricing inquiries or assistance, please contact Rinker Materials 1 (800) 909-7763 www.rinkerstormceptor.com

Stormceptor®

Appendix 2
Summary of Design Assumptions

SITE DETAILS

Site Drainage Area

Total Area (ac)	10	Imperviousness (%)	98

Surface Characteristics

Width (ft)	1320
Slope (%)	2
Impervious Depression Storage (in.)	0.02
Pervious Depression Storage (in.)	0.2
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Infiltration Parameters

Horton's equation is used to estimate infiltration	
Max. Infiltration Rate (in/hr)	2.44
Min. Infiltration Rate (in/hr)	0.4
Decay Rate (s^{-1})	0.00055
Regeneration Rate (s^{-1})	0.01

Maintenance Frequency

Sediment build-up reduces the storage volume for sedimentation. Frequency of maintenance is assumed for TSS removal calculations.	
Maintenance Frequency (months)	12

Evaporation

Daily Evaporation Rate (inches/day)	0.1

Dry Weather Flow

Dry Weather Flow (cfs)	No

Upstream Attenuation

Stage-storage and stage-discharge relationship used to model attenuation upstream of the Stormceptor System is identified in the table below.

Storage ac-ft	Discharge cfs
0	0

Rinker MATERIALS™

PARTICLE SIZE DISTRIBUTION

Particle Size Distribution

Removing fine particles from runoff ensures the majority of pollutants, such as heavy metals, hydrocarbons, free oils and nutrients are not discharged into natural water resources. The table below identifies the particle size distribution selected to define TSS removal for the design of the Stormceptor System.

Fine (organics, silts and sand)

Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s
20	20	1.3	0.0013					
60	20	1.8	0.0051					
150	20	2.2	0.0354					
400	20	2.65	0.2123					
2000	20	2.65	0.9417					

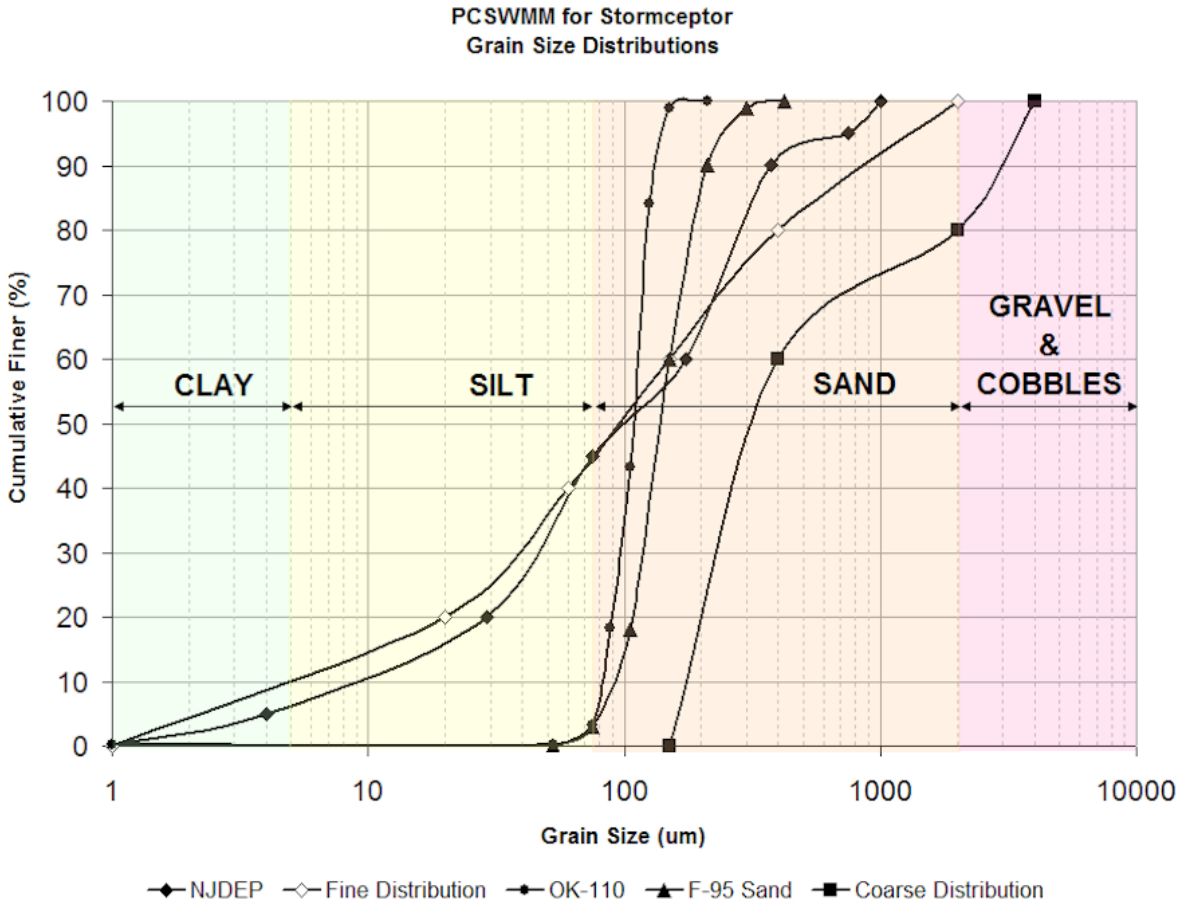


Figure 1. PCSWMM for Stormceptor standard design grain size distributions.

TSS LOADING

TSS Loading Parameters

TSS Loading Function	Buildup / Washoff

Parameters

Target Event Mean Concentration (EMC) (mg/L)	125
Exponential Buildup Power	0.4
Exponential Washoff Exponential	0.2

HYDROLOGY ANALYSIS

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of the Stormceptor System are based on the average annual removal of TSS for the selected site parameters. The Stormceptor System is engineered to capture fine particles (silts and sands) by focusing on average annual runoff volume ensuring positive removal efficiency is maintained during all rainfall events, while preventing the opportunity for negative removal efficiency (scour).

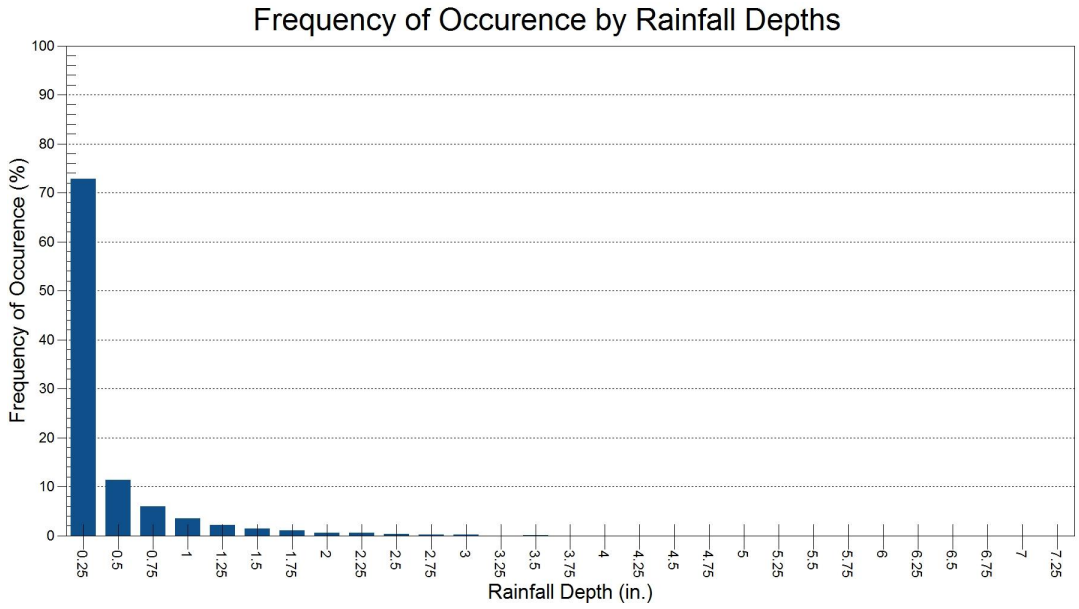
Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

Rainfall Station	BOSTON WSFO AP		
Rainfall File Name	MA770.NDC	Total Number of Events	9245
Latitude	42°21'38"N	Total Rainfall (in.)	2457.1
Longitude	71°0'38"W	Average Annual Rainfall (in.)	42.4
Elevation (ft)	20	Total Evaporation (in.)	255.0
Rainfall Period of Record (y)	58	Total Infiltration (in.)	48.2
Total Rainfall Period (y)	58	Percentage of Rainfall that is Runoff (%)	89.2

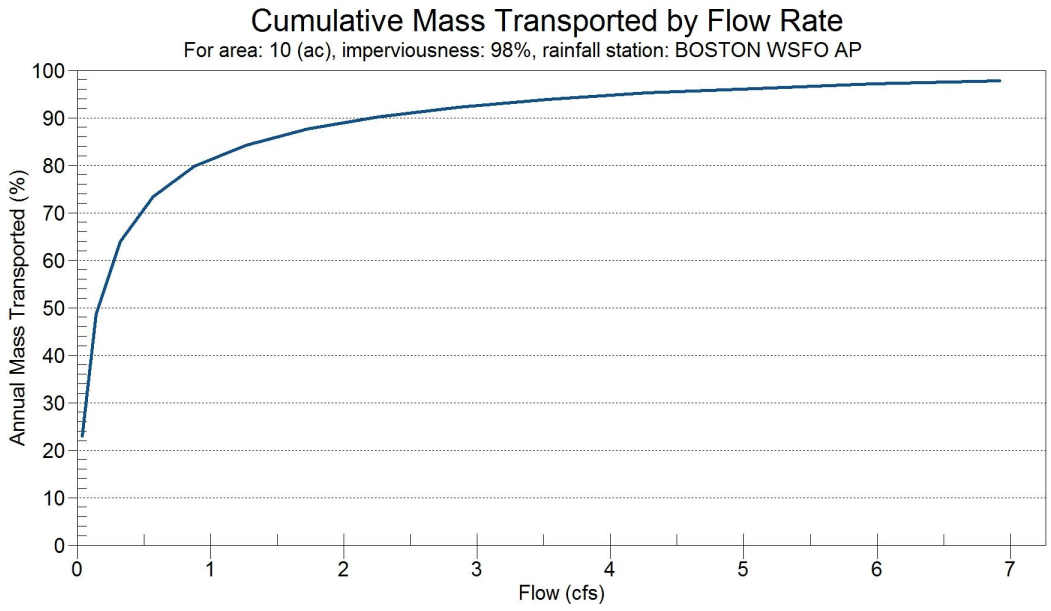
Rainfall Event Analysis

Rainfall Depth in.	No. of Events	Percentage of Total Events %	Total Volume in.	Percentage of Annual Volume %
0.25	6728	72.8	423	17.2
0.50	1052	11.4	387	15.8
0.75	541	5.9	335	13.6
1.00	323	3.5	281	11.4
1.25	192	2.1	217	8.8
1.50	128	1.4	177	7.2
1.75	89	1.0	144	5.9
2.00	52	0.6	97	3.9
2.25	48	0.5	102	4.1
2.50	29	0.3	69	2.8
2.75	14	0.2	37	1.5
3.00	16	0.2	46	1.9
3.25	4	0.0	12	0.5
3.50	5	0.1	17	0.7
3.75	4	0.0	15	0.6
4.00	2	0.0	8	0.3
4.25	4	0.0	17	0.7
4.50	2	0.0	9	0.4
4.75	1	0.0	5	0.2
5.00	4	0.0	20	0.8
5.25	1	0.0	5	0.2
5.50	0	0.0	0	0.0
5.75	3	0.0	17	0.7
6.00	0	0.0	0	0.0
6.25	2	0.0	12	0.5
6.50	0	0.0	0	0.0
6.75	0	0.0	0	0.0
7.00	0	0.0	0	0.0
7.25	1	0.0	7	0.3
7.50	0	0.0	0	0.0
7.75	0	0.0	0	0.0
8.00	0	0.0	0	0.0
8.25	0	0.0	0	0.0
>8.25	0	0.0	0	0.0

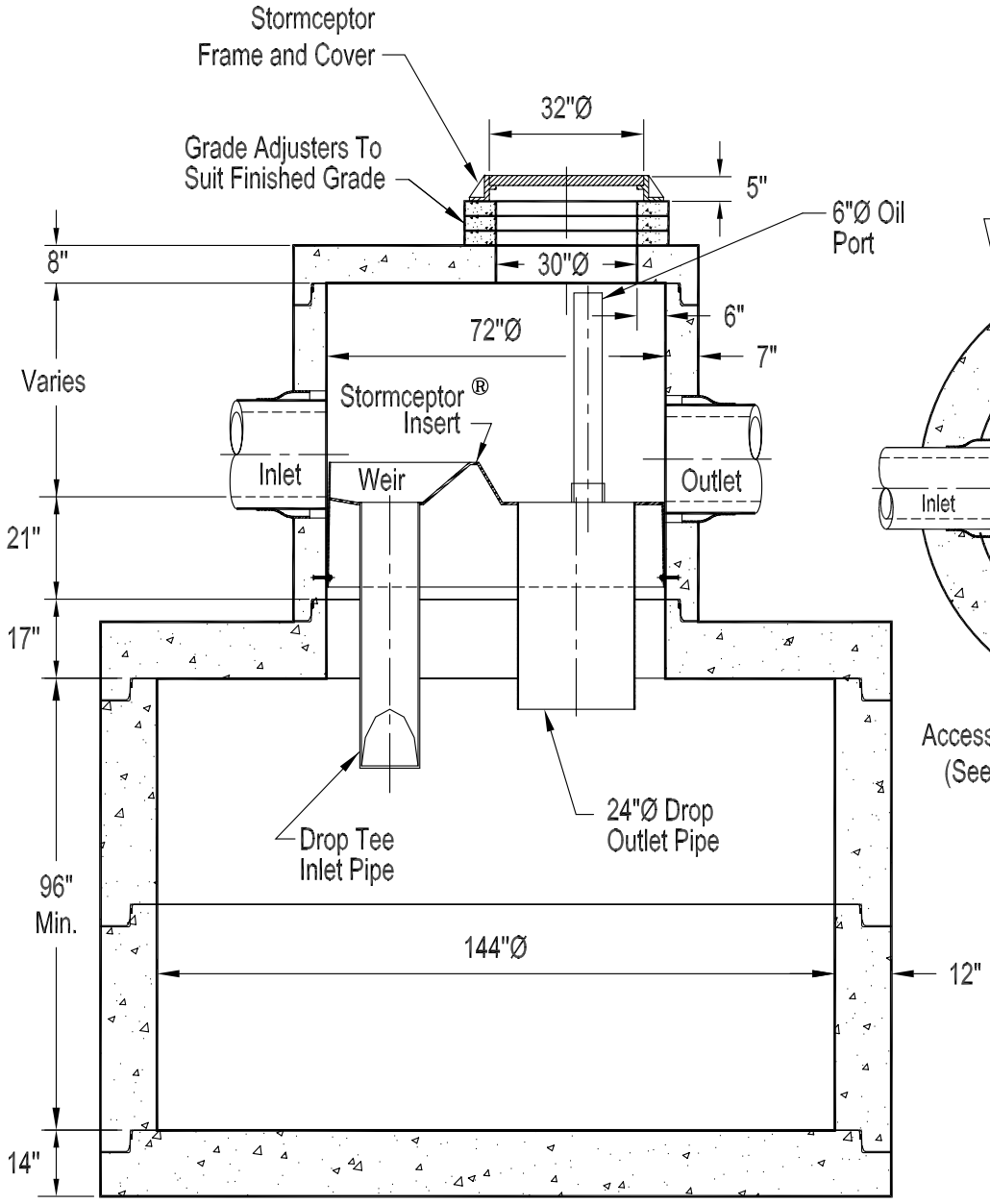


Pollutograph

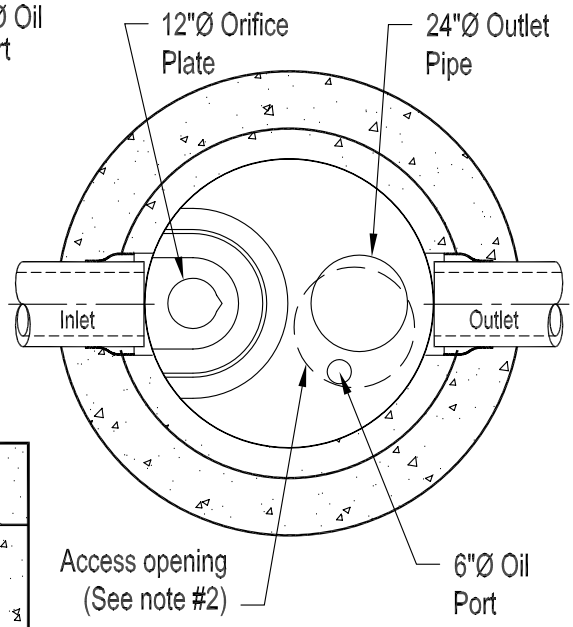
Flow Rate cfs	Cumulative Mass %
0.035	23.0
0.141	48.6
0.318	63.9
0.565	73.4
0.883	79.8
1.271	84.3
1.73	87.6
2.26	90.2
2.86	92.2
3.531	93.9
4.273	95.2
5.085	96.2
5.968	97.1
6.922	97.8
7.946	98.3
9.041	98.8
10.206	99.1
11.442	99.3
12.749	99.5
14.126	99.6
15.574	99.7
17.092	99.8
18.681	99.9
20.341	99.9
22.072	99.9
23.873	100.0
25.744	100.0
27.687	100.0
29.7	100.0
31.783	100.0



STC 7200 Precast Concrete Stormceptor®
(7200 U.S. Gallon Capacity)



Section Thru Chamber



Plan View

Notes:

1. The Use Of Flexible Connection is Recommended at The Inlet and Outlet Where Applicable.
2. The Cover Should be Positioned Over The Outlet Drop Pipe and The Oil Port.
3. The Stormceptor System is protected by one or more of the following U.S. Patents: #4985148, #5498331, #5725760, #5753115, #5849181, #6068765, #6371690.
4. Contact a Concrete Pipe Division representative for further details not listed on this drawing.

Nitsch Engineering

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July 2, 2013

THE RESORT AT SUFFOLK DOWNS
525 McClellan Highway
East Boston, Massachusetts

STANDARD 10: Illicit Discharge Compliance Statement

Standard 10 states: All illicit discharges to the stormwater management system are prohibited.

This is to verify:

1. Based on the information available there are no known or suspected illicit discharges to the stormwater management system at the RESORT AT SUFFOLK DOWNS site as defined in the DEP Stormwater Handbook.

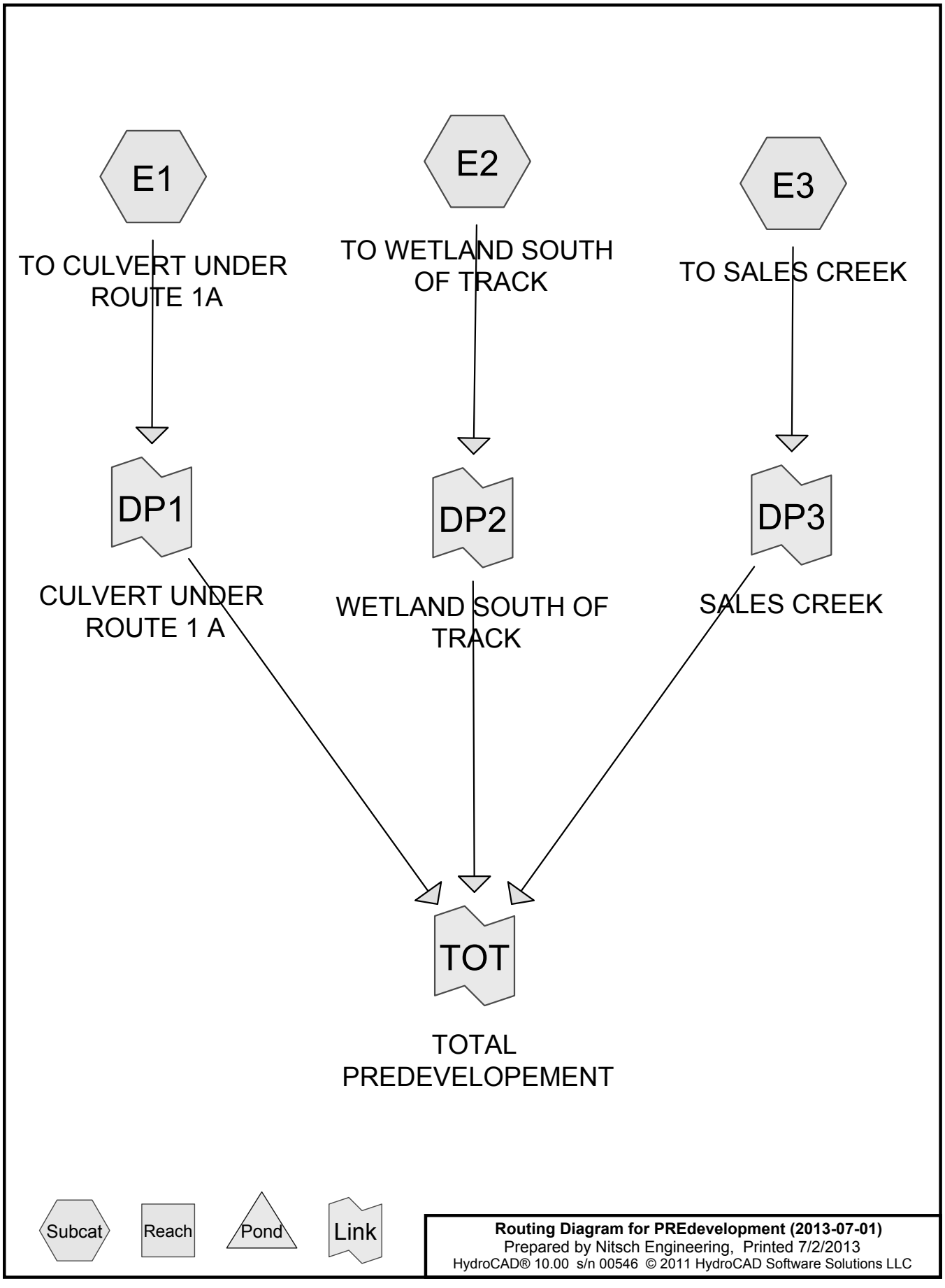
2. The design of the stormwater system includes no proposed illicit discharges and no proposed illicit discharges are proposed.

Scott Turner, P.E.

Date

APPENDIX B

Pre-Development Conditions – HydroCAD Calculations



Routing Diagram for PREdevelopment (2013-07-01)
Prepared by Nitsch Engineering, Printed 7/2/2013
HydroCAD® 10.00 s/n 00546 © 2011 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
5.02	70	Woods, Good, HSG C (E1, E2, E3)
52.11	74	>75% Grass cover, Good, HSG C (E1, E2, E3)
5.40	77	Woods, Good, HSG D (E1, E2, E3)
11.97	96	Gravel surface, HSG C (E2, E3)
62.36	98	Pavement, HSG C (E1, E2, E3)
13.97	98	Roofs, HSG C (E2, E3)
2.68	98	Water Surface (E3)
153.51	**88**	**TOTAL AREA**

Summary for Subcatchment E1: TO CULVERT UNDER ROUTE 1A

Runoff = 73.89 cfs @ 12.09 hrs, Volume= 5.306 af, Depth= 1.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (ac)	CN	Description
*	18.38	98	Pavement, HSG C
	9.06	74	>75% Grass cover, Good, HSG C
	3.07	70	Woods, Good, HSG C
	2.74	77	Woods, Good, HSG D
	33.25	87	Weighted Average
	14.87		44.72% Pervious Area
	18.38		55.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment E2: TO WETLAND SOUTH OF TRACK

Runoff = 39.20 cfs @ 12.09 hrs, Volume= 2.821 af, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (ac)	CN	Description
	3.83	74	>75% Grass cover, Good, HSG C
*	8.19	98	Pavement, HSG C
	0.75	98	Roofs, HSG C
	1.78	70	Woods, Good, HSG C
	1.14	77	Woods, Good, HSG D
	1.26	96	Gravel surface, HSG C
	16.95	88	Weighted Average
	8.01		47.26% Pervious Area
	8.94		52.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment E3: TO SALES CREEK

Runoff = 238.91 cfs @ 12.09 hrs, Volume= 17.192 af, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (ac)	CN	Description
	39.22	74	>75% Grass cover, Good, HSG C
	13.22	98	Roofs, HSG C
*	2.68	98	Water Surface
	10.71	96	Gravel surface, HSG C
	0.17	70	Woods, Good, HSG C
*	35.79	98	Pavement, HSG C
	1.52	77	Woods, Good, HSG D
	103.31	88	Weighted Average
	51.62		49.97% Pervious Area
	51.69		50.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Link DP1: CULVERT UNDER ROUTE 1 A

Inflow Area = 33.25 ac, 55.28% Impervious, Inflow Depth = 1.91" for 2-Year event
Inflow = 73.89 cfs @ 12.09 hrs, Volume= 5.306 af
Primary = 73.89 cfs @ 12.09 hrs, Volume= 5.306 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link DP2: WETLAND SOUTH OF TRACK

Inflow Area = 16.95 ac, 52.74% Impervious, Inflow Depth = 2.00" for 2-Year event
Inflow = 39.20 cfs @ 12.09 hrs, Volume= 2.821 af
Primary = 39.20 cfs @ 12.09 hrs, Volume= 2.821 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link DP3: SALES CREEK

Inflow Area = 103.31 ac, 50.03% Impervious, Inflow Depth = 2.00" for 2-Year event
Inflow = 238.91 cfs @ 12.09 hrs, Volume= 17.192 af
Primary = 238.91 cfs @ 12.09 hrs, Volume= 17.192 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link TOT: TOTAL PREDEVELOPEMENT

Inflow Area = 153.51 ac, 51.47% Impervious, Inflow Depth = 1.98" for 2-Year event
Inflow = 351.99 cfs @ 12.09 hrs, Volume= 25.319 af
Primary = 351.99 cfs @ 12.09 hrs, Volume= 25.319 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Subcatchment E1: TO CULVERT UNDER ROUTE 1A

Runoff = 121.60 cfs @ 12.09 hrs, Volume= 8.845 af, Depth= 3.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 10-Year Rainfall=4.60"

	Area (ac)	CN	Description
*	18.38	98	Pavement, HSG C
	9.06	74	>75% Grass cover, Good, HSG C
	3.07	70	Woods, Good, HSG C
	2.74	77	Woods, Good, HSG D
	33.25	87	Weighted Average
	14.87		44.72% Pervious Area
	18.38		55.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment E2: TO WETLAND SOUTH OF TRACK

Runoff = 63.60 cfs @ 12.09 hrs, Volume= 4.648 af, Depth= 3.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 10-Year Rainfall=4.60"

	Area (ac)	CN	Description
	3.83	74	>75% Grass cover, Good, HSG C
*	8.19	98	Pavement, HSG C
	0.75	98	Roofs, HSG C
	1.78	70	Woods, Good, HSG C
	1.14	77	Woods, Good, HSG D
	1.26	96	Gravel surface, HSG C
	16.95	88	Weighted Average
	8.01		47.26% Pervious Area
	8.94		52.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment E3: TO SALES CREEK

Runoff = 387.62 cfs @ 12.09 hrs, Volume= 28.327 af, Depth= 3.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 10-Year Rainfall=4.60"

	Area (ac)	CN	Description
	39.22	74	>75% Grass cover, Good, HSG C
	13.22	98	Roofs, HSG C
*	2.68	98	Water Surface
	10.71	96	Gravel surface, HSG C
	0.17	70	Woods, Good, HSG C
*	35.79	98	Pavement, HSG C
	1.52	77	Woods, Good, HSG D
	103.31	88	Weighted Average
	51.62		49.97% Pervious Area
	51.69		50.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Link DP1: CULVERT UNDER ROUTE 1 A

Inflow Area = 33.25 ac, 55.28% Impervious, Inflow Depth = 3.19" for 10-Year event
Inflow = 121.60 cfs @ 12.09 hrs, Volume= 8.845 af
Primary = 121.60 cfs @ 12.09 hrs, Volume= 8.845 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link DP2: WETLAND SOUTH OF TRACK

Inflow Area = 16.95 ac, 52.74% Impervious, Inflow Depth = 3.29" for 10-Year event
Inflow = 63.60 cfs @ 12.09 hrs, Volume= 4.648 af
Primary = 63.60 cfs @ 12.09 hrs, Volume= 4.648 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link DP3: SALES CREEK

Inflow Area = 103.31 ac, 50.03% Impervious, Inflow Depth = 3.29" for 10-Year event
Inflow = 387.62 cfs @ 12.09 hrs, Volume= 28.327 af
Primary = 387.62 cfs @ 12.09 hrs, Volume= 28.327 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link TOT: TOTAL PREDEVELOPEMENT

Inflow Area = 153.51 ac, 51.47% Impervious, Inflow Depth = 3.27" for 10-Year event
Inflow = 572.82 cfs @ 12.09 hrs, Volume= 41.820 af
Primary = 572.82 cfs @ 12.09 hrs, Volume= 41.820 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Subcatchment E1: TO CULVERT UNDER ROUTE 1A

Runoff = 152.44 cfs @ 12.09 hrs, Volume= 11.195 af, Depth= 4.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (ac)	CN	Description
*	18.38	98	Pavement, HSG C
	9.06	74	>75% Grass cover, Good, HSG C
	3.07	70	Woods, Good, HSG C
	2.74	77	Woods, Good, HSG D
	33.25	87	Weighted Average
	14.87		44.72% Pervious Area
	18.38		55.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment E2: TO WETLAND SOUTH OF TRACK

Runoff = 79.30 cfs @ 12.09 hrs, Volume= 5.856 af, Depth= 4.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (ac)	CN	Description
	3.83	74	>75% Grass cover, Good, HSG C
*	8.19	98	Pavement, HSG C
	0.75	98	Roofs, HSG C
	1.78	70	Woods, Good, HSG C
	1.14	77	Woods, Good, HSG D
	1.26	96	Gravel surface, HSG C
	16.95	88	Weighted Average
	8.01		47.26% Pervious Area
	8.94		52.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment E3: TO SALES CREEK

Runoff = 483.35 cfs @ 12.09 hrs, Volume= 35.692 af, Depth= 4.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (ac)	CN	Description
	39.22	74	>75% Grass cover, Good, HSG C
	13.22	98	Roofs, HSG C
*	2.68	98	Water Surface
	10.71	96	Gravel surface, HSG C
	0.17	70	Woods, Good, HSG C
*	35.79	98	Pavement, HSG C
	1.52	77	Woods, Good, HSG D
	103.31	88	Weighted Average
	51.62		49.97% Pervious Area
	51.69		50.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Link DP1: CULVERT UNDER ROUTE 1 A

Inflow Area = 33.25 ac, 55.28% Impervious, Inflow Depth = 4.04" for 25-Year event
Inflow = 152.44 cfs @ 12.09 hrs, Volume= 11.195 af
Primary = 152.44 cfs @ 12.09 hrs, Volume= 11.195 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link DP2: WETLAND SOUTH OF TRACK

Inflow Area = 16.95 ac, 52.74% Impervious, Inflow Depth = 4.15" for 25-Year event
Inflow = 79.30 cfs @ 12.09 hrs, Volume= 5.856 af
Primary = 79.30 cfs @ 12.09 hrs, Volume= 5.856 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link DP3: SALES CREEK

Inflow Area = 103.31 ac, 50.03% Impervious, Inflow Depth = 4.15" for 25-Year event
Inflow = 483.35 cfs @ 12.09 hrs, Volume= 35.692 af
Primary = 483.35 cfs @ 12.09 hrs, Volume= 35.692 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link TOT: TOTAL PREDEVELOPEMENT

Inflow Area = 153.51 ac, 51.47% Impervious, Inflow Depth = 4.12" for 25-Year event
Inflow = 715.10 cfs @ 12.09 hrs, Volume= 52.743 af
Primary = 715.10 cfs @ 12.09 hrs, Volume= 52.743 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Subcatchment E1: TO CULVERT UNDER ROUTE 1A

Runoff = 169.55 cfs @ 12.09 hrs, Volume= 12.516 af, Depth= 4.52"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 50-Year Rainfall=6.00"

	Area (ac)	CN	Description
*	18.38	98	Pavement, HSG C
	9.06	74	>75% Grass cover, Good, HSG C
	3.07	70	Woods, Good, HSG C
	2.74	77	Woods, Good, HSG D
	33.25	87	Weighted Average
	14.87		44.72% Pervious Area
	18.38		55.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment E2: TO WETLAND SOUTH OF TRACK

Runoff = 88.01 cfs @ 12.09 hrs, Volume= 6.534 af, Depth= 4.63"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 50-Year Rainfall=6.00"

	Area (ac)	CN	Description
	3.83	74	>75% Grass cover, Good, HSG C
*	8.19	98	Pavement, HSG C
	0.75	98	Roofs, HSG C
	1.78	70	Woods, Good, HSG C
	1.14	77	Woods, Good, HSG D
	1.26	96	Gravel surface, HSG C
	16.95	88	Weighted Average
	8.01		47.26% Pervious Area
	8.94		52.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment E3: TO SALES CREEK

Runoff = 536.40 cfs @ 12.09 hrs, Volume= 39.825 af, Depth= 4.63"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 50-Year Rainfall=6.00"

	Area (ac)	CN	Description
	39.22	74	>75% Grass cover, Good, HSG C
	13.22	98	Roofs, HSG C
*	2.68	98	Water Surface
	10.71	96	Gravel surface, HSG C
	0.17	70	Woods, Good, HSG C
*	35.79	98	Pavement, HSG C
	1.52	77	Woods, Good, HSG D
	103.31	88	Weighted Average
	51.62		49.97% Pervious Area
	51.69		50.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Link DP1: CULVERT UNDER ROUTE 1 A

Inflow Area = 33.25 ac, 55.28% Impervious, Inflow Depth = 4.52" for 50-Year event
Inflow = 169.55 cfs @ 12.09 hrs, Volume= 12.516 af
Primary = 169.55 cfs @ 12.09 hrs, Volume= 12.516 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link DP2: WETLAND SOUTH OF TRACK

Inflow Area = 16.95 ac, 52.74% Impervious, Inflow Depth = 4.63" for 50-Year event
Inflow = 88.01 cfs @ 12.09 hrs, Volume= 6.534 af
Primary = 88.01 cfs @ 12.09 hrs, Volume= 6.534 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link DP3: SALES CREEK

Inflow Area = 103.31 ac, 50.03% Impervious, Inflow Depth = 4.63" for 50-Year event
Inflow = 536.40 cfs @ 12.09 hrs, Volume= 39.825 af
Primary = 536.40 cfs @ 12.09 hrs, Volume= 39.825 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link TOT: TOTAL PREDEVELOPEMENT

Inflow Area = 153.51 ac, 51.47% Impervious, Inflow Depth = 4.60" for 50-Year event
Inflow = 793.95 cfs @ 12.09 hrs, Volume= 58.875 af
Primary = 793.95 cfs @ 12.09 hrs, Volume= 58.875 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Subcatchment E1: TO CULVERT UNDER ROUTE 1A

Runoff = 190.04 cfs @ 12.09 hrs, Volume= 14.113 af, Depth= 5.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 100-Year Rainfall=6.60"

	Area (ac)	CN	Description
*	18.38	98	Pavement, HSG C
	9.06	74	>75% Grass cover, Good, HSG C
	3.07	70	Woods, Good, HSG C
	2.74	77	Woods, Good, HSG D
	33.25	87	Weighted Average
	14.87		44.72% Pervious Area
	18.38		55.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment E2: TO WETLAND SOUTH OF TRACK

Runoff = 98.42 cfs @ 12.09 hrs, Volume= 7.353 af, Depth= 5.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 100-Year Rainfall=6.60"

	Area (ac)	CN	Description
	3.83	74	>75% Grass cover, Good, HSG C
*	8.19	98	Pavement, HSG C
	0.75	98	Roofs, HSG C
	1.78	70	Woods, Good, HSG C
	1.14	77	Woods, Good, HSG D
	1.26	96	Gravel surface, HSG C
	16.95	88	Weighted Average
	8.01		47.26% Pervious Area
	8.94		52.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment E3: TO SALES CREEK

Runoff = 599.88 cfs @ 12.09 hrs, Volume= 44.814 af, Depth= 5.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 100-Year Rainfall=6.60"

	Area (ac)	CN	Description
	39.22	74	>75% Grass cover, Good, HSG C
	13.22	98	Roofs, HSG C
*	2.68	98	Water Surface
	10.71	96	Gravel surface, HSG C
	0.17	70	Woods, Good, HSG C
*	35.79	98	Pavement, HSG C
	1.52	77	Woods, Good, HSG D
	103.31	88	Weighted Average
	51.62		49.97% Pervious Area
	51.69		50.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Link DP1: CULVERT UNDER ROUTE 1 A

Inflow Area = 33.25 ac, 55.28% Impervious, Inflow Depth = 5.09" for 100-Year event
Inflow = 190.04 cfs @ 12.09 hrs, Volume= 14.113 af
Primary = 190.04 cfs @ 12.09 hrs, Volume= 14.113 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link DP2: WETLAND SOUTH OF TRACK

Inflow Area = 16.95 ac, 52.74% Impervious, Inflow Depth = 5.21" for 100-Year event
Inflow = 98.42 cfs @ 12.09 hrs, Volume= 7.353 af
Primary = 98.42 cfs @ 12.09 hrs, Volume= 7.353 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link DP3: SALES CREEK

Inflow Area = 103.31 ac, 50.03% Impervious, Inflow Depth = 5.21" for 100-Year event
Inflow = 599.88 cfs @ 12.09 hrs, Volume= 44.814 af
Primary = 599.88 cfs @ 12.09 hrs, Volume= 44.814 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

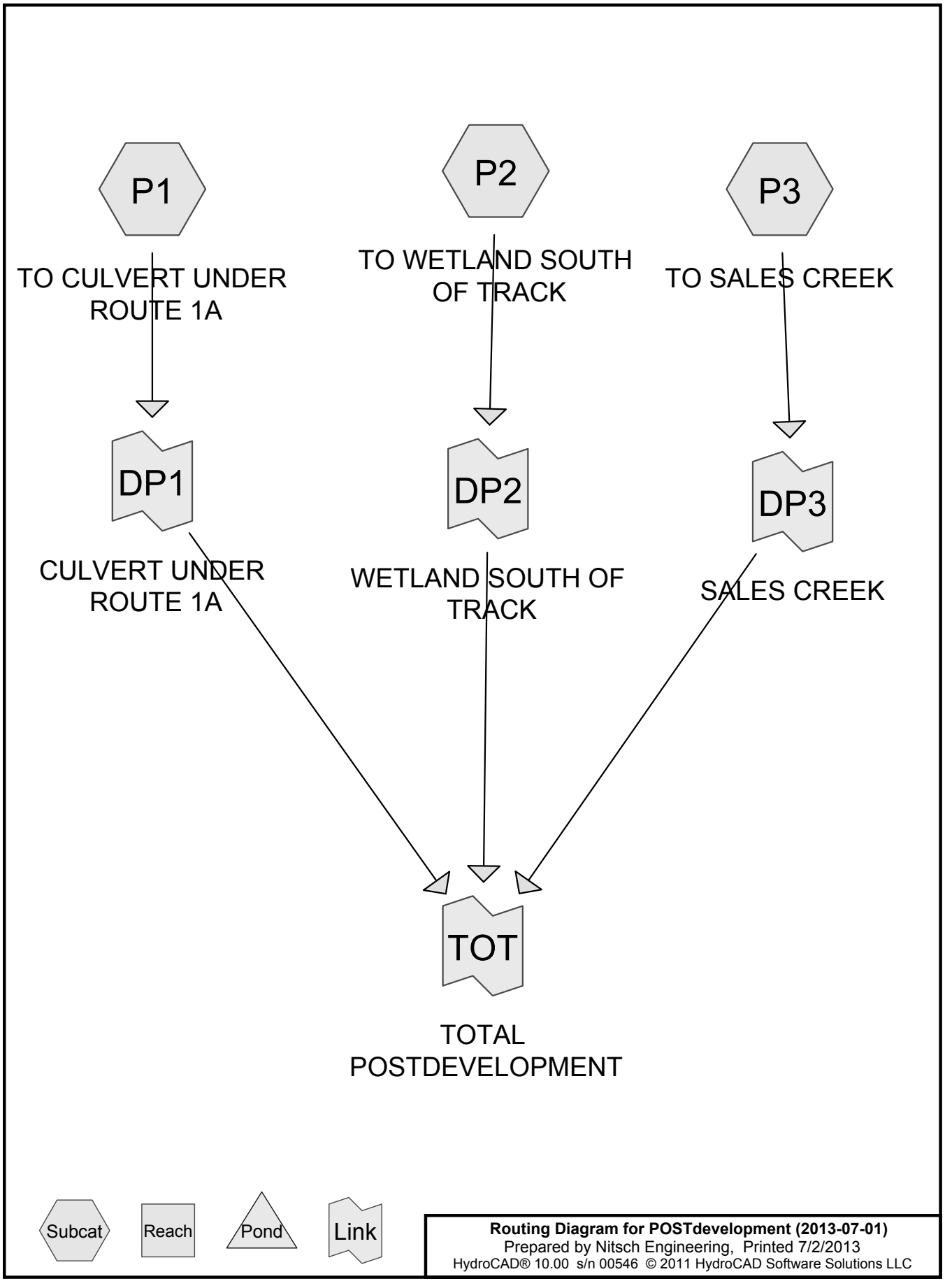
Summary for Link TOT: TOTAL PREDEVELOPEMENT

Inflow Area = 153.51 ac, 51.47% Impervious, Inflow Depth = 5.18" for 100-Year event
Inflow = 888.34 cfs @ 12.09 hrs, Volume= 66.280 af
Primary = 888.34 cfs @ 12.09 hrs, Volume= 66.280 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

APPENDIX C

Post-Development Conditions – HydroCAD Calculations



Routing Diagram for POSTdevelopment (2013-07-01)
Prepared by Nitsch Engineering, Printed 7/2/2013
HydroCAD® 10.00 s/n 00546 © 2011 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.92	70	Woods, Good, HSG C (P1, P2, P3)
64.10	74	>75% Grass cover, Good, HSG C (P1, P2, P3)
5.40	77	Woods, Good, HSG D (P1, P2, P3)
10.48	96	Gravel surface, HSG C (P3)
4.75	98	Bioretention Area (P1, P3)
42.42	98	Pavement, HSG C (P1, P2, P3)
19.76	98	Roofs, HSG C (P1, P3)
2.68	98	Water surface (P3)
153.51	**86**	**TOTAL AREA**

Summary for Subcatchment P1: TO CULVERT UNDER ROUTE 1A

Runoff = 68.42 cfs @ 12.09 hrs, Volume= 4.908 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (ac)	CN	Description
*	6.20	98	Pavement, HSG C
	4.20	98	Roofs, HSG C
	15.01	74	>75% Grass cover, Good, HSG C
	2.77	70	Woods, Good, HSG C
	2.74	77	Woods, Good, HSG D
*	4.09	98	Bioretention Area
	35.01	84	Weighted Average
	20.52		58.61% Pervious Area
	14.49		41.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P2: TO WETLAND SOUTH OF TRACK

Runoff = 37.67 cfs @ 12.09 hrs, Volume= 2.705 af, Depth= 1.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (ac)	CN	Description
*	9.38	98	Pavement, HSG C
	5.33	74	>75% Grass cover, Good, HSG C
	1.10	70	Woods, Good, HSG C
	1.14	77	Woods, Good, HSG D
	16.95	87	Weighted Average
	7.57		44.66% Pervious Area
	9.38		55.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P3: TO SALES CREEK

Runoff = 225.67 cfs @ 12.09 hrs, Volume= 16.205 af, Depth= 1.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (ac)	CN	Description
*	26.84	98	Pavement, HSG C
	15.56	98	Roofs, HSG C
*	2.68	98	Water surface
	43.76	74	>75% Grass cover, Good, HSG C
	0.05	70	Woods, Good, HSG C
	1.52	77	Woods, Good, HSG D
*	0.66	98	Bioretention Area
	10.48	96	Gravel surface, HSG C
	101.55	87	Weighted Average
	55.81		54.96% Pervious Area
	45.74		45.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Link DP1: CULVERT UNDER ROUTE 1A

Inflow Area = 35.01 ac, 41.39% Impervious, Inflow Depth = 1.68" for 2-Year event
Inflow = 68.42 cfs @ 12.09 hrs, Volume= 4.908 af
Primary = 68.42 cfs @ 12.09 hrs, Volume= 4.908 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link DP2: WETLAND SOUTH OF TRACK

Inflow Area = 16.95 ac, 55.34% Impervious, Inflow Depth = 1.91" for 2-Year event
Inflow = 37.67 cfs @ 12.09 hrs, Volume= 2.705 af
Primary = 37.67 cfs @ 12.09 hrs, Volume= 2.705 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link DP3: SALES CREEK

Inflow Area = 101.55 ac, 45.04% Impervious, Inflow Depth = 1.91" for 2-Year event
Inflow = 225.67 cfs @ 12.09 hrs, Volume= 16.205 af
Primary = 225.67 cfs @ 12.09 hrs, Volume= 16.205 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link TOT: TOTAL POSTDEVELOPMENT

Inflow Area = 153.51 ac, 45.35% Impervious, Inflow Depth = 1.86" for 2-Year event
Inflow = 331.75 cfs @ 12.09 hrs, Volume= 23.818 af
Primary = 331.75 cfs @ 12.09 hrs, Volume= 23.818 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Subcatchment P1: TO CULVERT UNDER ROUTE 1A

Runoff = 117.74 cfs @ 12.09 hrs, Volume= 8.480 af, Depth= 2.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 10-Year Rainfall=4.60"

	Area (ac)	CN	Description
*	6.20	98	Pavement, HSG C
	4.20	98	Roofs, HSG C
	15.01	74	>75% Grass cover, Good, HSG C
	2.77	70	Woods, Good, HSG C
	2.74	77	Woods, Good, HSG D
*	4.09	98	Bioretention Area
	35.01	84	Weighted Average
	20.52		58.61% Pervious Area
	14.49		41.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P2: TO WETLAND SOUTH OF TRACK

Runoff = 61.99 cfs @ 12.09 hrs, Volume= 4.509 af, Depth= 3.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 10-Year Rainfall=4.60"

	Area (ac)	CN	Description
*	9.38	98	Pavement, HSG C
	5.33	74	>75% Grass cover, Good, HSG C
	1.10	70	Woods, Good, HSG C
	1.14	77	Woods, Good, HSG D
	16.95	87	Weighted Average
	7.57		44.66% Pervious Area
	9.38		55.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P3: TO SALES CREEK

Runoff = 371.39 cfs @ 12.09 hrs, Volume= 27.014 af, Depth= 3.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 10-Year Rainfall=4.60"

	Area (ac)	CN	Description
*	26.84	98	Pavement, HSG C
	15.56	98	Roofs, HSG C
*	2.68	98	Water surface
	43.76	74	>75% Grass cover, Good, HSG C
	0.05	70	Woods, Good, HSG C
	1.52	77	Woods, Good, HSG D
*	0.66	98	Bioretention Area
	10.48	96	Gravel surface, HSG C
	101.55	87	Weighted Average
	55.81		54.96% Pervious Area
	45.74		45.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Link DP1: CULVERT UNDER ROUTE 1A

Inflow Area = 35.01 ac, 41.39% Impervious, Inflow Depth = 2.91" for 10-Year event
Inflow = 117.74 cfs @ 12.09 hrs, Volume= 8.480 af
Primary = 117.74 cfs @ 12.09 hrs, Volume= 8.480 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link DP2: WETLAND SOUTH OF TRACK

Inflow Area = 16.95 ac, 55.34% Impervious, Inflow Depth = 3.19" for 10-Year event
Inflow = 61.99 cfs @ 12.09 hrs, Volume= 4.509 af
Primary = 61.99 cfs @ 12.09 hrs, Volume= 4.509 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link DP3: SALES CREEK

Inflow Area = 101.55 ac, 45.04% Impervious, Inflow Depth = 3.19" for 10-Year event
Inflow = 371.39 cfs @ 12.09 hrs, Volume= 27.014 af
Primary = 371.39 cfs @ 12.09 hrs, Volume= 27.014 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link TOT: TOTAL POSTDEVELOPMENT

Inflow Area = 153.51 ac, 45.35% Impervious, Inflow Depth = 3.13" for 10-Year event
Inflow = 551.12 cfs @ 12.09 hrs, Volume= 40.003 af
Primary = 551.12 cfs @ 12.09 hrs, Volume= 40.003 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Subcatchment P1: TO CULVERT UNDER ROUTE 1A

Runoff = 150.10 cfs @ 12.09 hrs, Volume= 10.885 af, Depth= 3.73"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (ac)	CN	Description
*	6.20	98	Pavement, HSG C
	4.20	98	Roofs, HSG C
	15.01	74	>75% Grass cover, Good, HSG C
	2.77	70	Woods, Good, HSG C
	2.74	77	Woods, Good, HSG D
*	4.09	98	Bioretention Area
	35.01	84	Weighted Average
	20.52		58.61% Pervious Area
	14.49		41.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P2: TO WETLAND SOUTH OF TRACK

Runoff = 77.71 cfs @ 12.09 hrs, Volume= 5.707 af, Depth= 4.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (ac)	CN	Description
*	9.38	98	Pavement, HSG C
	5.33	74	>75% Grass cover, Good, HSG C
	1.10	70	Woods, Good, HSG C
	1.14	77	Woods, Good, HSG D
	16.95	87	Weighted Average
	7.57		44.66% Pervious Area
	9.38		55.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P3: TO SALES CREEK

Runoff = 465.58 cfs @ 12.09 hrs, Volume= 34.192 af, Depth= 4.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (ac)	CN	Description
*	26.84	98	Pavement, HSG C
	15.56	98	Roofs, HSG C
*	2.68	98	Water surface
	43.76	74	>75% Grass cover, Good, HSG C
	0.05	70	Woods, Good, HSG C
	1.52	77	Woods, Good, HSG D
*	0.66	98	Bioretention Area
	10.48	96	Gravel surface, HSG C
	101.55	87	Weighted Average
	55.81		54.96% Pervious Area
	45.74		45.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Link DP1: CULVERT UNDER ROUTE 1A

Inflow Area = 35.01 ac, 41.39% Impervious, Inflow Depth = 3.73" for 25-Year event
Inflow = 150.10 cfs @ 12.09 hrs, Volume= 10.885 af
Primary = 150.10 cfs @ 12.09 hrs, Volume= 10.885 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link DP2: WETLAND SOUTH OF TRACK

Inflow Area = 16.95 ac, 55.34% Impervious, Inflow Depth = 4.04" for 25-Year event
Inflow = 77.71 cfs @ 12.09 hrs, Volume= 5.707 af
Primary = 77.71 cfs @ 12.09 hrs, Volume= 5.707 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link DP3: SALES CREEK

Inflow Area = 101.55 ac, 45.04% Impervious, Inflow Depth = 4.04" for 25-Year event
Inflow = 465.58 cfs @ 12.09 hrs, Volume= 34.192 af
Primary = 465.58 cfs @ 12.09 hrs, Volume= 34.192 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link TOT: TOTAL POSTDEVELOPMENT

Inflow Area = 153.51 ac, 45.35% Impervious, Inflow Depth = 3.97" for 25-Year event
Inflow = 693.38 cfs @ 12.09 hrs, Volume= 50.783 af
Primary = 693.38 cfs @ 12.09 hrs, Volume= 50.783 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Subcatchment P1: TO CULVERT UNDER ROUTE 1A

Runoff = 168.13 cfs @ 12.09 hrs, Volume= 12.243 af, Depth= 4.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 50-Year Rainfall=6.00"

	Area (ac)	CN	Description
*	6.20	98	Pavement, HSG C
	4.20	98	Roofs, HSG C
	15.01	74	>75% Grass cover, Good, HSG C
	2.77	70	Woods, Good, HSG C
	2.74	77	Woods, Good, HSG D
*	4.09	98	Bioretention Area
	35.01	84	Weighted Average
	20.52		58.61% Pervious Area
	14.49		41.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P2: TO WETLAND SOUTH OF TRACK

Runoff = 86.43 cfs @ 12.09 hrs, Volume= 6.381 af, Depth= 4.52"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 50-Year Rainfall=6.00"

	Area (ac)	CN	Description
*	9.38	98	Pavement, HSG C
	5.33	74	>75% Grass cover, Good, HSG C
	1.10	70	Woods, Good, HSG C
	1.14	77	Woods, Good, HSG D
	16.95	87	Weighted Average
	7.57		44.66% Pervious Area
	9.38		55.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P3: TO SALES CREEK

Runoff = 517.83 cfs @ 12.09 hrs, Volume= 38.227 af, Depth= 4.52"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 50-Year Rainfall=6.00"

	Area (ac)	CN	Description
*	26.84	98	Pavement, HSG C
	15.56	98	Roofs, HSG C
*	2.68	98	Water surface
	43.76	74	>75% Grass cover, Good, HSG C
	0.05	70	Woods, Good, HSG C
	1.52	77	Woods, Good, HSG D
*	0.66	98	Bioretention Area
	10.48	96	Gravel surface, HSG C
	101.55	87	Weighted Average
	55.81		54.96% Pervious Area
	45.74		45.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Link DP1: CULVERT UNDER ROUTE 1A

Inflow Area = 35.01 ac, 41.39% Impervious, Inflow Depth = 4.20" for 50-Year event
Inflow = 168.13 cfs @ 12.09 hrs, Volume= 12.243 af
Primary = 168.13 cfs @ 12.09 hrs, Volume= 12.243 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link DP2: WETLAND SOUTH OF TRACK

Inflow Area = 16.95 ac, 55.34% Impervious, Inflow Depth = 4.52" for 50-Year event
Inflow = 86.43 cfs @ 12.09 hrs, Volume= 6.381 af
Primary = 86.43 cfs @ 12.09 hrs, Volume= 6.381 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link DP3: SALES CREEK

Inflow Area = 101.55 ac, 45.04% Impervious, Inflow Depth = 4.52" for 50-Year event
Inflow = 517.83 cfs @ 12.09 hrs, Volume= 38.227 af
Primary = 517.83 cfs @ 12.09 hrs, Volume= 38.227 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link TOT: TOTAL POSTDEVELOPMENT

Inflow Area = 153.51 ac, 45.35% Impervious, Inflow Depth = 4.44" for 50-Year event
Inflow = 772.39 cfs @ 12.09 hrs, Volume= 56.851 af
Primary = 772.39 cfs @ 12.09 hrs, Volume= 56.851 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Subcatchment P1: TO CULVERT UNDER ROUTE 1A

Runoff = 189.78 cfs @ 12.09 hrs, Volume= 13.890 af, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 100-Year Rainfall=6.60"

	Area (ac)	CN	Description
*	6.20	98	Pavement, HSG C
	4.20	98	Roofs, HSG C
	15.01	74	>75% Grass cover, Good, HSG C
	2.77	70	Woods, Good, HSG C
	2.74	77	Woods, Good, HSG D
*	4.09	98	Bioretention Area
	35.01	84	Weighted Average
	20.52		58.61% Pervious Area
	14.49		41.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P2: TO WETLAND SOUTH OF TRACK

Runoff = 96.88 cfs @ 12.09 hrs, Volume= 7.194 af, Depth= 5.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 100-Year Rainfall=6.60"

	Area (ac)	CN	Description
*	9.38	98	Pavement, HSG C
	5.33	74	>75% Grass cover, Good, HSG C
	1.10	70	Woods, Good, HSG C
	1.14	77	Woods, Good, HSG D
	16.95	87	Weighted Average
	7.57		44.66% Pervious Area
	9.38		55.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P3: TO SALES CREEK

Runoff = 580.40 cfs @ 12.09 hrs, Volume= 43.102 af, Depth= 5.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type III 24-hr 100-Year Rainfall=6.60"

	Area (ac)	CN	Description
*	26.84	98	Pavement, HSG C
	15.56	98	Roofs, HSG C
*	2.68	98	Water surface
	43.76	74	>75% Grass cover, Good, HSG C
	0.05	70	Woods, Good, HSG C
	1.52	77	Woods, Good, HSG D
*	0.66	98	Bioretention Area
	10.48	96	Gravel surface, HSG C
	101.55	87	Weighted Average
	55.81		54.96% Pervious Area
	45.74		45.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Link DP1: CULVERT UNDER ROUTE 1A

Inflow Area = 35.01 ac, 41.39% Impervious, Inflow Depth = 4.76" for 100-Year event
Inflow = 189.78 cfs @ 12.09 hrs, Volume= 13.890 af
Primary = 189.78 cfs @ 12.09 hrs, Volume= 13.890 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link DP2: WETLAND SOUTH OF TRACK

Inflow Area = 16.95 ac, 55.34% Impervious, Inflow Depth = 5.09" for 100-Year event
Inflow = 96.88 cfs @ 12.09 hrs, Volume= 7.194 af
Primary = 96.88 cfs @ 12.09 hrs, Volume= 7.194 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link DP3: SALES CREEK

Inflow Area = 101.55 ac, 45.04% Impervious, Inflow Depth = 5.09" for 100-Year event
Inflow = 580.40 cfs @ 12.09 hrs, Volume= 43.102 af
Primary = 580.40 cfs @ 12.09 hrs, Volume= 43.102 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

Summary for Link TOT: TOTAL POSTDEVELOPMENT

Inflow Area = 153.51 ac, 45.35% Impervious, Inflow Depth = 5.02" for 100-Year event
Inflow = 867.05 cfs @ 12.09 hrs, Volume= 64.186 af
Primary = 867.05 cfs @ 12.09 hrs, Volume= 64.186 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs

APPENDIX D

Long-Term Pollution Prevention and Stormwater Operation and Maintenance Plan

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APPENDIX D:
LONG-TERM POLLUTION PREVENTION PLAN AND STORMWATER OPERATION AND MAINTENANCE PLAN

Resort at Suffolk Downs

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1.0 INTRODUCTION

The purpose of this document is to specify the pollution prevention measures and stormwater management system operation and maintenance for the Resort at Suffolk Downs (the Resort). The Owner shall implement the management practices outlined in this Manual and proactively conduct operations at the Resort in an environmentally responsible manner. Compliance with this Manual does not in any way dismiss the Owner, property manager, or occupants from compliance with other applicable Federal, State or local laws.

Owner: The Resort at Suffolk Downs
525 McClellan Highway
East Boston, MA 02128

This Document has been prepared in compliance with Standards 4 and 9 of the 2008 Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards, which state:

Standard 4:
The Long Term Pollution Prevention Plan shall include the proper procedures for the following:

- Good housekeeping
- Storing materials and waste products inside or under cover
- Vehicle washing
- Routine inspections of stormwater best management practices
- Spill prevention and response
- Maintenance of lawns, gardens, and other landscaped areas
- Storage and used of fertilizers, herbicides, and pesticides
- Pet waste management
- Operation and management of septic systems
- Proper management of deicing chemicals and snow

Standard 9:
The Long-Term Operation and Maintenance Plan shall at a minimum include:

- Stormwater management system(s) owner(s)
- The party or parties responsible for operation and maintenance, including how future property owners shall be notified of the presence of the stormwater management system and the requirement for operation and maintenance
- The routine and non-routine maintenance tasks to be undertaken after construction is complete and a schedule for implementing those tasks
- A plan that is drawn to scale and shows the location of all stormwater BMPs in each treatment train along with the discharge point
- A description of public safety features
- An estimated operations and maintenance budget

2.0 LONG-TERM POLLUTION PREVENTION PLAN

2.1 Source Control Practices for Pollution Prevention

The Owner and occupants should follow good housekeeping procedures at the Resort to reduce the possibility of accidental releases and to reduce safety hazards, which shall include but not be limited to the following:

- Proper handling, storage, disposal, and recycling of hazardous materials and waste products.
- Proper handling, storage and inventory of household chemicals.
- Prompt cleanup and removal of spills and releases.

2.2 Storage of Hazardous Materials

To prevent leaks and spills, keep hazardous materials and waste products under cover or inside. Use drip pans or spill containment systems to prevent chemicals from entering the drainage system. Inspect storage areas for materials and waste products at least once per year to determine amount and type of the material on site, and if the material requires disposal.

Securely store liquid petroleum products and other liquid chemicals in federally- and state-approved containers. Restrict access to maintenance personnel and administrators.

Store fluid fertilizers in labeled containers and/or structures that prevent the discharge of fluid fertilizers and are resistant to corrosion, puncture, or cracking. Store and handle dry fertilizers in a manner to prevent pollution by minimizing losses to the air, surface water, ground water, or subsoil.

2.3 Storage of Waste Products

Collect and store all waste materials in securely lidded dumpster(s) or other secure containers as applicable to the material. Keep dumpster lids closed and the areas around them clean. Do not fill the dumpsters with liquid waste or hose them out. Sweep areas around the dumpster regularly and put the debris in the garbage, instead of sweeping or hosing it into the parking lot. Legally dispose of collected waste on a regular basis.

Segregate liquid wastes, including motor oil, antifreeze, solvents, and lubricants, from solid waste and recycle through hazardous waste disposal companies, whenever possible. Separate oil filters, batteries, tires, and metal filings from grinding and polishing metal parts from common trash items and recycle. These items are not trash and are illegal to dump. Contact a hazardous waste hauler for proper disposal of unwanted pesticides to a hazardous waste collection center.

2.4 Spill Prevention and Response

The Owner shall implement spill response procedures for releases of significant materials such as fuels, oils, or chemical materials onto the ground or other area that could reasonably be expected to discharge to surface or groundwater.

- For minor spills, keep fifty (50) gallon spill control kits and Speedy Dry at all maintenance facilities and work areas.

- Immediately contact applicable Federal, State, and local agencies for reportable quantities as required by law.

- Immediately perform applicable containment and cleanup procedures following a spill release.

- Promptly remove and dispose of all material collected during the response in accordance with Federal, State and local requirements. A licensed emergency response contractor may be required to assist in cleanup of releases depending on the amount of the release, and the ability of the Contractor to perform the required response.

- Reportable quantities of chemicals, fuels, or oils are established under the Clean Water Act and enforced through Massachusetts Department of Environmental Protection (DEP).

2.5 Minimize Soil Erosion

Soil erosion facilitates mechanical transport of nutrients, pathogens, and organic matter to surface water bodies. Repair all areas where erosion is occurring throughout the Resort. Stabilize bare soil with riprap, seed, mulch, or vegetation.

2.6 Vehicle Washing:

Vehicle washing shall not occur on the property.

2.7 Maintenance of Lawns, Gardens, and other Landscaped Areas

Pesticides and fertilizers shall not be used in landscaped areas located within environmentally sensitive areas, including the 25-foot Riverfront Area to Sales Creek and the 100-foot Buffer Zone to the Bordering Vegetated Wetlands. Grass clippings, pruned branches and any other landscaped waste should be disposed of or composted in an appropriate location outside of the environmentally-sensitive areas. No irrigation shall be used in the landscaped areas for this project.

2.8 Management of Deicing Chemicals and Snow

The qualified contractor selected for snow plowing and deicing shall be made fully aware of the requirements of this section.

No road salt (sodium chloride) shall be stored on-site. The use of magnesium chloride de-icing product with a 0.5 to 1.0 percent sodium chloride mix for snow and ice treatment is permitted. The product shall be stored in a locked room inside the building and shall be used at exterior stairs and walkways. The snow plow contractor shall adhere to these magnesium chloride use and storage requirements.

During typical snow plowing operations, snow shall be pushed to the designated snow removal areas. Snow shall not be stockpiled in environmentally sensitive areas, including the 25-foot Riverfront Area to Sales Creek and the 100-foot Buffer Zones to the Bordering Vegetated Wetlands, the bioretention basins, or biofiltration swales. In severe conditions where snow cannot be stockpiled on site, the snow shall be removed from the site and properly disposed of in accordance with DEP Guideline BRP601-01.

Use of sand is permitted only for impervious roadways and parking areas. If sand is applied, the snow plowed from impervious areas shall not be stored on porous asphalt.

Porous pavers are proposed in pedestrian areas. The porous pavers shall be maintained during snow events as provided below:

- Apply anti-icing treatments prior to storms only when absolutely necessary. It is not anticipated that deicing chemicals will be required for typical winter events.

- Plow as needed after storm events. Avoid scarifying the paver surface. Special plow blades should be used whenever possible. Attach rollers to the bottoms of snowplows to prevent them from catching on the edges of pavers.

- Apply the minimum amount of deicing agents during and after storms required to control compact snow and ice that are not removed by plowing.

- Do not apply sand in porous paver areas. "No Sanding" signs shall be posted before the first snowfall and maintenance and snow removal contractors shall be made aware of this requirement.

Before winter begins, the property owner and the contractor shall review snow plowing, deicing, and stockpiling procedures. Areas designated for stockpiling should be cleaned of any debris. Street and parking lot sweeping should be followed in accordance with the Operation and Maintenance Plan.

2.9 Coordination with other Permits and Requirements

Certain conditions of other approvals affecting the long term management of the property shall be considered part of this Long Term Pollution Prevention Plan. The Owner shall become familiar with those documents and comply with the guidelines set forth in those documents.

3.0 STORMWATER MANAGEMENT SYSTEM OPERATION AND MAINTENANCE PLAN

3.1 Introduction

This Stormwater Management System Operation and Maintenance Plan (O&M Plan) for the Resort at Suffolk Downs is required under Standard 9 of the 2008 MassDEP Stormwater Handbook to provide best management practices for implementing maintenance activities for the stormwater management system in a manner that minimizes impacts to wetland resource areas.

The Owner shall implement this O&M Plan and proactively conduct operations at the site in an environmentally responsible manner. Compliance with this O&M Plan does not in any way dismiss the Owner from compliance with other applicable Federal, State or local laws.

Routine maintenance during construction and post-development phases of the project, as defined in the Operation and Maintenance Plan, shall be permitted without amendment to the Order of Conditions. A continuing condition in the Certificate of Compliance shall ensure that maintenance can be performed without triggering further filings under the Wetlands Protection Act.

All stormwater best management practices (BMPs) shall be operated and maintained in accordance with the design plans and the Operation and Maintenance Plan approved by the issuing authority. The Owner shall:

a. Maintain an operation and maintenance log for the last three years, including inspections, repairs, replacement and disposal (for disposal the log shall indicate the type of material and the disposal location). This is a rolling log in which the responsible party records all operation and maintenance activities for the past three years.

b. Make this log available to MassDEP and the Conservation Commission upon request; and

c. Allow members and agents of the MassDEP and the Conservation Commission to enter and inspect the premises to evaluate and ensure that the Owner complies with the Operation and Maintenance requirements for each BMP.

3.2 Stormwater Operation and Maintenance Requirements

Inspect and maintain the stormwater management system as directed below. Repairs to any component of the system shall be made as soon as possible to prevent any potential pollutants (including silt) from entering the resource areas.

<u>Deep Sump and Hooded Catch Basins</u>

Inspect catch basins four times per year, including after the foliage season. Other inspection and maintenance requirements include:

- Remove organic material, sediment and hydrocarbons four times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.
- Always clean out catch basins after street sweeping. If any evidence of hydrocarbons is found during inspection, the material immediately remove using absorbent pads or other suitable measures and dispose of legally. Remove other accumulated debris as necessary.

- Transport and disposal of accumulated sediment off-site shall be in accordance with applicable local, state and federal guidelines and regulations.

Area Drains

Inspect area drains at least once per month and remove debris from the grate. Clean out accumulated sediments at least once per year and more frequently as necessary.

Stormceptor® Water Quality Structures

Maintain Stormceptor® water quality structures according the recommendations set forth by the manufacturer, which are provided below:

- Units should be inspected post construction, prior to being put into service.
- Inspect every six months for the first year to determine the oil and sediment accumulation rate. All inspections shall include checking the oil level and sediment depth in the unit. Removal of sediments/oils shall occur per manufacturer recommendations.
- In subsequent years, inspections can be based on first-year observations and no less than once per year.
- Cleaning is required once the sediment depth reaches 15% of storage capacity, and no less than once per year.
- Inspect the unit immediately after an oil, fuel or chemical spill.
- A licensed waste management company should remove oil and sediment and dispose responsibly.
- OSHA confined space entry protocols shall be followed if entry into the unit is required.

Sediment Forebays

At a minimum, inspect the sediment forebays monthly and remove accumulated sediment at least four times per year. Stabilize the flood and sidewalls of the forebay before making it operational. When mowing grasses, keep the height no greater than 6 inches. Check for signs of erosion and repair as needed. After removing sediment, replace any vegetation damaged during the clean-out by either reseeding or re-sodding. When reseeding, incorporate practices such as hydroseeding with a tackifier, blanket, or similar practice to ensure that no scour occurs in the forebay.

Bioretention Basins

Perform annual maintenance of all components of the bioretention basins, including plants, soil, and mulch. Table 1, below, outlines recommended maintenance activities.

Table 1. Bioretention area maintenance recommendations

Location	Description	Frequency	Time of Year
Surface	Inspect and remove trash	Monthly	Year round
Soil	Inspect and repair erosion	Monthly	Year round
Organic Layer	Remulch void areas	Annually	Spring
	Remove previous mulch layer before applying new layer (optional)	Annually	Spring
Plants	Water vegetation at end of day for 14 consecutive days after planting	Immediately after planting	As needed
	Remove and replace all dead and diseased vegetation that cannot be treated	Annually	Spring
	Treat all diseased trees and shrubs	As needed	Variable

During and after storm events, record the length of time standing water remains in the bioretention basins. If the time is greater than 72 hours, thoroughly inspect the basins for signs of clogging and develop a corrective action plan. The corrective action plan, prepared by a qualified professional, will outline procedures to restore infiltrative function. The owner of the site shall take immediate action to implement these corrective measures.

Biofiltration Swales

Inspect the biofiltration swales in the first few months after construction to ensure that there is no rilling or gullying, and that vegetation in the swales is adequate. Thereafter, inspect the swales twice per year for slope integrity, soil moisture, vegetative health, soil stability, soil compaction, soil erosion, ponding, and sediment accumulation.

Regular maintenance tasks include mowing, fertilizing, liming, watering, pruning, weeding, and pest control.

- Mow channels at least once per year. Do not cut the grass shorter than three to four inches. Keep grass height under 6 inches to maintain the design depth necessary to serve as a conveyance. Do not mow excessively, because it may increase the design flow velocity.
- Remove sediment and debris manually at least once per year.
- Re-seed periodically to maintain the dense growth of grass vegetation.

Porous Pavers

Porous pavers are proposed in pedestrian areas throughout the site. Inspection and maintenance of the porous pavers are critical to prevent clogging.

Frequent vacuum sweeping along with jet washing of porous asphalt is required. No winter sanding shall be conducted on the porous surface. For proper maintenance:

- Keep adjacent landscaped areas well maintained to prevent soil from being transported onto the porous pavers.
- Regularly monitor the porous pavers to check for deterioration and make sure that they drain

properly after storm events.

- Clean the surface of the porous pavers using vacuum sweeping as required to keep the pavement functioning as designed. For paving stones, periodically add joint material (sand) to replace material that has been transported.
- At a minimum, the porous pavers shall be cleaned after the winter season and every three months thereafter. This requirement may be adjusted as needed, based on regular visual inspections of the paver surface.
- Periodically reseed grass pavers to fill in bare spots.
- Never seal or pave with impermeable materials.
- When infiltrative capacity of porous pavers is reduced to less than the design rate, the pavers and base materials shall be replaced.

Stormwater Outfalls

Inspect flared end sections and associated riprap spillways at least once per year and after major storm events (rainfall totals greater than 2.5 inches in 24 hours) to ensure that the stability of the outlet area is maintained. Keep the outfall area clear of debris such as trash, branches, and sediment. Make repairs immediately if riprap displacement or downstream channel scour is observed.

Level Spreaders

Inspect level spreaders regularly, especially after major storm events (rainfall totals greater than 2.5 inches in 24 hours). Repair any erosion or low spots in the level spreader.

3.3 Street Sweeping

Perform street sweeping at least twice per year and whenever there is significant debris present on roads and parking lots. Street sweeping shall occur in March (or before spring rains begin) and November (or before the first snow storm). Sweepings must be handled and disposed of properly according to the Conservation Commission.

3.4 Repair of the Stormwater Management System

The stormwater management system shall be maintained. The repair of any component of the system shall be made as soon as possible to prevent any potential pollutants including silt from entering the resource areas or the existing closed drainage system.

3.5 Reporting

The Owner shall maintain a record of drainage system inspections and maintenance (per this Plan) and submit a yearly report to the Conservation Commission.

STORMWATER MANAGEMENT SYSTEM INSPECTION & MAINTENANCE FORM

The Resort at Suffolk Downs
East Boston, MA

Inspected by:_____
Date:_____

Component	Status/Inspection	Action Taken
Deep Sump Catch Basins, Area Drains and Drain Manholes		
Sediment Forebays		
Bioretention Basins		
Biofiltration Swales		
Stormceptor Water Quality Structures		
Stormwater Outfalls with Level Spreaders		
Porous Pavers		

SUBMIT COPIES OF STORMWATER MANAGEMENT SYSTEM INSPECTION FORM TO THE CONSERVATION COMMISSIONS WITH THE YEARLY REPORT.

Nitsch Engineering

APPENDIX E

DRAFT Stormwater Pollution Prevention Plan (SWPPP)

Construction SWPPP Template

Instructions

To help you develop your construction project Stormwater Pollution Prevention Plan (SWPPP), the U.S Environmental Protection Agency (EPA) has created this SWPPP Template. The template is designed to help you develop a SWPPP that is compliant with the minimum requirements of EPA's 2012 Construction General Permit ("2012 CGP"), and is customizable to your specific project and site.

Using the SWPPP Template

Each section of the SWPPP Template includes "instructions" and space for your project and site information. You should read the instructions for each section before you complete that section. The SWPPP Template was developed as an editable document file so that you can easily add tables and additional text, and delete unneeded or non-applicable fields. Note that some sections may require only a brief description while others may require several pages of explanation.

The following tips for using this template will help you ensure that the minimum permit requirements are met:

- Read the 2012 CGP thoroughly before you begin preparation of your SWPPP to ensure that you have a working understanding of the permit's underlying requirements. You will also need to consult Part 9 of the permit to determine if your state or tribe has included additional requirements that affect you.
- Complete the SWPPP prior to submitting your Notice of Intent (NOI) for permit coverage. This is required in Parts 1.4 and 7.1.1.
- If you prepared a SWPPP for coverage under a previous version of EPA's CGP, you must review and update your SWPPP to ensure that the 2012 CGP requirements are addressed prior to submitting your NOI.

  Note: If your project is an "existing project" (see Part 1.4.2.b) or if you are a "new operator of an existing project" (see Part 1.4.2.c), and it is infeasible for you to comply with a specific requirement in Part 2.1 and 2.3.3 through 2.3.5 of the permit (except for Parts 2.3.3.1, 2.3.3.2b, 2.3.3.3c.i, and 2.3.3.4) because (1) the provision was not part of the permit you were previously covered under (i.e., the 2003 or 2008 CGP), and (2) because you are prevented from compliance due to the nature or location of earth disturbances that commenced prior to February 16, 2012, or because you are unable to comply with the requirement due to the manner in which stormwater controls have already been installed or were already designed prior to February 16, 2012, you are required to include documentation in your SWPPP of the reasons why it is infeasible for you to meet the specific requirement, and then you may be waived from complying with the requirement. You must include a separate justification why it is infeasible for you to meet each of the applicable requirements.

- If there is more than one construction operator for your project, consider coordinating development of your SWPPP with the other operators. However, while multiple operators may share the same SWPPP, make sure that responsibilities and scope of work are clearly described for each operator.
- Once you have been provided coverage under the CGP, include your NOI and authorization email, as well as a copy of the CGP, as attachments to the SWPPP. See Appendices B and C of the SWPPP Template.

EPA notes that while EPA has made every effort to ensure the accuracy of all instructions and guidance contained in the SWPPP Template, the actual obligations of regulated construction activities are determined by the relevant provisions of the permit, not by the Template. In the event of a conflict between the SWPPP Template and any corresponding provision of the 2012 CGP, you must abide by the requirements in the permit. EPA welcomes comments on the SWPPP Template at any time and will consider those comments in any future revision of this document. You may contact EPA for CGP-related inquiries at cgp@epa.gov.

Stormwater Pollution Prevention Plan (SWPPP)

For Construction Activities At:

The Resort at Suffolk Downs
525 McClellan Highway
East Boston, MA 02128

SWPPP Prepared For:

Sterling Suffolk Racecourse LLC
c/o Alan Spara, Plaza Construction
111 Waldemar Ave
East Boston, MA 02128
212-849-4720
aspara@plazaconstruction.com

SWPPP Prepared By:

Nitsch Engineering
Timothy McGivern
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Boston, MA 02108
617-338-0063
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SWPPP Preparation Date:

07/02/2013

Estimated Project Dates:

Project Start Date: 06/01/2014
Project Completion Date: 07/01/2016

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SECTION 1: CONTACT INFORMATION/RESPONSIBLE PARTIES

1.1 Operator(s) / Subcontractor(s)

Operator(s):

Suffolk Construction
CONTACT: Ed Janus
ADDRESS: 65 Allerton Street
Boston, MA 02219
PHONE: 617-445-3500

EMAIL: ejanus@suffolkconstruction.com

Subcontractor(s):

CONTACT:
ADDRESS:

PHONE:

EMAIL:

Emergency 24-Hour Contact:

Insert Company or Organization Name:
Insert Name:
Insert Telephone Number:

1.2 Stormwater Team

Professional Engineer
Director of Planning
Scott Turner, PE, AICP, LEED AP ND
617-338-0063
sturner@nitscheng.com

Professional Engineer
Senior Project Engineer
Timothy McGivern, PE, LEED AP BD+C
617-338-0063
tmcgivern@nitscheng.com

SECTION 2: SITE EVALUATION, ASSESSMENT, AND PLANNING

2.1 Project/Site Information

Project Name and Address

Project/Site Name: Resort at Suffolk Downs
Project Street/Location: 525 McClellan Highway
City: East Boston
State: MA
ZIP Code: 02128
County or Similar Subdivision: Suffolk

Project Latitude/Longitude

(Use **one** of three possible formats, and specify method)

Latitude:	Longitude:
1. 42 ° 23 ' 36.24" N (degrees, minutes, seconds)	1. 70 ° 59 ' 52.73" W (degrees, minutes, seconds)
2. _ _ ° _ _ . _ _ ' N (degrees, minutes, decimal)	2. _ _ ° _ _ . _ _ ' W (degrees, minutes, decimal)
3. _ _ . _ _ _ _ ° N (decimal)	3. _ _ . _ _ _ _ ° W (decimal)

Method for determining latitude/longitude:
☐ USGS topographic map (specify scale: _____) ☐ EPA Web site ☐ GPS
☒ Other (please specify): Google Earth

Horizontal Reference Datum:
☐ NAD 27 ☒ NAD 83 or WGS 84 ☐ Unknown

If you used a U.S.G.S topographic map, what was the scale? _____

Additional Project Information

Is the project/site located on Indian country lands, or located on a property of religious or cultural significance to an Indian tribe? ☐ Yes ☒ No

If yes, provide the name of the Indian tribe associated with the area of Indian country (including the name of Indian reservation if applicable), or if not in Indian country, provide the name of the Indian tribe associated with the property:

If you are conducting earth-disturbing activities in response to a public emergency, document the cause of the public emergency *(e.g., natural disaster, extreme flooding conditions)*, information substantiating its occurrence *(e.g., state disaster declaration)*, and a description of the construction necessary to reestablish effective public services:

Are you applying for permit coverage as a "federal operator" as defined in Appendix A of the 2012 CGP? ☐ Yes ☒ No

2.2 Discharge Information

Does your project/site discharge stormwater into a Municipal Separate Storm Sewer System (MS4)? ☐ Yes ☒ No

Are there any surface waters that are located within 50 feet of your construction disturbances?
☒ Yes ☐ No

Table 1 – Names of Receiving Waters

Name(s) of the first surface water that receives stormwater directly from your site and/or from the MS4 (note: multiple rows provided where your site has more than one point of discharge that flows to different surface waters)
1. Sales Creek
2.
3.
4.
5.
6.

Table 2 – Impaired Waters / TMDLs (Answer the following for each surface water listed in Table 1 above)

	Is this surface water listed as "impaired"?	If you answered yes, then answer the following:			
		What pollutant(s) are causing the impairment?	Has a TMDL been completed?	Title of the TMDL document	Pollutant(s) for which there is a TMDL
1.	☒ YES ☐ NO	**Pathogens**	☒ YES ☐ NO	**Draft Pathogen TMDL for the Boston Harbor Watershed (excluding the Neponset River sub-basin)**	**Pathogens**
2.	☐ YES ☐ NO		☐ YES ☐ NO		
3.	☐ YES ☐ NO		☐ YES ☐ NO		
4.	☐ YES ☐ NO		☐ YES ☐ NO		
5.	☐ YES ☐ NO		☐ YES ☐ NO		
6.	☐ YES ☐ NO		☐ YES ☐ NO		

Describe the method(s) you used to determine whether or not your project/site discharges to an impaired water:
http://www.mass.gov/dep/water/resources/bharbor1.pdf

Table 3 – Tier 2, 2.5, or 3 Waters (Answer the following for each surface water listed in Table 1 above)

	Is this surface water designated as a Tier 2, Tier 2.5, or Tier 3 water? (see Appendix F)	If you answered yes, specify which Tier (2, 2.5, or 3) the surface water is designated as?
1.	☐ YES ☒ NO	INSERT "Tier 2", "Tier 2.5", or "Tier 3"
2.	☐ YES ☐ NO	INSERT "Tier 2", "Tier 2.5", or "Tier 3"
3.	☐ YES ☐ NO	INSERT "Tier 2", "Tier 2.5", or "Tier 3"
4.	☐ YES ☐ NO	INSERT "Tier 2", "Tier 2.5", or "Tier 3"
5.	☐ YES ☐ NO	INSERT "Tier 2", "Tier 2.5", or "Tier 3"
6.	☐ YES ☐ NO	INSERT "Tier 2", "Tier 2.5", or "Tier 3"

2.3 Nature of the Construction Activity

General Description of Project
Provide a general description of the construction project:

Caesars Resort at Suffolk Downs is a redevelopment proposed on approximately 161 acres of land that will contain two distinct gaming areas (referred to herein as "Casino Area I" and "Casino Area II"), up to 450 guestrooms in two hotels, a multi-purpose meeting/entertainment space, dedicated covered parking, fine dining, and retail space. The Proponent proposes to construct substantial infrastructure improvements on Route 1A in the vicinity of the Project site as an integral part of the Project. The Project elements are more specifically listed below:

- Two hotels: an approximately 300-room Hotel I and an approximately 150-room Hotel II;
- Multi-purpose meeting/entertainment space;
- Dining: approximately 16 restaurants including fine dining concepts, casual outlets, and a food court;
- Gaming Space: approximately 200,000 square feet of gaming space containing 4,000-5,000 slot machines, 200 table games, and a World Series of Poker™ room;
- Retail: approximately 30,000 square feet;
- Central Utility Plant (CUP); and
- Parking: a total of approximately 5,000 parking spaces including structural and surface parking spaces.

The Project also involves continued operations at the Suffolk Downs racetrack as well as continued maintenance in the existing horse barn area.

Size of Construction Project
What is the size of the property (in acres), the total area expected to be disturbed by the construction activities (in acres), and the maximum area expected to be disturbed at any one time?

SIZE OF PROPERTY: 161 acres
AREA OF CONSTRUCTION DISTURBANCES: 161 Acres

Construction Support Activities (only provide if applicable)
Describe any construction support activities for the project (e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas)

2.4 Sequence and Estimated Dates of Construction Activities

TO BE DETERMINED BY GENERAL CONTRACTOR PRIOR TO CONSTRUCTION

The project is anticipated to start in June 2014 and be completed in July 2016.

2.5 Allowable Non-Stormwater Discharges

List of Allowable Non-Stormwater Discharges Present at the Site

Type of Allowable Non-Stormwater Discharge	Likely to be Present at Your Site?
Discharges from emergency fire-fighting activities	☐ YES ☒ NO
Fire hydrant flushings	☐ YES ☒ NO
Landscape irrigation	☒ YES ☐ NO
Waters used to wash vehicles and equipment	☒ YES ☐ NO
Water used to control dust	☒ YES ☐ NO
Potable water including uncontaminated water line flushings	☒ YES ☐ NO
Routine external building wash down	☒ YES ☐ NO
Pavement wash waters	☒ YES ☐ NO
Uncontaminated air conditioning or compressor condensate	☒ YES ☐ NO
Uncontaminated, non-turbid discharges of ground water or spring water	☒ YES ☐ NO
Foundation or footing drains	☒ YES ☐ NO
Construction dewatering water	☒ YES ☐ NO

(Note: You are reminded of the requirement to identify the likely locations of these allowable non-stormwater discharges on your site map. See Section 2.6, below, of the SWPPP Template.)

2.6 Site Maps

SECTION 3: DOCUMENTATION OF COMPLIANCE WITH OTHER FEDERAL REQUIREMENTS

3.1 Endangered Species Protection

Eligibility Criterion

Under which criterion listed in Appendix D are you eligible for coverage under this permit?

☒ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E**

For reference purposes, the eligibility criteria listed in Appendix D are as follows:

Criterion A. No federally-listed threatened or endangered species or their designated critical habitat(s) are likely to occur in your site's "action area" as defined in Appendix A of this permit.

Criterion B. The construction site's discharges and discharge-related activities were already addressed in another operator's valid certification of eligibility for your action area under eligibility Criterion A, C, D, E, or F and there is no reason to believe that federally-listed species or federally-designated critical habitat not considered in the prior certification may be present or located in the "action area". To certify your eligibility under this Criterion, there must be no lapse of NPDES permit coverage in the other operator's certification. By certifying eligibility under this Criterion, you agree to comply with any effluent limitations or conditions upon which the other operator's certification was based. You must include in your NOI the tracking number from the other operator's notification of authorization under this permit. If your certification is based on another operator's certification under Criterion C, you must provide EPA with the relevant supporting information required of existing dischargers in Criterion C in your NOI form.

Criterion C. Federally-listed threatened or endangered species or their designated critical habitat(s) are likely to occur in or near your site's "action area," and your site's discharges and discharge-related activities are not likely to adversely affect listed threatened or endangered species or critical habitat. This determination may include consideration of any stormwater controls and/or management practices you will adopt to ensure that your discharges and discharge-related activities are not likely to adversely affect listed species and critical habitat. To make this certification, you must include the following in your NOI: 1) any federally listed species and/or designated habitat located in your "action area"; and 2) the distance between your site and the listed species or designated critical habitat (in miles). You must also include a copy of your site map with your NOI.

Criterion D. Coordination between you and the Services has been concluded. The coordination must have addressed the effects of your site's discharges and discharge-related activities on federally-listed threatened or endangered species and federally-designated critical habitat, and must have resulted in a written concurrence from the relevant Service(s) that your site's discharges and discharge-related activities are not likely to adversely affect listed species or critical habitat. You must include copies of the correspondence between yourself and the Services in your SWPPP and your NOI.

Criterion E. Consultation between a Federal Agency and the U.S. Fish and Wildlife Service and/or the National Marine Fisheries Service under section 7 of the ESA has been concluded. The consultation must have addressed the effects of the construction site's discharges and discharge-related activities on federally-listed threatened or endangered species and federally-designated critical habitat. The result of this consultation must be either:

i. a biological opinion that concludes that the action in question (taking into account the effects of your site's discharges and discharge-related activities) is not likely to jeopardize the continued existence of listed species, nor the destruction or adverse modification of critical habitat; or

ii. written concurrence from the applicable Service(s) with a finding that the site's discharges and discharge-related activities are not likely to adversely affect federally-listed species or federally-designated habitat.

You must include copies of the correspondence between yourself and the Services in your SWPPP and your NOI.

Criterion F. Your construction activities are authorized through the issuance of a permit under section 10 of the ESA, and this authorization addresses the effects of the site's discharges and discharge-related activities on federally-listed species and federally-designated critical habitat. You must include copies of the correspondence between yourself and the Services in your SWPPP and your NOI.

Supporting Documentation

Provide documentation for the applicable eligibility criterion you select in Appendix D, as follows:

For criterion A, indicate the basis for your determination that no federally-listed threatened or endangered species or their designated critical habitat(s) are likely to occur in your site's action area (as defined in Appendix A of the permit). Check the applicable source of information you relied upon:

- ☐ Specific communication with staff of the U.S. Fish & Wildlife Service or National Marine Fisheries Service.
- ☒ Publicly available species list. NHESP Priority Habitats online viewer and GIS data
- ☐ Other source:

3.2 Historic Preservation

Appendix E, Step 1

Do you plan on installing any of the following stormwater controls at your site? Check all that apply below, and proceed to Appendix E, Step 2.

- ☐ Dike
- ☐ Berm
- ☒ Catch Basin
- ☐ Pond
- ☒ Stormwater Conveyance Channel (e.g., ditch, trench, perimeter drain, swale, etc.)
- ☒ Culvert
- ☒ Other type of ground-disturbing stormwater control: proprietary water quality structures, bioretention basin, rainwater harvesting cistern, porous pavers

(Note: If you will not be installing any ground-disturbing stormwater controls, no further documentation is required for Section 3.2 of the Template.)

Appendix E, Step 2

If you answered yes in Step 1, have prior surveys or evaluations conducted on the site already determined that historic properties do not exist, or that prior disturbances at the site have precluded the existence of historic properties? ☒ YES ☐ NO

- If yes, no further documentation is required for Section 3.2 of the Template.
- If no, proceed to Appendix E, Step 3.

Appendix E, Step 3

If you answered no in Step 2, have you determined that your installation of subsurface earth-disturbing stormwater controls will have no effect on historic properties? ☐ YES ☐ NO

If yes, provide documentation of the basis for your determination. INSERT REFERENCES TO DOCUMENTS, STUDIES, OR OTHER SOURCES RELIED UPON

If no, proceed to Appendix E, Step 4.

Appendix E, Step 4

If you answered no in Step 3, did the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Office (THPO), or other tribal representative (whichever applies) respond to you within 15 calendar days to indicate whether the subsurface earth disturbances caused by the installation of stormwater controls affect historic properties? ☐ YES ☐ NO

If no, no further documentation is required for Section 3.2 of the Template.

If yes, describe the nature of their response:

☐ Written indication that adverse effects to historic properties from the installation of stormwater controls can be mitigated by agreed upon actions. INSERT COPIES OF LETTERS, EMAILS, OR OTHER COMMUNICATION BETWEEN YOU AND THE APPLICABLE SHPO, THPO, OR OTHER TRIBAL REPRESENTATIVE

☐ No agreement has been reached regarding measures to mitigate effects to historic properties from the installation of stormwater controls. INSERT COPIES OF LETTERS, EMAILS, OR OTHER COMMUNICATION BETWEEN YOU AND THE APPLICABLE SHPO, THPO, OR OTHER TRIBAL REPRESENTATIVE

☐ Other: INSERT COPIES OF LETTERS, EMAILS, OR OTHER COMMUNICATION BETWEEN YOU AND THE APPLICABLE SHPO, THPO, OR OTHER TRIBAL REPRESENTATIVE

3.3 Safe Drinking Water Act Underground Injection Control Requirements

Do you plan to install any of the following controls? Check all that apply below.

- ☐ Infiltration trenches (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)
- ☒ Commercially manufactured pre-cast or pre-built proprietary subsurface detention vaults, chambers, or other devices designed to capture and infiltrate stormwater flow
- ☐ Drywells, seepage pits, or improved sinkholes (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)

If yes, INSERT COPIES OF LETTERS, EMAILS, OR OTHER COMMUNICATION BETWEEN YOU AND THE STATE AGENCY OR EPA REGIONAL OFFICE

SECTION 4: EROSION AND SEDIMENT CONTROLS

General Instructions (See CGP Parts 2.1 and 7.2.10):

- Describe the erosion and sediment controls that will be installed and maintained at your site.
- For more information or ideas on BMPs, see EPA's National Menu of BMPs http://www.epa.gov/npdes/stormwater/menuofbmps

4.1 Natural Buffers or Equivalent Sediment Controls

Instructions (see CGP Parts 2.1.2.1 and 7.2.9, and Appendix G):

This section only applies to you if a surface water is located within 50 feet your construction activities. If this is the case, consult CGP Part 2.1.2.1 and Appendix G for information on how to comply with the buffer requirements.

- Describe the compliance alternative (CGP Part 2.1.2.1.a.i, ii, or iii) that was chosen to meet the buffer requirements, and include any required documentation supporting the alternative selected. The compliance alternative selected must be maintained throughout the duration of permit coverage. However, if you select a different compliance alternative during your period of permit coverage, you must modify your SWPPP to reflect this change.
- If you qualify for one of the exceptions in CGP Part 2.1.2.1.e, include documentation related to your qualification for such exceptions.

Buffer Compliance Alternatives

Are there any surface waters within 50 feet of your project's earth disturbances? ☒ YES ☐ NO

(Note: If no, no further documentation is required for the SWPPP Template.)

Check the compliance alternative that you have chosen:

☐ I will provide and maintain a 50-foot undisturbed natural buffer.

(Note (1): You must show the 50-foot boundary line of the natural buffer on your site map.)

(Note (2): You must show on your site map how all discharges from your construction disturbances through the natural buffer area will first be treated by the site's erosion and sediment controls. Also, show on the site map any velocity dissipation devices used to prevent erosion within the natural buffer area.)

☐ I will provide and maintain an undisturbed natural buffer that is less than 50 feet and is supplemented by additional erosion and sediment controls, which in combination achieves the sediment load reduction equivalent to a 50-foot undisturbed natural buffer.

(Note (1): You must show the boundary line of the natural buffer on your site map.)

(Note (2): You must show on your site map how all discharges from your construction disturbances through the natural buffer area will first be treated by the site's erosion and sediment controls. Also, show on the site map any velocity dissipation devices used to prevent erosion within the natural buffer area.)

☐ It is infeasible to provide and maintain an undisturbed natural buffer of any size, therefore I will implement erosion and sediment controls that achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer.

☒ I qualify for one of the exceptions in Part 2.1.2.1.e. (If you have checked this box, provide information on the applicable buffer exception that applies, below.)

Buffer Exceptions

Which of the following exceptions to the buffer requirements applies to your site?

☐ There is no discharge of stormwater to the surface water that is located 50 feet from my construction disturbances.

(Note: If this exception applies, no further documentation is required for Section 4.1 of the Template.)

☒ No natural buffer exists due to preexisting development disturbances that occurred prior to the initiation of planning for this project.

(Note (1): If this exception applies, no further documentation is required for Section 4.1 of the Template.)

(Note (2): Where some natural buffer exists but portions of the area within 50 feet of the surface water are occupied by preexisting development disturbances, you must still comply with the one of the CGP Part 2.1.2.1.a compliance alternatives.)

☐ For a "linear project" (defined in Appendix A), site constraints (e.g., limited right-of-way) make it infeasible for me to meet any of the CGP Part 2.1.2.1.a compliance alternatives. INCLUDE DOCUMENTATION HERE OF THE FOLLOWING: (1) WHY IT IS INFEASIBLE FOR YOU TO MEET ONE OF THE BUFFER COMPLIANCE ALTERNATIVES, AND (2) BUFFER WIDTH RETAINED AND/OR SUPPLEMENTAL EROSION AND SEDIMENT CONTROLS TO TREAT DISCHARGES TO THE SURFACE WATER

☐ The project qualifies as "small residential lot" construction (defined in Part 2.1.2.1.e.iv and in Appendix A).

For Alternative 1 (see Appendix G, Part G.2.3.2.a):

- INSERT WIDTH OF NATURAL BUFFER TO BE RETAINED
- INSERT APPLICABLE REQUIREMENTS BASED ON TABLE G-1
- INSERT DESCRIPTION OF HOW YOU WILL COMPLY WITH THESE REQUIREMENTS

For Alternative 2 (see Appendix G, Part G.2.3.2.b):

- INSERT (1) THE ASSIGNED RISK LEVEL BASED ON APPLICABLE TABLE IN APP. G, PART G.2.3.2.b, AND (2) THE PREDOMINANT SOIL TYPE AND AVERAGE SLOPE AT YOUR SITE
- INSERT APPLICABLE REQUIREMENTS BASED ON APP. G, TABLE G-7
- INSERT DESCRIPTION OF HOW YOU WILL COMPLY WITH THESE REQUIREMENTS

☐ Buffer disturbances are authorized under a CWA Section 404 permit. INSERT DESCRIPTION OF ANY EARTH DISTURBANCES THAT WILL OCCUR WITHIN THE BUFFER AREA

(Note (1): If this exception applies, no further documentation is required for Section 4.1 of the Template.)

(Note (2): This exception only applies to the limits of disturbance authorized under the Section 404 permit, and does not apply to any upland portion of the construction project.)

☐ Buffer disturbances will occur for the construction of a water-dependent structure or water access area (e.g., pier, boat ramp, and trail). INSERT DESCRIPTION OF ANY EARTH DISTURBANCES THAT WILL OCCUR WITHIN THE BUFFER AREA

(Note (1): If this exception applies, no further documentation is required for Section 4.1 of the Template.)

4.2 Perimeter Controls

General

The area of construction activity will be enclosed with a combination chain link fence, wind screen, and silt fence. The sediment controls will be installed along those perimeter areas of the site that will receive stormwater from earth-disturbing activities as shown on the plan. Gates will be constructed as shown on the plans to allow for construction vehicle access.

Specific Perimeter Controls

Perimeter Control # 1

- BMP Description: Silt Fence/Straw bales
- Installation Schedule: Start of construction
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

Perimeter Control # 2

- BMP Description: Super Silt Fence
- Installation Schedule: Start of construction
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

Perimeter Control # 3

- BMP Description: Sediment Trap
- Installation Schedule: Start of dewatering activities
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

Perimeter Control # 4

- BMP Description: Check Dams
- Installation Schedule: Start of construction
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

4.3 Sediment Track-Out

General

Gates will be constructed as shown on the plans to allow for construction vehicle access. Construction access points will either have a stabilized construction entrance at the access location or a wheel wash station to minimize the track-out of sediment onto off-site streets, other paved areas, and sidewalks from vehicles exiting the construction site. Sediment tracked offsite must be removed by the end of the same workday.

Specific Track-Out Controls

Track-Out Control # 1

- BMP Description: Designated truck washing area
  - ☐ Permanent ☒ Temporary
- Installation Schedule: Start of construction
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

Track-Out Control # 2

- BMP Description: Stone filter berm
  - ☐ Permanent ☒ Temporary
- Installation Schedule: Start of construction
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

Track-Out Control # 3

- BMP Description: Wheel Wash station and Gravel
- Installation Schedule: Start of construction
- Maintenance and Inspection: Daily
- Responsible Staff: **Construction Manager** and **Site Contractor**

Track-Out Control # 4

- BMP Description: Street Sweeping
- Installation Schedule: Start of construction
- Maintenance and Inspection: Weekly or as needed
- Responsible Staff **Construction Manager** and **Site Contractor**

4.4 Stockpiled Sediment or Soil

General

All soil stockpiles are to be located away from existing catch basin structures and shall be protected from contact with onsite stormwater runoff using temporary perimeter sediment barriers.

Soil stockpiles shall also be provided with cover (a tarp) or appropriate temporary stabilization to avoid direct contact with precipitation and to minimize sediment discharge. All excavated soil will be stockpiled in the designated areas onsite. Soil stabilization measures shall be initiated immediately when earth-disturbing activities have permanently or temporarily ceased on any portion of the site. Earth-disturbing activities are considered temporarily ceased when work will not resume for a period of 14 or more calendar days. Stabilization activities shall be completed within 14 calendar days after the initiation of soil stabilization measures. Hay bales or a silt fence may be placed around the perimeter of stockpiles to contain sediments. Stabilized portions of a site shall be inspected at least once per month. In landscaped areas or areas where infiltration practices will be installed, soil compaction shall be minimized. This includes restricting vehicle and equipment use and conditioning soil to support vegetative growth. When utilizing sediment basins, use outlet structures that withdraw water from the surface of the basins.

Specific Stockpile Controls

Stockpile Control # 1

- BMP Description: Soil Stabilization Mats
- Installation Schedule: As/if required
- Maintenance and Inspection: Weekly & after storm events greater than 0.25"
- Responsible Staff: **Construction Manager** and **Site Contractor**

Stockpile Control # 2

- BMP Description: Rip-Rap
- Installation Schedule: As/if required
- Maintenance and Inspection: Weekly & after storm events greater than 0.25"
- Responsible Staff: **Construction Manager** and **Site Contractor**

Stockpile Control # 3

- BMP Description: Silt fabric Catch Basin Inlet Protection
- Installation Schedule: Start of construction
- Maintenance and Inspection: Weekly & after storm events greater than 0.25"
- Responsible Staff: **Construction Manager** and **Site Contractor**

Stockpile Control # 4

- BMP Description: Block and Gravel Inlet Protection
- Installation Schedule: Start of construction
- Maintenance and Inspection: Weekly & after storm events greater than 0.25"
- Responsible Staff: **Construction Manager** and **Site Contractor**

Stockpile Control # 5

- BMP Description: Silt Sacks
- Installation Schedule: Start of construction
- Maintenance and Inspection: Weekly & after storm events greater than 0.25"
- Responsible Staff: **Construction Manager** and **Site Contractor**

4.5 Minimize Dust

General

Soils shall be stabilized with temporary seeding and mulching or a tarp to prevent blowing dust and siltation into the storm drain system. Hay bales or a silt fence may be placed around the perimeter of stockpiles to contain sediments.

Specific Dust Controls

Dust Control # 1

- BMP Description: Contractor's seed mix
  - ☐ Permanent ☒ Temporary
- Installation Schedule: Start of earthwork activities
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

Dust Control # 2

- BMP Description: Hydro Seeding
  - ☐ Permanent ☒ Temporary
- Installation Schedule: Start of earthwork activities
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

Dust Control # 3

- BMP Description: Straw or Mulch
  - ☐ Permanent ☒ Temporary
- Installation Schedule: Start of earthwork activities
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

Dust Control # 4

- BMP Description: Annual Rye Seed Mix
  - ☐ Permanent ☒ Temporary
- Installation Schedule: Start of earthwork activities
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

4.6 Minimize the Disturbance of Steep Slopes

General

Disturbance of slopes 15% or greater shall be minimized. Steep slopes will be stabilized against erosion by the use of a temporary vegetative cover. Stabilized portions of a site shall be inspected at least one per month.

Specific Steep Slope Controls

Steep Slope Control # 1

- BMP Description: Straw or Mulch
- Installation Schedule: Start of earthwork activities
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

Steep Slope Control # 2

- BMP Description: Contractor's seed mix
- Installation Schedule: Start of earthwork activities
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

Steep Slope Control # 3

- BMP Description: Hydro Seeding
- Installation Schedule: Start of earthwork activities
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

Steep Slope Control # 4

- BMP Description: Soil Stabilization Mats
- Installation Schedule: Start of earthwork activities
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

Steep Slope Control # 5

- BMP Description: Rip-Rap

  ☐ Permanent ☒ Temporary
- Installation Schedule: Start of earthwork activities
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

4.7 Topsoil

General

Onsite native topsoil shall be preserved, unless infeasible. Soil stabilization measures shall be initiated immediately when earth-disturbing activities have permanently or temporarily ceased on any portion of the site. Earth-disturbing activities are considered temporarily ceased when work will not resume for a period of 14 or more calendar days. Stabilization activities shall be completed within 14 calendar days after the initiation of soil stabilization measures.

Specific Topsoil Controls

Topsoil Control # 1

- BMP Description: Contractor's seed mix
  - ☐ Permanent ☒ Temporary
- Installation Schedule: Start of earthwork activities
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

Topsoil Control # 2

- BMP Description: Hydro Seeding
  - ☐ Permanent ☒ Temporary
- Installation Schedule: Start of earthwork activities
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

Topsoil Control # 3

- BMP Description: Straw or Mulch
  - ☐ Permanent ☒ Temporary
- Installation Schedule: Start of earthwork activities
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

Topsoil Control # 4

- BMP Description: Annual Rye Seed Mix
  - ☐ Permanent ☒ Temporary
- Installation Schedule: Start of earthwork activities
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

4.8 Soil Compaction

General

In landscaped areas or areas where infiltration practices will be installed, soil compaction shall be minimized. This includes restricting vehicle and equipment use and conditioning soil to support vegetative growth. When utilizing sediment basins, use outlet structures that withdraw water from the surface of the basins.

Specific Soil Compaction Controls – TO BE DETERMINED BY GENERAL CONTRACTOR PRIOR TO CONSTRUCTION

Soil Compaction Control # 1

Soil Compaction Control Description

- INSERT DESCRIPTION OF SOIL COMPACTION CONTROL TO BE INSTALLED
- INCLUDE COPIES OF DESIGN SPECIFICATIONS HERE

Installation

- INSERT APPROXIMATE DATE OF INSTALLATION

Maintenance Requirements

- INSERT MAINTENANCE REQUIREMENTS FOR THE SOIL COMPACTION CONTROL

[Repeat as needed for individual soil compaction controls.]

4.9 Storm Drain Inlets

Specific Storm Drain Inlet Controls

Storm Drain Inlet Control # 1

- BMP Description: Silt fabric Catch Basin Inlet Protection
- Design Specifications: Found on Detail Sheet C504
- Installation Schedule: Start of site disturbance activities
- Inspection: Weekly & after storm events greater than 0.25"
- Maintenance: Clean, or remove and replace, the protection measures as sediment accumulates, the filter becomes clogged, and/or performance is compromised. Where there is evidence of sediment accumulation adjacent to the inlet protection measure, you must remove the deposited sediment by the end of the same work day in which it is found or by the end of the following work day if removal by the same work day is not feasible.
- Responsible Staff: Construction Manager and Site Contractor

Storm Drain Inlet Control # 2

- BMP Description: Silt Sacks
- Design Specifications: As needed
- Installation Schedule: Start of site disturbance activities
- Inspection: Weekly & after storm events greater than 0.25"
- Maintenance: Clean, or remove and replace, the protection measures as

sediment accumulates, the filter becomes clogged, and/or performance is compromised. Where there is evidence of sediment accumulation adjacent to the inlet protection measure, you must remove the deposited sediment by the end of the same work day in which it is found or by the end of the following work day if removal by the same work day is not feasible.

- Responsible Staff: Construction Manager and Site Contractor

4.10 Constructed Stormwater Conveyance Channels

Specific Conveyance Channel Controls

Stormwater Conveyance Channel Control # 1

- BMP Description: Check Dams
- Installation Schedule: Start of construction
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

Stormwater Conveyance Channel Control # 2

- BMP Description: Rip-Rap

  ☐ Permanent ☒ Temporary
- Installation Schedule: Start of earthwork activities
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

4.11 Sediment Basins

Specific Sediment Basin Controls

Sediment Basin Control # 1

- BMP Description: Weir
- Installation Schedule: Start of earthwork activities
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

4.12 Chemical Treatment

There are no proposed chemical treatments associated with this project, and therefore no proposed BMP's.

4.13 Dewatering Practices

Specific Dewatering Practices

Dewatering Practice # 1

- BMP Description: Sediment Trap
  - ☐ Permanent ☒ Temporary
- Installation Schedule: Start of de-watering activities
- Maintenance and Inspection: Weekly & after 1/4" storm events
- Responsible Staff: **Construction Manager** and **Site Contractor**

Dewatering Practice # 2

- BMP Description: Stone filter berm
  - ☐ Permanent ☒ Temporary
- Installation Schedule: Start of construction
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

4.14 Other Stormwater Controls

Any changes in construction activity that produce other allowable non-stormwater discharges will be identified, the SWPPP will be amended, and the appropriate erosion and sedimentation controls will be implemented.

4.15 Site Stabilization

Site Stabilization Practice (only use this if you are not located in an arid, semi-arid, or drought-stricken area)

All excavated soil will be stockpiled in the designated areas onsite. Soil stabilization measures shall be initiated immediately when earth-disturbing activities have permanently or temporarily ceased on any portion of the site. Earth-disturbing activities are considered temporarily ceased when work will not resume for a period of 14 or more calendar days. Stabilization activities shall be completed within 14 calendar days after the initiation of soil stabilization measures. It shall be stabilized with temporary soil stabilization mats or a tarp to prevent blowing dust and siltation into the storm drain system.

☐ *Vegetative* ☒ *Non-Vegetative*
☒ *Temporary* ☐ *Permanent*

- BMP Description: Soil Stabilization Mat
- Installation Schedule: As/if required
- Maintenance and Inspection: Weekly & after storm events greater than 0.25"
- Responsible Staff: Construction Manager and Site Contractor

SECTION 5: POLLUTION PREVENTION STANDARDS

5.1 Potential Sources of Pollution

Potential sources of sediment to stormwater runoff:

- Stockpiles and construction staging
- Clearing and grubbing operations
- Grading and site excavation
- Topsoil stripping
- Landscape operations
- Soil tracking offsite from construction vehicles
- Runoff from unstabilized areas
- Construction debris

Potential pollutants and sources, other than sediment, to stormwater runoff:

- Combined Staging Area – fueling activities, equipment maintenance, sanitary facilities, and hazardous waste storage
- Materials Storage Area – building materials, solvents, adhesives, paving materials, paints, aggregates, trash, etc.
- Construction Activity-paving, curb installation, concrete pouring, and building construction

The **Contractor** shall coordinate staging areas with the **Owner.** The location of all staging areas will be determined for each phase of construction and shown on plans produced by The Contractor.

Potential Site Pollutants

MATERIALS/ CHEMICAL	PHYSICAL DESCRIPTION	STORMWATER POLLUTANTS	LOCATION
Pesticides (insecticides, fungicides, herbicides, rodenticides)	Various colored to colorless liquid powder, pellets, or grains	Chlorinated hydrocarbons, organophosphates, carbonates, arsenic	Herbicides used for noxious weed control
Fertilizers	Liquid of solid grains	Nitrogen, phosphorous	Newly seeded areas
Plaster	White granules or powder	Calcium sulphate, calcium carbonate, sulfuric acid	Building construction
Cleaning Solvents	Colorless, blue, or yellow green liquid	Perchloroethylene, methylene chloride, trichloroethylene, petroleum distillates	No equipment cleaning allowed in project limits
Asphalt	Black solid	Oil, petroleum distillates	Streets and parking lots

Concrete	White solid/grey liquid	Limestone, sand pH, chromium	Curb and gutter, sidewalk, building construction
Glue, Adhesives	White or yellow liquid	Polymers, epoxies	Building construction
Paints	Various colored liquid	Metal oxides, Stoddard solvent, talc, calcium carbonate, arsenic	Building construction
Curing compounds	Creamy white liquid	Naphtha	Curb and gutter, building construction
Wood preservatives	Clear amber or dark brown liquid	Stoddard solvent, petroleum distillates, arsenic, copper, chromium	Timber pads, bracing, building construction
Hydraulic Oils/fluids	Brown oily petroleum hydrocarbon	Mineral oil	Leaks/broken hoses from equipment
Gasoline	Colorless, pale brown or pink petroleum hydrocarbon	Benzene, ethyl benzene, toluene, xylene, MTBE	Secondary containment/staging area
Diesel Fuel	Clear, blue-green to yellow liquid	Petroleum distillate, oil & grease, naphthalene, xylenes	Secondary containment/staging area
Kerosene	Pale yellow liquid petroleum hydrocarbon	Coal oil, petroleum distillates	Secondary containment/staging area
Antifreeze/coolant	Clear green/yellow liquid	Ethylene glycol, propylene glycol, heavy metals (copper, lead, zinc)	Leaks or broken hoses from equipment
Sanitary toilets	Various colored liquid	Bacteria, parasites, and viruses	Staging area

5.2 Spill Prevention and Response

If fueling and/or maintenance of equipment or vehicles takes place, an effective means of eliminating the discharge of spilled or leaked chemicals, including fuel, from the area where these activities will take place must be provided. If applicable, the Spill Prevention Control and Countermeasures (SPCC) requirements in 40 CFR 112 and Section 311 of the CWA must be complied with. Adequate supplies must be available at all times to handle spill, leaks, and disposal of used liquids. Drip pans and absorbents must be used under or around leaky vehicles. Oil and oily wastes must be disposed of or recycled in accordance with other federal, state, tribal, or local requirements. Spills or contaminated surfaces must be cleaned up immediately using dry clean up measures where possible, and the source of the spill must be eliminated to prevent a discharge or a furtherance of an ongoing discharge. Surfaces cannot be cleaned by hosing the area down.

Spill Prevention and Control Practice

- BMP Description: Spill kit, vehicle washing, straw bale catch basin protection, silt fence
- Installation Schedule: Start of construction activity
- Maintenance and Inspection: Minimum weekly & as necessary
- Responsible Staff: **Construction Manager** and **Site Contractor**

- Hazardous material handling shall be provided to sub Construction Manager.
- Major vehicle maintenance on-site shall be prohibited
- Re-fueling of vehicles within 25 feet of a drainage structure shall be prohibited
- Spill kit shall be kept on-site consisting of:
    - Gloves
    - Absorbent mats
    - Drip pan

Spill Prevention and Control Plan

- Manufacturers' recommended spill control methods will be posted onsite and site personnel will be made aware of the requirements.
- Cleanup supplies will be kept onsite in a materials storage area. This equipment will include: goggles, brooms, dustpans, mops, rags, gloves, oil absorbent, sawdust, plastic and metal trash cans, and other materials and supplies specifically designated for cleanup.
- All spills will be immediately cleaned up after discovery.
- The spill area will be well ventilated.
- Cleanup personnel will wear suitable protective clothing.
- Spills of toxic and/or hazardous material will be reported to state, local, and Federal authorities, as required by law. Spills shall also be reported immediately to the owner.
- A spill incident report will be filed detailing the amount and extent of the spill, material(s) involved, and effectiveness of the cleanup. This report will be on file at the Construction Manager/ Site Contractor office, as well as kept onsite in the field office. A copy shall also be filed with the Hazard Communication Coordinator (HCC).
- The **Construction Manager/ Site Contractor** will designate someone onsite that will serve as the Spill Cleanup Coordinator. At least two other personnel will be designated as alternate spill coordinators. All spill control personnel will be trained in spill prevention, control, and cleanup.

The names of the responsible personnel will be posted at the jobsite office of the **Construction Manager/ Site Contractor.**

5.3 Fueling and Maintenance of Equipment or Vehicles

Minor vehicle and equipment emergency maintenance can be performed onsite. Major vehicle and equipment maintenance must be performed offsite. Equipment/vehicle storage areas and any onsite fuel tanks will be inspected weekly and after storm events. Equipment and vehicles will be inspected on each day of use. Any leaks will be repaired immediately or the equipment/vehicle will be removed from the site.

Minor vehicle and equipment emergency maintenance shall occur when a vehicle cannot be safely removed from the site. The vehicle should be repaired so it can be taken off-site so that the rest of the maintenance can occur.

Major vehicle maintenance on-site is prohibited. Re-fueling of vehicles within 25 feet of a drainage structure shall be prohibited.

5.4 Washing of Equipment and Vehicles

Pollution Prevention Practice # 1

- BMP Description: Designated truck washing area

  ☐ Permanent ☒ Temporary
- Installation Schedule: Start of construction
- Maintenance and Inspection: Weekly & after storm events greater than 1/4"
- Responsible Staff: **Construction Manager** and **Site Contractor**

5.5 Storage, Handling, and Disposal of Construction Products, Materials, and Wastes

5.5.1 Building Products

Any building materials required to be stored onsite will be stored at a combined staging and materials storage area. Larger items, such as framing materials, will be elevated by appropriate methods to minimize contact with runoff. The storage area will be inspected weekly and after storm events. It will be kept clean, organized, and equipped with appropriate cleaning supplies. Perimeter controls (silt fence, straw bales, gravel bag berms, etc.), containment structures, covers, and liners will be repaired or replaced as needed to maintain proper function.

Building product usage shall follow the following good housekeeping BMPs:

- The Responsible Staff: Construction Manager or Site Contractor representative will inspect daily for proper use, storage, and cleanup of material used on the job site.
- Store only enough material onsite required for that job as to satisfy current construction needs.
- Store required materials in tightly lidded containers under cover.
- Store materials in original containers with clearly legible labels.
- Separate and store materials apart from each other.
- Do not mix materials unless specifically in accordance with manufacturers' recommendations.
- Use all products from a container before disposing of the container.

- Follow manufacturers' instructions for handling, storage, and disposing of all materials.
- All materials shall be stored in an area to prevent the discharge of pollutants from building products.

Pollution Prevention Practice # 1

- BMP Description: Stacked straw bales around soil stockpiles
- Installation Schedule: Start of construction
- Maintenance and Inspection: Weekly & after storm events greater than 0.25"
- Responsible Staff: Construction Manager and Site Contractor

Pollution Prevention Practice # 2

- BMP Description: Silt Fence
- Installation Schedule: Start of construction
- Maintenance and Inspection: Weekly & after storm events greater than 0.25"
- Responsible Staff: Construction Manager and Site Contractor

Pollution Prevention Practice # 3

- BMP Description: Plastic Cover
- Installation Schedule: Start of construction
- Maintenance and Inspection: Weekly & after storm events greater than 0.25"
- Responsible Staff: Construction Manager and Site Contractor

5.5.2 Pesticides, Herbicides, Insecticides, Fertilizers, and Landscape Materials

- Fertilizers will be used at the application rates called for in the specifications for the project.
- Once applied, fertilizer will be worked into the soil to minimize wash off from irrigation and stormwater.
- Fertilizer will be stored under cover.
- The contents of partially used fertilizer bags will be transferred to re-sealable, watertight containers clearly labeled with their contents.

5.5.3 Diesel Fuel, Oil, Hydraulic Fluids, Other Petroleum Products, and Other Chemicals

- Only skilled personnel in a designated area will perform fueling of vehicles onsite.
- Vehicles used onsite will be monitored for fuel and oil leaks.
- Vehicles used onsite will be maintained in good working order.
- Asphalt substances will be applied in accordance with manufacturers' recommendations.
- The use of petroleum products as a release agent for asphalt transport trucks is prohibited.
- Vehicle fueling will only be done in vehicle fueling areas located by the contractor.
- All vehicles parked overnight onsite shall have fuel absorbent pads placed beneath them to absorb any fuel leaks.
- The contractor shall be responsible for locating the fuel storage and re-fueling area onsite to minimize disturbance to construction activates and site area.

5.5.4 Hazardous or Toxic Waste

- Keep products in their original containers.
- Original container labels should be clearly visible.
- Material safety data sheets will be kept onsite and be available.

- Follow all state, local, and Federal regulations regarding the handling, use, storage, and disposal of hazardous material.

Paints:

- All paint containers will be tightly sealed when not in use.
- Remove excess paint in original labeled containers from the jobsite.
- Paint will not be disposed of onsite. Remove excess paint material from the site and legally dispose of.
- Paint shall not be disposed of in the storm drain system.

5.5.5 Construction and Domestic Waste

Pollution Prevention Practice # 1

- BMP Description: Dumpster
- Installation Schedule: Start of construction
- Maintenance and Inspection: Weekly
- Responsible Staff: **Construction Manager** and **Site Contractor**

Pollution Prevention Practice # 2

- BMP Description: Litter/debris pick-up
- Installation Schedule: Start of construction
- Maintenance and Inspection: Daily
- Responsible Staff: **Construction Manager** and **Site Contractor**

5.5.6 Sanitary Waste

Pollution Prevention Practice # 1

- BMP Description: Porta John
- Installation Schedule: Start of construction
- Maintenance and Inspection: As manufacturer requires
- Responsible Staff: Construction Manager and Site Contractor

5.6 Washing of Applicators and Containers used for Paint, Concrete or Other Materials

General

Washing of applicators and containers used for paint, concrete or other materials shall follow the following good housekeeping BMPs:

- An effective means of eliminating the discharge of water from the washout and cleanout of stucco, paint, concrete, form release oils, curing compounds, and other construction materials.
- All washwater must be directed into a leak-proof container or leak-proof pit. The container or pit must be designed so that no overflows can occur due to inadequate sizing or precipitation.
- Washout and cleanout wastes should be handled as follows:
    - Do not dump liquid wastes into storm sewers.
    - Dispose of liquid wastes in accordance with applicable requirements.

  - Remove and dispose of hardened concrete waste consistent with the handling of other construction wastes.
- Locate any washout or cleanout activities as far away as possible from surface waters and stormwater inlets or conveyances, and to the extent practicable, designate areas to be used for these activities and conduct such activities only in these areas.

Specific Pollution Prevention Practices

Pollution Prevention Practice # 1

- BMP Description: Designated applicator and container washing areas
- Installation Schedule: Start of construction
- Maintenance and Inspection: Daily
- Responsible Staff: Construction Manager and Site Contractor

5.7 Fertilizers

General
Fertilizer usage shall follow the following good housekeeping BMPs to minimize discharges of nitrogen and phosphorous:

- Fertilizers will be used at the application rates called for in the specifications for the project and the manufacturer's specifications.
- Apply at the appropriate time of year for your location, and preferably timed to coincide as closely as possible to the period of maximum vegetation uptake and growth.
- Avoid applying before heavy rains that could cause excess nutrients to be discharged.
- Never apply to frozen ground.
- Never apply to stormwater conveyance channels with flowing water.
- Follow all other federal, state, tribal, and local requirements regarding fertilizer
- application.
- Once applied, Fertilizers will be worked into the soil to minimize wash off from irrigation and stormwater.
- Fertilizers will be stored under cover.
- The contents of partially used fertilizer bags will be transferred to re-sealable, watertight containers clearly labeled with their contents.

5.8 Other Pollution Prevention Practices

SECTION 6: INSPECTION AND CORRECTIVE ACTION

6.1 Inspection Personnel and Procedures

Personnel Responsible for Inspections

NOT YET DETERMINED

Inspection Schedule

Specific Inspection Frequency

- All area-drain, catch basins, drain manholes and other structures shall be inspected before and after construction. The condition of the structures shall be recorded.
- All stormwater control devices are to be inspected weekly (7 days) and within 24-hours of the occurrence of a storm even event of 0.25" depth or greater (even if the storm is still continuing.
- Litter and debris clean-up shall be performed daily.
- If a problem is observed with an erosion and sediment control (needs repair or replacement), work must be initiated immediately to fix the problem, and shall be completed by the end of the next work day. If the repair or replacement is more substantial, it shall be completed within 7 calendar days from the time of discovery. If a repair takes longer than 48-hours, the repair procedures should be documented and recorded.
- If discharge of stormwater is occurring during an inspection, the location and quality of the discharge shall be noted as well as the effectiveness of erosion and sediment controls.
- Attach a copy of the inspection report you will use for your site.
- For reduction in inspections due to frozen conditions: Approximate frozen ground dates in Boston - December 1 +/- to April 1

Inspection Report Forms

Inspection Report Forms are found in Appendix D.

6.2 Corrective Action

Personnel Responsible for Corrective Actions

To be determined

Corrective Action Forms

To be developed

6.3 Delegation of Authority

Duly Authorized Representative(s) or Position(s):

To be determined

SECTION 7: TRAINING

To be completed:

Table 7-1: Documentation for Completion of Training

Name	Date Training Completed

SECTION 8: CERTIFICATION AND NOTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: _____ Title: _____

Signature: _____ Date: _____

[Repeat as needed for multiple construction operators at the site.]

SWPPP APPENDICES

Attach the following documentation to the SWPPP:

Appendix A – Site Maps

Appendix B – Copy of 2012 CGP

Appendix C – NOI and EPA Authorization Email

Appendix D – Inspection Form

(Note: EPA is in the process of developing a sample inspection form for use by CGP permittees. The form will be made available at http://cfpub.epa.gov/npdes/stormwater/cgp.cfm.)

Appendix E – Corrective Action Form

(Note: EPA is in the process of developing a sample corrective action form for use by CGP permittees. The form will be made available at http://cfpub.epa.gov/npdes/stormwater/cgp.cfm.)

Appendix F – SWPPP Amendment Log

Appendix G – Subcontractor Certifications/Agreements

Appendix H – Grading and Stabilization Activities Log

Appendix I – Training Log

Appendix J – Delegation of Authority

Appendix K – Endangered Species Documentation

Appendix L – Historic Preservation Documentation

Appendix A – Site Maps



LOCUS MAP

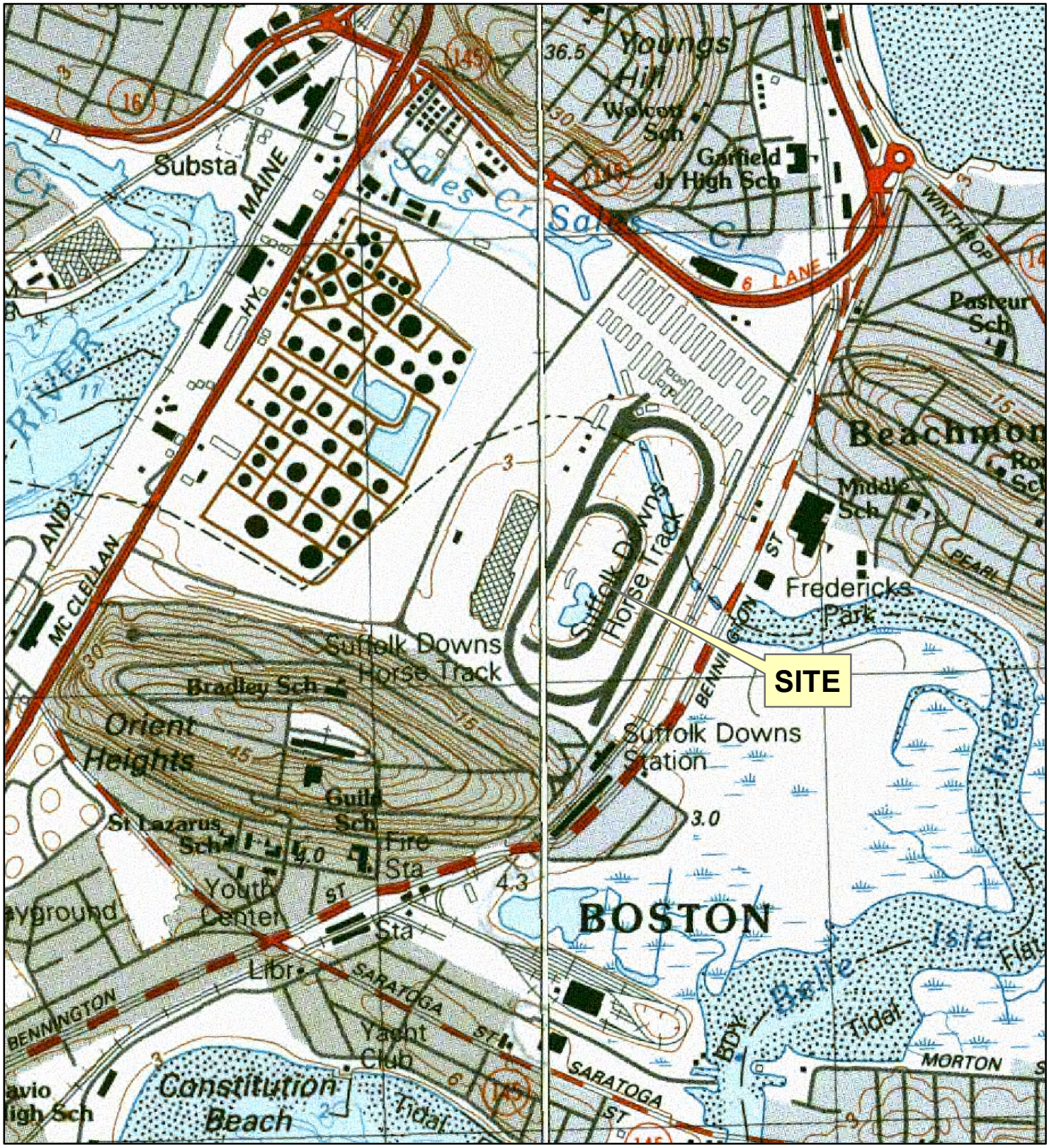
RESORT AT SUFFOLK DOWNS
BOSTON, MA

Nitsch Engineering

NITSCH PROJECT# 9180

N

1,000 500 0 1,000
Feet



USGS LOCUS MAP

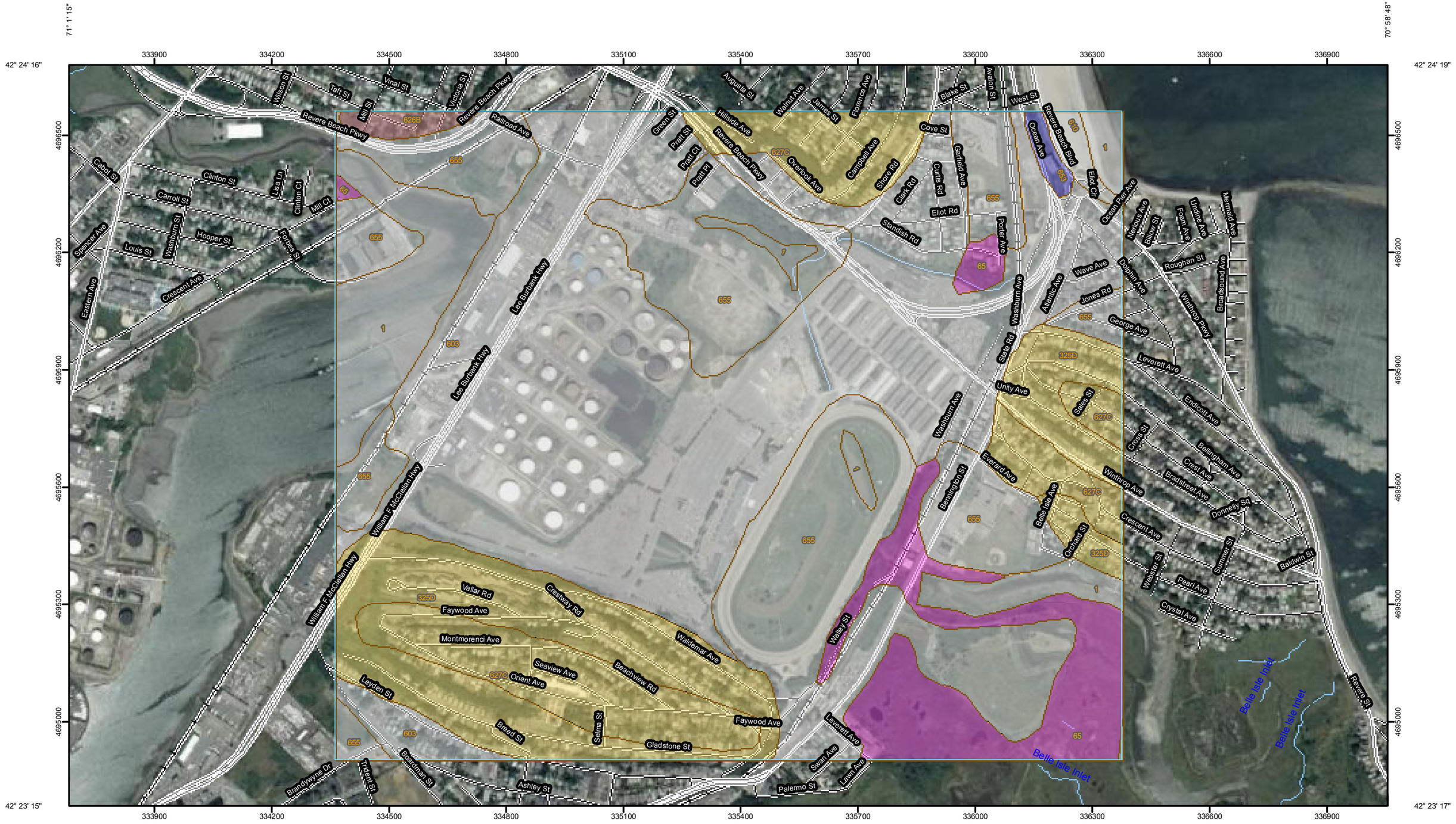
RESORT AT SUFFOLK DOWNS
BOSTON, MA

Nitsch Engineering

NITSCH PROJECT# 9180

N

1,000 500 0 1,000
Feet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70° 58' 48"
42° 24' 16"
42° 24' 19"
42° 23' 15"
42° 23' 17"
333900
334200
334500
334800
335100
335400
335700
336000
336300
336600
336900
4696500
4696200
4695900
4695600
4695300
4695000
Revere Beach Pkwy
Wilson St
Taft St
Vinal St
Victoria St
Mill St
Railroad Ave
Augusta St
Walnut Ave
James St
Florence Ave
Blake St
Avalon St
West St
Revere Beach Blvd
Ocean Ave
Cove St
Hillside Ave
Green St
Pratt St
Pratt Ct
Pratt Pl
Overlook Ave
Campbell Ave
Shore Rd
Clark Rd
Curtis Rd
Garfield Ave
Eliot Rd
Eliot Cir
Ocean Pier Ave
Standish Rd
Porter Ave
Nerious Ave
Billow St
Foam Ave
Undine Ave
Mermaid Ave
Roughan St
Wave Ave
Dolphin Ave
Jones Rd
George Ave
Leverett Ave
Endicott Ave
Winthrop Pkwy
Broadsound Ave
Atlantic Ave
Washburn Ave
State Rd
Unity Ave
Sales St
Cross St
Bellingham Ave
Crest Ave
Bradstreet Ave
Donnelly Sq
Winthrop Ave
Crescent Ave
Summer St
Baldwin St
Webster St
Pearl Ave
Crystal Ave
Everard Ave
Bennington St
Belle Isle Ave
Orchard St
Wesley St
Belle Isle Inlet
Revere St
Cabot St
Clinton St
Lisa Ln
Clinton Ct
Mill Ct
Carroll St
Spencer Ave
Louis St
Washburn St
Hooper St
Forbes St
Eastern Ave
Crescent Ave
Lee Burbank Hwy
William F McClellan Hwy
Valiar Rd
Crestway Rd
Faywood Ave
Montmorenci Ave
Waldemar Ave
Seaview Ave
Beachview Rd
Orient Ave
Leyden St
Selma St
Gladstone St
Bryeed St
Brandywyne Dr
Trident St
Boardman St
Ashley St
Palermo St
Swan Ave
Lawn Ave
626B
655
627C
603
325D
65
1
7
Map Scale: 1:9,320 if printed on B size (11" x 17") sheet.
N
0 150 300 600 900 Meters
0 500 1,000 2,000 3,000 Feet

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:9,320 if printed on B size (11" × 17") sheet.

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 19N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 8, Jul 23, 2010

Date(s) aerial images were photographed: 7/7/2003; 7/25/2003

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Norfolk and Suffolk Counties, Massachusetts (MA616)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
1	Water		56.6	6.9%
65	Ipswich mucky peat, 0 to 1 percent slopes	D	57.4	7.0%
325D	Newport silt loam, 15 to 25 percent slopes	C	97.3	11.8%
603	Urban land, wet substratum, 0 to 3 percent slopes		318.2	38.5%
610	Beaches		4.6	0.6%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	A	4.6	0.6%
627C	Newport-Urban land complex, 3 to 15 percent slopes	C	77.7	9.4%
653	Udorthents, sandy	B	3.1	0.4%
655	Udorthents, wet substratum		206.0	25.0%
Totals for Area of Interest			**825.5**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix B – Copy of 2012 CGP

Appendix C – Copy of NOI and EPA Authorization email

Appendix D – Copy of Inspection Form

Appendix E – Copy of Corrective Action Form

Appendix F – *Sample* SWPPP Amendment Log

No.	Description of the Amendment	Date of Amendment	Amendment Prepared by [Name(s) and Title]

Appendix G – *Sample* Subcontractor Certifications/Agreements

SUBCONTRACTOR CERTIFICATION
STORMWATER POLLUTION PREVENTION PLAN

Project Number: _____

Project Title: _____

Operator(s): _____

As a subcontractor, you are required to comply with the Stormwater Pollution Prevention Plan (SWPPP) for any work that you perform on-site. Any person or group who violates any condition of the SWPPP may be subject to substantial penalties or loss of contract. You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP. A copy of the SWPPP is available for your review at the office trailer.

Each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement:

I certify under the penalty of law that I have read and understand the terms and conditions of the SWPPP for the above designated project and agree to follow the practices described in the SWPPP.

This certification is hereby signed in reference to the above named project:

Company: _____

Address: _____

Telephone Number: _____

Type of construction service to be provided: _____

_____

_____

Signature: _____

Title: _____

Date: _____

Appendix H – *Sample* Grading and Stabilization Activities Log

Date Grading Activity Initiated	**Description of Grading Activity**	**Description of Stabilization Measure and Location**	**Date Grading Activity Ceased** (Indicate Temporary or Permanent)	**Date When Stabilization Measures Initiated**

Appendix I – *Sample* SWPPP Training Log

Stormwater Pollution Prevention Training Log

Project Name:

Project Location:

Instructor's Name(s):

Instructor's Title(s):

Course Location: _____ Date: _____

Course Length (hours): _____

Stormwater Training Topic: *(check as appropriate)*

- ❑ **Sediment and Erosion Controls**
- ❑ **Emergency Procedures**
- ❑ **Stabilization Controls**
- ❑ **Inspections/Corrective Actions**
- ❑ **Pollution Prevention Measures**

Specific Training Objective:_____

_____

Attendee Roster: *(attach additional pages as necessary)*

No.	Name of Attendee	Company
1		
2		
3		
4		
5		
6		
7		
8		

Appendix J – *Sample* Delegation of Authority Form

Delegation of Authority

I, _____ (name), hereby designate the person or specifically described position below to be a duly authorized representative for the purpose of overseeing compliance with environmental requirements, including the Construction General Permit, at the _____ construction site. The designee is authorized to sign any reports, stormwater pollution prevention plans and all other documents required by the permit.

_____ (name of person or position)
_____ (company)
_____ (address)
_____ (city, state, zip)
_____ (phone)

By signing this authorization, I confirm that I meet the requirements to make such a designation as set forth in Appendix I of EPA's Construction General Permit (CGP), and that the designee above meets the definition of a "duly authorized representative" as set forth in Appendix I.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: _____

Company: _____

Title: _____

Signature: _____

Date: _____

Appendix K – Endangered Species Documentation

INSERT DOCUMENTATION CONSISTENT WITH SWPPP TEMPLATE SECTION 3.1



NHESP ESTIMATED AND PRIORITY HABITATS MAP

RESORT AT SUFFOLK DOWNS
BOSTON, MA

Nitsch Engineering

NITSCH PROJECT# 9180

N

Legend

- NHESP Estimated Habitats of Rare Wildlife
- NHESP Priority Habitats of Rare Species

1,000 500 0 1,000 Feet

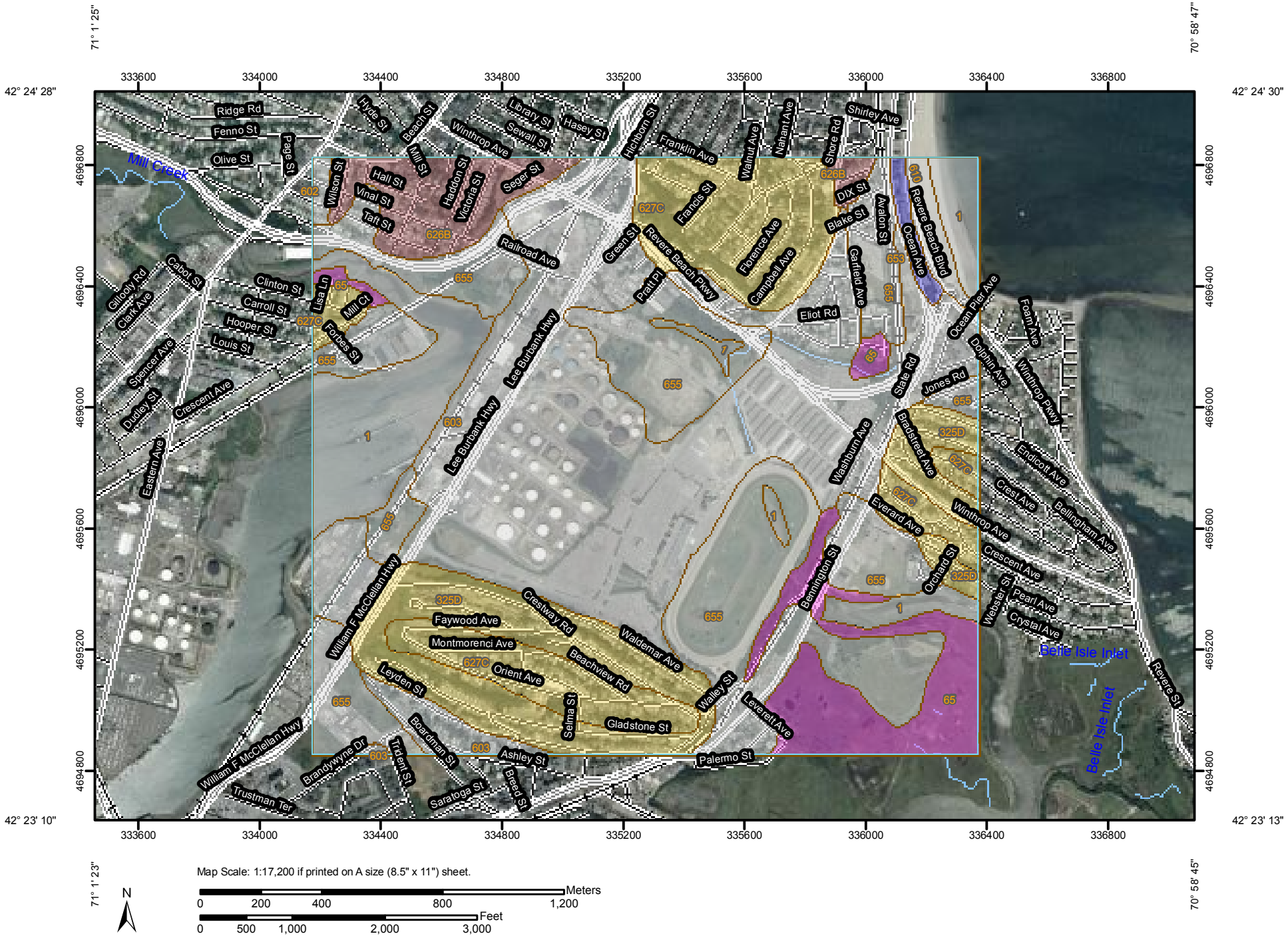
Appendix L – Historic Properties Documentation

INSERT DOCUMENTATION CONSISTENT WITH SWPPP TEMPLATE SECTION 3.2

APPENDIX F

Soil Investigations
NRCS Soil Maps and Descriptions
Compiled Test Pit Information

Hydrologic Soil Group—Norfolk and Suffolk Counties, Massachusetts
(Suffolk Downs)



Map Scale: 1:17,200 if printed on A size (8.5" x 11") sheet.

N

Meters
0 200 400 800 1,200

Feet
0 500 1,000 2,000 3,000

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:17,200 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:25,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 19N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 8, Jul 23, 2010

Date(s) aerial images were photographed: 7/7/2003; 7/25/2003

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Norfolk and Suffolk Counties, Massachusetts (MA616)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
1	Water		91.1	8.5%
65	Ipswich mucky peat, 0 to 1 percent slopes	D	67.2	6.3%
325D	Newport silt loam, 15 to 25 percent slopes	C	106.1	9.9%
602	Urban land, 0 to 15 percent slopes		3.1	0.3%
603	Urban land, wet substratum, 0 to 3 percent slopes		361.1	33.8%
610	Beaches		10.1	0.9%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	A	45.9	4.3%
627C	Newport-Urban land complex, 3 to 15 percent slopes	C	126.6	11.8%
653	Udorthents, sandy	B	6.5	0.6%
655	Udorthents, wet substratum		251.7	23.5%
Totals for Area of Interest			**1,069.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

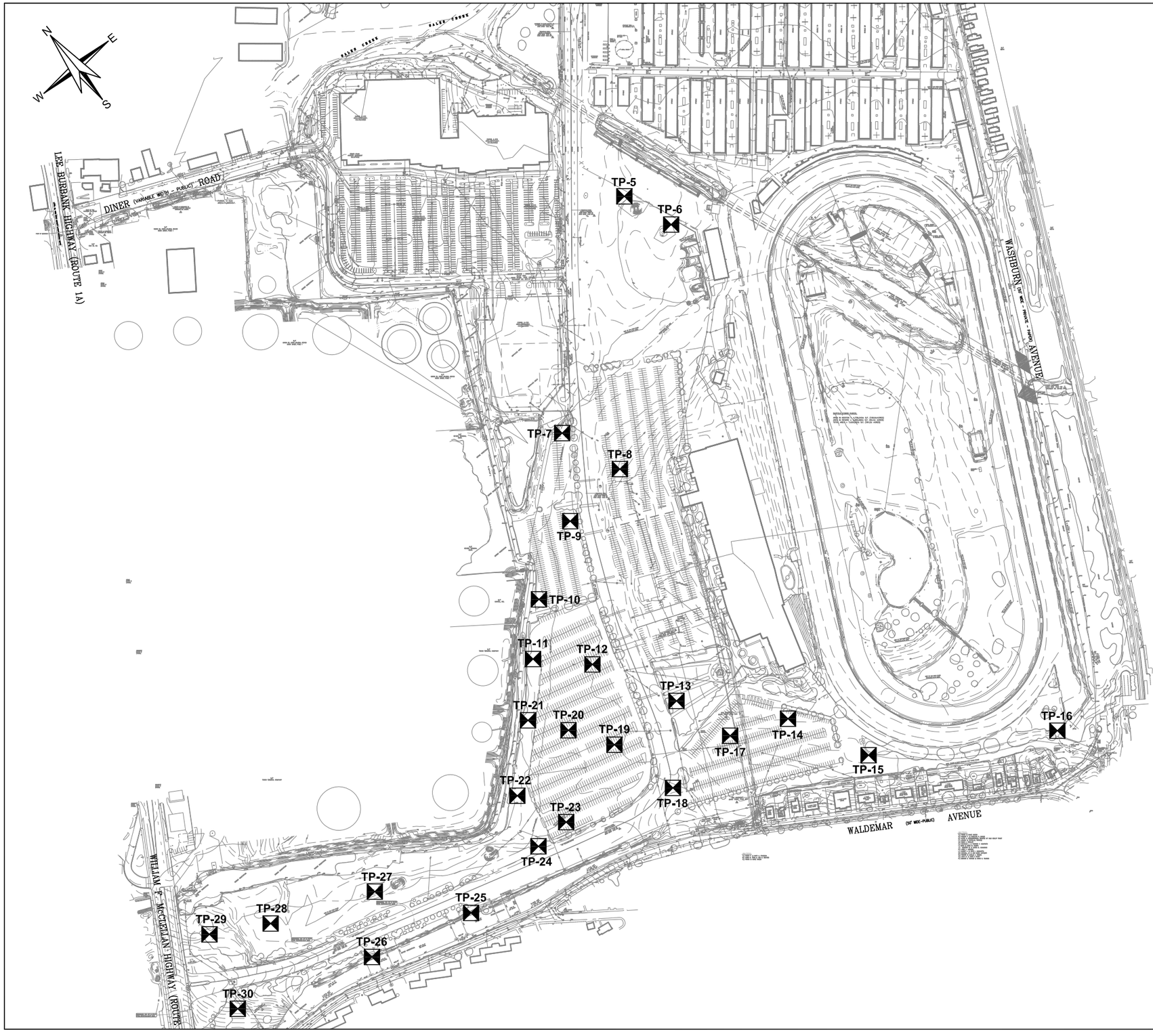
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



LEGEND:

TP-5 DESIGNATION AND APPROXIMATE LOCATION OF TEST PIT EXCAVATED BY JAMES W. FLETT COMPANY BETWEEN 8 AND 11 MAY 2012 AND MONITORED BY HALEY & ALDRICH, INC.

NOTE:

1. BASE PLAN TAKEN FROM A DRAWING TITLED 9180_TOPO1_051712.dwg PREPARED BY NITSCH ENGINEERING OF BOSTON, MASSACHUSETTS.

0 400 800
SCALE IN FEET

HALEY & ALDRICH

SUFFOLK DOWNS DEVELOPMENT
EAST BOSTON, MASSACHUSETTS

SITE AND SUBSURFACE EXPLORATION LOCATION PLAN

SCALE: AS SHOWN
JUNE 2012

FIGURE 2

J:\GRAPHICS\37181\37181-003-B003.DWG

DEEP OBSERVATION HOLE (TEST PIT) LOG

Exploration:	TP12-7	Date:	5/10/2012
Project:	Suffolk Downs	Field Representative:	Scott Shay
Location:	East Boston, MA	PM:	Brad Aldinger
File No.:	37181-002	Geotech Log Available?	Yes
Ground Surface El. (ft):	16.2		

Depth (Ft)		**Soil Horizon/ Layer**	**Soil Matrix: Color-Moist (Munsell)**	**Redoximorphic Features (mottles)**			**Soil Texture (USDA)**	**Coarse Fragments % by Volume**		**Soil Structure**	**Soil Consistence (Moist)**	**Other**
				Depth	**Color**	**Percent**		**Gravel**	**Cobbles & Stones**			
0	1	FILL	7.5YR3/2	None	None	None	Sand	20	None	Structureless	Loose	
1	1.4	FILL	7.5YR4/3	1-1.4	10YR 6/2 5YR 5/3	50 15	Sand	None	None	Weak	Friable	See Note 2
1.4	3.5	FILL	GLEY2 4/1	2.5-3.5	Dark Bluish Gray	100	Loamy Sand	None	None	Weak	Friable	

Other Notes:

1. 5YR 4/6 in pockets, 10% at 1.4 ft depth.
2. Mottling is not associated with SHWT.

DEEP OBSERVATION HOLE (TEST PIT) LOG

Exploration:	TP12-25	Date:	5/8/2012
Project:	Suffolk Downs	Field Representative:	Scott Shay
Location:	East Boston, MA	PM:	Brad Aldinger
File No.:	37181-002	Geotech Log Available?	Yes
Ground Surface El. (ft):	16.9		

Depth (Ft)		**Soil Horizon/ Layer**	**Soil Matrix: Color-Moist (Munsell)**	**Redoximorphic Features (mottles)**			**Soil Texture (USDA)**	**Coarse Fragments % by Volume**		**Soil Structure**	**Soil Consistence (Moist)**	**Other**
				Depth	**Color**	**Percent**		**Gravel**	**Cobbles & Stones**			
0	0.9	FILL	7.5YR4/2	None	None	None	Sandy Loam	5	None	single gr	Friable	
0.9	2.3	FILL	2.5Y4/4	None	None	None	Sandy Loam	20	None	single gr	Friable	
2.3	6	FILL	7.5 YR 4/3	2.3	5 YR 3/4	30	Sandy Loam	20	5	Massive	Firm	

Other Notes:

1. Possible boulder refusal at sloping depth of 4.5 to 6 ft.
2. Material above 2.3 ft appears to be reworked native material (potentially reworked glacial till).

HALEY & ALDRICH

TEST PIT LOG

Test Pit No. TP12-5

Project	SUFFOLK DOWNS DEVELOPMENT
Location	EAST BOSTON, MA
Client	STERLING SUFFOLK RACECOURSE, LLC
Contractor	JAMES W. FLETT COMPANY, INC.
Equipment Used	CAT M318
File No.	37181-003
H&A Rep	S. Shay
Date	11 May 2012
Weather	Partly cloudy, 60s

Ground El.: 13.2 (est.) **El. Datum:** BCB | **Location:** See Plan | **Groundwater depths/entry rates (in./min.):** 6.0 ft/rapidly

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0			SP	Medium SAND (SP)										
1				-FILL-										
2														
3		10.2 3.0		Approximately 80% ASH, CINDERS, black sandy, trace glass, brick, scrap metal, fabric, trash dump material										
4														
5				-FILL-										
6														
		6.7 6.5		BOTTOM OF EXPLORATION 6.5 FT										

Obstructions: None

Remarks: Standard backfill

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth 6.0 ft
measured after 5 min. hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	= -
over 24	-	= -

Test Pit Dimensions (ft)

Pit Length x Width (ft) 8.0 x 4.0
Pit Depth (ft) 6.5

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

HA TESTPIT-07-1 HA-LIB07-1-BOS.GLB HA-TP07-1.GDT G:\37181\003\TEST PITS\36171-003_TP.GPJ 4 Jun 12

HALEY & ALDRICH

TEST PIT LOG

Test Pit No. TP12-6

Project	SUFFOLK DOWNS DEVELOPMENT	**File No.**	37181-003
Location	EAST BOSTON, MA	**H&A Rep**	S. Shay
Client	STERLING SUFFOLK RACECOURSE, LLC	**Date**	11 May 2012
Contractor	JAMES W. FLETT COMPANY, INC.	**Weather**	Partly cloudy, 60s
Equipment Used	CAT M318		

Ground El.: 13.2 (est.) **El. Datum:** BCB | **Location:** See Plan | **Groundwater depths/entry rates (in./min.):** 5.3 ft/ rapidly

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0			SP	Brown medium SAND (SP)										
1				-FILL-										
2		11.2 2.0		Note: 2.0 in. of asphalt across entire pit floor at 2.0 ft.										
		11.0 2.2		Approximately 80% TRASH DUMP MATERIAL, black sandy, ash and cinders with brick, glass, scrap metal, fabric										
3														
4				-FILL-										
5														
6		7.2 6.0		BOTTOM OF EXPLORATION 6.0 FT										

Obstructions: None

Remarks: Standard backfill

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth 5.3 ft
measured after 5 min. hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	= -
over 24	-	= -

Test Pit Dimensions (ft)

Pit Length x Width (ft) 8.0 x 4.0
Pit Depth (ft) 6.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

HA TESTPIT-07-1 HA-LIB07-1-BOS.GLB HA-TP07-1.GDT G:\37181\003\TEST PITS\36171-003_TP.GPJ 4 Jun 12

HALEY & ALDRICH

TEST PIT LOG

Test Pit No. TP12-7

Project	SUFFOLK DOWNS DEVELOPMENT	**File No.**	37181-003
Location	EAST BOSTON, MA	**H&A Rep**	S. Shay
Client	STERLING SUFFOLK RACECOURSE, LLC	**Date**	10 May 2012
Contractor	JAMES W. FLETT COMPANY, INC.	**Weather**	Cloudy, 60s
Equipment Used	CAT M318		

Ground El.: 16.2 (est.) **El. Datum:** BCB | **Location:** See Plan | **Groundwater depths/entry rates (in./min.):** 5.5 ft/ rapidly

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0			SP	Dark brown poorly graded SAND with gravel (SP), mps 3 in., no structure, no odor, moist, 1% cobbles	10	10	25	35	15	5				
1				Note: Mottles present from 1.0 to 1.4 ft. (Mottles as variegated coloring associated with slight textural changes. May not be result of a seasonal high water table; rather momentary pauses as a wetting front descends through the soil.)										
2				-FILL-										
		13.7 2.5	SM	Gray silty SAND (SM), 0% oversize, mps 1/32 in., slightly irregular stratification, no odor, moist, occasional plastic organic silt seams					65	35				
3				-FILL-										
		12.7 3.5	SP	Dark brown poorly graded SAND (SP), 0% oversize, mps 2.5 in., no structure, no odor, wet, trace amounts of brick, cinders, wood, ash, shells, glass		10	25	25	35	5				
4				Note: Loose, easy to excavate.										
5				-FILL-										
6														
		9.7 6.5		BOTTOM OF EXPLORATION 6.5 FT										

Obstructions: None

Remarks: Standard backfill

Field Tests

Dilatancy	R - Rapid S - Slow N - None
Toughness	L - Low M - Medium H - High
Plasticity	N - Nonplastic L - Low M - Medium H - High
Dry Strength	N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth 5.5 ft
measured after 0.25 hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	= -
over 24	-	= -

Test Pit Dimensions (ft)

Pit Length x Width (ft) 8.0 x 4.0
Pit Depth (ft) 6.5

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

HA TESTPIT-07-1 HA-LIB07-1-BOS.GLB HA-TP07-1.GDT G:\37181\003\TEST PITS\36171-003_TP.GPJ 4 Jun 12

HALEY & ALDRICH

TEST PIT LOG

Test Pit No. TP12-8

Project	SUFFOLK DOWNS DEVELOPMENT	**File No.**	37181-003
Location	EAST BOSTON, MA	**H&A Rep**	S. Shay
Client	STERLING SUFFOLK RACECOURSE, LLC	**Date**	11 May 2012
Contractor	JAMES W. FLETT COMPANY, INC.	**Weather**	Sunny, 40s
Equipment Used	CAT M318		

Ground El.: 20.3 (est.) **El. Datum:** BCB

Location: See Plan

Groundwater depths/entry rates (in./min.): 7.9 ft/ moderately rapidly

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0		20.1		-ASPHALT-										
		0.2												
			SM	-COARSE GRAVEL BASE-	90	10	15	15	35	15				
		20.0		Olive-brown silty SAND with gravel (SM), 0% oversize, mps 2 in., no structure, no odor, dry]	5	15								
		0.3												
		19.7		-FILL-										
		0.6												
			SM	Dark brown silty SAND (SM), few oversize particles as rubble fill, mps 4 in., no structure, no odor, moist, approximately 20% cinders with ash, trace amounts of brick, porcelain, glass, wood, scrap metal			25	25	20	30				
2														
4				-FILL-										
6														
8				Note: Saturated at 8.0 ft.										
		11.8												
		8.5		BOTTOM OF EXPLORATION 8.5 FT										

Obstructions: None

Remarks: Standard backfill

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth 8.0 ft
measured after 0.25 hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	= -
over 24	-	= -

Test Pit Dimensions (ft)

Pit Length x Width (ft) 8.0 x 4.0
Pit Depth (ft) 8.5

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

HA TESTPIT-07-1 HA-LIB07-1-BOS.GLB HA-TP07-1.GDT G:\37181\003\TEST PITS\36171-003_TP.GPJ 4 Jun 12

HALEY & ALDRICH

TEST PIT LOG

Test Pit No. TP12-9

Project	SUFFOLK DOWNS DEVELOPMENT	**File No.**	37181-003
Location	EAST BOSTON, MA	**H&A Rep**	S. Shay
Client	STERLING SUFFOLK RACECOURSE, LLC	**Date**	10 May 2012
Contractor	JAMES W. FLETT COMPANY, INC.	**Weather**	Cloudy, 60s
Equipment Used	CAT M318		

Ground El.: 17.1 (est.) **El. Datum:** BCB | **Location:** See Plan | **Groundwater depths/entry rates (in./min.):** 4.5 ft/ rapidly

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0		16.9		-ASPHALT-										
		0.2	SP	Dark brown poorly graded SAND with gravel (SP)	10	10	15	50	10	5				
				-FILL-										
1		16.1												
		1.0	SP	Dark gray to black poorly graded SAND (SP), 2% oversize, mps 4 in., no structure, no odor, wet, up to approximately 40% ash and cinders, 5% glass, trace brick, trace scrap metal	5	5	20	35	30	5				
2														
3														
				-FILL-										
4														
5														
6		11.1												
		6.0		BOTTOM OF EXPLORATION 6.0 FT										

Obstructions: None

Remarks: Standard backfill

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth 4.5 ft
measured after 0.25 hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	= -
over 24	-	= -

Test Pit Dimensions (ft)

Pit Length x Width (ft) 8.0 x 4.0
Pit Depth (ft) 6.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

HA TESTPIT-07-1 HA-LIB07-1-BOS.GLB HA-TP07-1.GDT G:\37181\003\TEST PITS\36171-003_TP.GPJ 4 Jun 12

HALEY & ALDRICH

TEST PIT LOG

Test Pit No. TP12-10

Project	SUFFOLK DOWNS DEVELOPMENT	**File No.**	37181-003
Location	EAST BOSTON, MA	**H&A Rep**	S. Shay
Client	STERLING SUFFOLK RACECOURSE, LLC	**Date**	10 May 2012
Contractor	JAMES W. FLETT COMPANY, INC.	**Weather**	Overcast, 60s
Equipment Used	CAT M318		

Ground El.: 16.6 (est.) **El. Datum:** BCB | **Location:** See Plan | **Groundwater depths/entry rates (in./min.):** 3.5 ft/ rapidly

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0		16.4		-ASPHALT-										
		0.2	SP	Dark gray to black poorly graded SAND (SP), 2% oversize, mps 4 in., no structure, no odor, wet, approximately 30-40% ash and cinders, trace glass, brick, scrap metal	5	5	20	35	30	5				
1														
2				-FILL-										
3														
4		12.6												
		4.0		BOTTOM OF EXPLORATION 4.0 FT										

Obstructions: None

Remarks: Standard backfill

Field Tests

Dilatancy	R - Rapid S - Slow N - None
Toughness	L - Low M - Medium H - High
Plasticity	N - Nonplastic L - Low M - Medium H - High
Dry Strength	N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth 3.5 ft
measured after 5 min. hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	= -
over 24	-	= -

Test Pit Dimensions (ft)

Pit Length x Width (ft) 8.0 x 4.0
Pit Depth (ft) 4.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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HALEY & ALDRICH

TEST PIT LOG

Test Pit No. TP12-11

Project	SUFFOLK DOWNS DEVELOPMENT	**File No.**	37181-003
Location	EAST BOSTON, MA	**H&A Rep**	S. Shay
Client	STERLING SUFFOLK RACECOURSE, LLC	**Date**	10 May 2012
Contractor	JAMES W. FLETT COMPANY, INC.	**Weather**	Light rain, 60s
Equipment Used	CAT M318		

Ground El.: 16.0 (est.) **El. Datum:** BCB | **Location:** See Plan | **Groundwater depths/entry rates (in./min.):** 3.3 ft/ rapidly

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0		15.8		-ASPHALT-										
		0.2	SP	Brown poorly graded SAND with gravel (SP), intermittently layered										
		15.5		-FILL-										
		0.5	SP	Dark gray to black poorly graded SAND (SP), 2% oversize, mps 4 in., no structure, no odor, wet, approximately 30-40% ash/cinders, trace glass, brick, metal	5	5	20	35	30	5				
1														
2														
				-FILL-										
3														
4		12.0												
		4.0		BOTTOM OF EXPLORATION 4.0 FT										

Obstructions: None

Remarks: Standard backfill

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth 3.3 ft
measured after 5 min. hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	= -
over 24	-	= -

Test Pit Dimensions (ft)

Pit Length x Width (ft) 8.0 x 4.0
Pit Depth (ft) 4.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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HALEY & ALDRICH

TEST PIT LOG

Test Pit No. TP12-12

Project	SUFFOLK DOWNS DEVELOPMENT	**File No.**	37181-003
Location	EAST BOSTON, MA	**H&A Rep**	S. Shay
Client	STERLING SUFFOLK RACECOURSE, LLC	**Date**	10 May 2012
Contractor	JAMES W. FLETT COMPANY, INC.	**Weather**	Rain, 60s
Equipment Used	CAT M318		

Ground El.: 16.8 (est.) **El. Datum:** BCB | **Location:** See Plan | **Groundwater depths/entry rates (in./min.):** 3.0 ft/ rapidly

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0		16.6		-ASPHALT-										
		0.2	SM	Irregular clumps of olive-brown silty SAND with gravel (SM), well bonded		5	10	20	40	25				
				-FILL-										
1		15.8												
		1.0	SP- SM	Dark gray poorly graded SAND with silt and gravel (SP-SM), 2% cobbles, mps 4 in., no structure, no odor, moist, trace glass, trace porcelain, trace brick, trace wood	5	15	20	20	30	10				
2				-FILL-										
3		13.8												
		3.0		ASH, light gray, trace sand										
				-FILL-										
4		12.8												
		4.0		BOTTOM OF EXPLORATION 4.0 FT										

Obstructions: None

Remarks: Standard backfill

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth 3.0 ft
measured after 5 min. hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	= -
over 24	-	= -

Test Pit Dimensions (ft)

Pit Length x Width (ft) 8.0 x 4.0
Pit Depth (ft) 4.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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HALEY & ALDRICH

TEST PIT LOG

Test Pit No. TP12-13

Project	SUFFOLK DOWNS DEVELOPMENT
Location	EAST BOSTON, MA
Client	STERLING SUFFOLK RACECOURSE, LLC
Contractor	JAMES W. FLETT COMPANY, INC.
Equipment Used	CAT M318
File No.	37181-003
H&A Rep	S. Shay
Date	9 May 2012
Weather	Light rain, 50s

Ground El.: 19.3 (est.) **El. Datum:** BCB | **Location:** See Plan | **Groundwater depths/entry rates (in./min.):** 6.3/ rapidly

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0		19.0		-TURF ROOTMAT-										
		0.3	SP	Brown poorly graded SAND (SP), 0% oversize, mps 1.5 in., no structure, no odor, moist		10	30	40	20					
1				-FILL-										
		17.6												
		1.7	SP	Dark gray to black poorly graded SAND (SP), 2% oversize mostly as rubble fill, mps 6 in., no structure, no odor, moist, up to approximately 50% ash and cinders, 20% brick, 20% intermixed organic soil pockets, trace metal, glass, wood Note: Loose, easy to excavate.									
2														
3														
4				-FILL-										
5														
6				Note: Saturated at 6.3 ft.										
		12.3												
7		7.0		BOTTOM OF EXPLORATION 7.0 FT										

Obstructions: None

Remarks: Standard backfill
Landscaped area

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth 6.3 ft
measured after 10 min. hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	-
over 24	-	-

Test Pit Dimensions (ft)

Pit Length x Width (ft) 8.0 x 4.0
Pit Depth (ft) 7.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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TEST PIT LOG

Test Pit No. TP12-14

Project	SUFFOLK DOWNS DEVELOPMENT
Location	EAST BOSTON, MA
Client	STERLING SUFFOLK RACECOURSE, LLC
Contractor	JAMES W. FLETT COMPANY, INC.
Equipment Used	CAT M318
File No.	37181-003
H&A Rep	S. Shay
Date	9 May 2012
Weather	Light rain, 50s

Ground El.: 19.5 (est.) **El. Datum:** BCB | **Location:** See Plan | **Groundwater depths/entry rates (in./min.):** 5.7 ft/ rapidly

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0		19.2		-ASPHALT-										
		0.3	SP	Black to dark gray poorly graded SAND (SP), 0% oversize, mps 2.5 in., no structure, no odor, dry to moist, approximately 20% ash and cinders, 10% brick, porcelain, glass, trace metal	5	5	30	50	10					
1														
2														
3				-FILL-										
4														
5				Note: Saturated at 5.7 ft.										
6														
		13.0												
		6.5		BOTTOM OF EXPLORATION 6.5 FT										

Obstructions: None

Remarks: Standard backfill
Asphalt segregated

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth 5.7 ft
measured after 10 min. hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	= -
over 24	-	= -

Test Pit Dimensions (ft)

Pit Length x Width (ft) 8.0 x 4.0
Pit Depth (ft) 6.5

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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HALEY & ALDRICH

TEST PIT LOG

Test Pit No. TP12-15

Project	SUFFOLK DOWNS DEVELOPMENT
Location	EAST BOSTON, MA
Client	STERLING SUFFOLK RACECOURSE, LLC
Contractor	JAMES W. FLETT COMPANY, INC.
Equipment Used	CAT M318
File No.	37181-003
H&A Rep	S. Shay
Date	9 May 2012
Weather	Overcast, 50s

Ground El.: 17.6 (est.) **El. Datum:** BCB

Location: See Plan

Groundwater depths/entry rates (in./min.): 4.0 ft/ entering rapidly from floor

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0		17.4		-SANDY ROOTMAT-				50	50					
		0.2	SP	Light gray-brown fine SAND (SP)				10	90					
		17.2		-FILL-										
		0.4	SP	Dark brown poorly graded SAND (SP), 0% oversize, mps 2 in., no structure, no odor, moist, approximately 30-40% ash and cinders, 5% glass, brick, wood, trace metal, intact bottles			40	40	20					
1				Note: Loose, easy to excavate.										
2														
3				-FILL-										
4				Note: Saturated at 4.0 ft.										
5		12.6												
		5.0		BOTTOM OF EXPLORATION 5.0 FT										

Obstructions: None

Remarks: Standard backfill
Did not take soil sample due to high ash and cinder content.
Moved pit approximately 15.0 ft north of original staked location.

Field Tests

Dilatancy	R - Rapid S - Slow N - None
Toughness	L - Low M - Medium H - High
Plasticity	N - Nonplastic L - Low M - Medium H - High
Dry Strength	N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth	4.0	ft
measured after	0.25	hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	= -
over 24	-	= -

Test Pit Dimensions (ft)

Pit Length x Width (ft) 8.0 x 4.0
Pit Depth (ft) 5.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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HALEY & ALDRICH

TEST PIT LOG

Test Pit No. TP12-16

Project	SUFFOLK DOWNS DEVELOPMENT	**File No.**	37181-003
Location	EAST BOSTON, MA	**H&A Rep**	S. Shay
Client	STERLING SUFFOLK RACECOURSE, LLC	**Date**	8 May 2012
Contractor	JAMES W. FLETT COMPANY, INC.	**Weather**	Light rain, 50s
Equipment Used	CAT M318		

Ground El.: 18.4 (est.) **El. Datum:** BCB | **Location:** See Plan | **Groundwater depths/entry rates (in./min.):** 6.2 ft/ slowly

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0			SM	Brown silty SAND (SM), 0% oversize, mps 4 in., no structure, no odor, moist			20	20	30	30				
1				-FILL-										
2		16.4 2.0	SC	Gray-black clayey SAND (SC), 0% oversize, mps 4 in., no structure, no odor, moist to very moist, trace brick, porcelain, metal, generally cohesive			15	15	25	45				
3														
4				-FILL-										
5														
6		11.9 6.5		BOTTOM OF EXPLORATION 6.5 FT										

Obstructions: None

Remarks: Standard backfill
Water observed in bucket teeth marks

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth 6.1 ft
measured after 0.25 hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	= -
over 24	-	= -

Test Pit Dimensions (ft)

Pit Length x Width (ft) 10.0 x 4.0
Pit Depth (ft) 6.5

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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HALEY & ALDRICH

TEST PIT LOG

Test Pit No. TP12-17

Project	SUFFOLK DOWNS DEVELOPMENT
Location	EAST BOSTON, MA
Client	STERLING SUFFOLK RACECOURSE, LLC
Contractor	JAMES W. FLETT COMPANY, INC.
Equipment Used	CAT M318
File No.	37181-003
H&A Rep	S. Shay
Date	9 May 2012
Weather	Light rain, 50s

Ground El.: 19.5 (est.) **El. Datum:** BCB | **Location:** See Plan | **Groundwater depths/entry rates (in./min.):** 5.5 ft/ rapidly

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0		19.2		-ASPHALT-										
		0.3	SP	Dark gray poorly graded SAND (SP), 0% oversize, mps 2 in., no structure, no odor, dry to moist, approximately 30-40% cinders (mostly) and ash, 50% brick, glass, wood (milled wood and tree branch pieces), metal, occasional intact bottles		10	20	50	20					
1														
2														
3				-FILL-										
4														
5														
6														
		13.0												
		6.5		BOTTOM OF EXPLORATION 6.5 FT										

Obstructions: None

Remarks: Standard backfill
Pit moved approximately 20.0 ft east per Steve Pini (Suffolk Downs) to avoid utility.

Field Tests

Dilatancy	R - Rapid S - Slow N - None
Toughness	L - Low M - Medium H - High
Plasticity	N - Nonplastic L - Low M - Medium H - High
Dry Strength	N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth 5.5 ft
measured after 10 min. hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	= -
over 24	-	= -

Test Pit Dimensions (ft)

Pit Length x Width (ft) 8.0 x 4.0
Pit Depth (ft) 6.5

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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HALEY & ALDRICH

TEST PIT LOG

Test Pit No. TP12-18

Project	SUFFOLK DOWNS DEVELOPMENT	**File No.**	37181-003
Location	EAST BOSTON, MA	**H&A Rep**	S. Shay
Client	STERLING SUFFOLK RACECOURSE, LLC	**Date**	9 May 2012
Contractor	JAMES W. FLETT COMPANY, INC.	**Weather**	Light rain/ 50s
Equipment Used	CAT M318		

Ground El.: 20.7 (est.) **El. Datum:** BCB | **Location:** See Plan | **Groundwater depths/entry rates (in./min.):** 6.8 ft/ rapidly

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0		20.5		-ASPHALT-										
		0.2		-ROADWAY BASE SAND/GRAVEL-										
		20.3	SP	Dark gray poorly graded SAND (SP), 0% oversize, mps 3 in., no structure, slight petroleum-like odor, dry to moist, up to approximately 50% cinders with ash, 20% brick, 5% glass, metal		5	30	55	10					
1		0.4		Note: Loose, easy to excavate.										
2														
3				-FILL-										
4														
5														
6				Note: Saturated from 6.8 to 7.0 ft.										
7		13.7		BOTTOM OF EXPLORATION 7.0 FT										
		7.0												

Obstructions: None

Remarks: Standard backfill

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth 6.8 ft
measured after 10 min. hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	= -
over 24	-	= -

Test Pit Dimensions (ft)

Pit Length x Width (ft) 8.0 x 4.0
Pit Depth (ft) 7.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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TEST PIT LOG

Test Pit No. TP12-19

Project	SUFFOLK DOWNS DEVELOPMENT	**File No.**	37181-003
Location	EAST BOSTON, MA	**H&A Rep**	S. Shay
Client	STERLING SUFFOLK RACECOURSE, LLC	**Date**	9 May 2012
Contractor	JAMES W. FLETT COMPANY, INC.	**Weather**	Overcast, 60s
Equipment Used	CAT M318		

Ground El.: 16.5 (est.) **El. Datum:** BCB | **Location:** See Plan | **Groundwater depths/entry rates (in./min.):** 4.3 ft/ rapidly

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0		16.3		-ASPHALT-										
		0.2		Brown medium SAND, trace gravel										
		16.0		-FILL-										
		0.5	SM	Olive-gray silty SAND with gravel (SM)	10	20	15	20	20	15				
1				-FILL-										
		15.3												
		1.2	SP	Dark gray to black poorly graded SAND (SP), 0% oversize, mps 4 in., no structure, no odor, moist to wet, approximately 25% ash/cinders, trace brick, glass, wood	5	5	15	50	20	5				
2														
3				-FILL-										
4														
5		11.5												
		5.0		BOTTOM OF EXPLORATION 5.0 FT										

Obstructions: None

Remarks: Standard backfill

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth 4.3 ft
measured after 10 min. hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	= -
over 24	-	= -

Test Pit Dimensions (ft)

Pit Length x Width (ft) 8.0 x 4.0
Pit Depth (ft) 5.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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HALEY & ALDRICH

TEST PIT LOG

Test Pit No. TP12-20

Project	SUFFOLK DOWNS DEVELOPMENT	**File No.**	37181-003
Location	EAST BOSTON, MA	**H&A Rep**	S. Shay
Client	STERLING SUFFOLK RACECOURSE, LLC	**Date**	10 May 2012
Contractor	JAMES W. FLETT COMPANY, INC.	**Weather**	Rain, 60s
Equipment Used	CAT M318		

Ground El.: 16.3 (est.) **El. Datum:** BCB | **Location:** See Plan | **Groundwater depths/entry rates (in./min.):** 3.5 ft/ rapidly

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0		16.1		-ASPHALT-										
		0.2	SP- SM	Gray poorly graded SAND with silt and gravel (SP-SM), 2% cobbles, mps 3 in., no structure, no odor, moist	5	15	20	20	30	10				
1				-FILL-										
2														
3		13.3												
		3.0	SP	Black poorly graded SAND with gravel (SP), 10% oversize, mps 6 in., no structure, no odor, wet, up to approximately 30% cinders with ash, trace brick, glass	5	10	20	25	35	5				
4				-FILL-										
		11.8												
		4.5		BOTTOM OF EXPLORATION 4.5 FT										

Obstructions: None

Remarks: Standard backfill

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth 3.5 ft
measured after 10 min. hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	= -
over 24	-	= -

Test Pit Dimensions (ft)

Pit Length x Width (ft) 8.0 x 4.0
Pit Depth (ft) 4.5

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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HALEY & ALDRICH

TEST PIT LOG

Test Pit No. TP12-21

Project	SUFFOLK DOWNS DEVELOPMENT
Location	EAST BOSTON, MA
Client	STERLING SUFFOLK RACECOURSE, LLC
Contractor	JAMES W. FLETT COMPANY, INC.
Equipment Used	CAT M318
File No.	37181-003
H&A Rep	S. Shay
Date	10 May 2012
Weather	Overcast, 60s

Ground El.: 15.4 (est.) **El. Datum:** BCB | **Location:** See Plan | **Groundwater depths/entry rates (in./min.):** 3.0 ft/ rapidly

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0		15.2		-ASPHALT-										
		0.2	SP	Dark gray to black poorly graded SAND with ash and cinders (SP), occasional intact bottles, brick, wood	5	5	15	20	50	5				
1				-FILL-										
2														
3														
4		11.4												
		4.0		BOTTOM OF EXPLORATION 4.0 FT										

Obstructions: None

Remarks: Standard backfill

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth 3.0 ft
measured after 5 min. hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	= -
over 24	-	= -

Test Pit Dimensions (ft)

Pit Length x Width (ft) 8.0 x 4.0
Pit Depth (ft) 4.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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HALEY & ALDRICH

TEST PIT LOG

Test Pit No. TP12-22

Project	SUFFOLK DOWNS DEVELOPMENT	**File No.**	37181-003
Location	EAST BOSTON, MA	**H&A Rep**	S. Shay
Client	STERLING SUFFOLK RACECOURSE, LLC	**Date**	9 May 2012
Contractor	JAMES W. FLETT COMPANY, INC.	**Weather**	Overcast, 60s
Equipment Used	CAT M318		

Ground El.: 14.3 (est.) **El. Datum:** BCB | **Location:** See Plan | **Groundwater depths/entry rates (in./min.):** 3.6 ft/ rapidly

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0				-ASPHALT-										
		14.0												
		0.3	SM	Olive-gray silty SAND with gravel (SM), 5% cobbles, mps 4 in., no structure, no odor, moist	5	10	15	15	35	20				
				-FILL-										
1														
		13.1												
		1.2	SP	Dark gray to black poorly graded SAND (SP), 0% oversize, mps 2 in., no structure, no odor, moist to wet, approximately 20-30% ash/cinders, trace brick										
2														
				-FILL-										
3														
		10.3												
4		4.0		BOTTOM OF EXPLORATION 4.0 FT										

Obstructions: None

Remarks: Standard backfill

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth 3.6 ft
measured after 5 min. hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	= -
over 24	-	= -

Test Pit Dimensions (ft)

Pit Length x Width (ft) 8.0 x 4.0
Pit Depth (ft) 4.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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TEST PIT LOG

Test Pit No. TP12-23

Project	SUFFOLK DOWNS DEVELOPMENT
Location	EAST BOSTON, MA
Client	STERLING SUFFOLK RACECOURSE, LLC
Contractor	JAMES W. FLETT COMPANY, INC.
Equipment Used	CAT M318
File No.	37181-003
H&A Rep	S. Shay
Date	9 May 2012
Weather	Overcast, 60s

Ground El.: 15.1 (est.) **El. Datum:** BCB | **Location:** See Plan | **Groundwater depths/entry rates (in./min.):** 3.5 ft/ rapidly

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0				-ASPHALT-										
		14.8 / 0.3	SM	Olive-gray silty SAND with gravel (SM), single boulder oversize, 10% cobbles, mps 1.8 in., no structure, no odor, moist	5	15	15	20	20	25				
1				-FILL-										
2														
		12.6 / 2.5	SP	Dark brown poorly graded SAND (SP), 3% cobbles, mps 4 in., no structure, no odor, wet, approximately 25% cinders with ash, 10% brick, trace wood, glass	5	5	20	35	30	5				
3				-FILL-										
4		11.1 / 4.0		BOTTOM OF EXPLORATION 4.0 FT										

Obstructions: None

Remarks: Standard backfill
Too wet; come back when settled/cones - caution tape on 5/9/12

Field Tests

Dilatancy	R - Rapid S - Slow N - None
Toughness	L - Low M - Medium H - High
Plasticity	N - Nonplastic L - Low M - Medium H - High
Dry Strength	N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth 3.5 ft
measured after 5 min. hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	= -
over 24	-	= -

Test Pit Dimensions (ft)

Pit Length x Width (ft) 8.0 x 4.0
Pit Depth (ft) 4.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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TEST PIT LOG

Test Pit No. TP12-24

Project	SUFFOLK DOWNS DEVELOPMENT	**File No.**	37181-003
Location	EAST BOSTON, MA	**H&A Rep**	S. Shay
Client	STERLING SUFFOLK RACECOURSE, LLC	**Date**	10 May 2012
Contractor	JAMES W. FLETT COMPANY, INC.	**Weather**	Rain, 60s
Equipment Used	CAT M318		

Ground El.: 15.7 (est.) **El. Datum:** BCB | **Location:** See Plan | **Groundwater depths/entry rates (in./min.):** 3.5 ft/ rapidly

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0		15.4		-ASPHALT-										
		0.3	SP- SM	Gray poorly graded SAND with silt and gravel (SP-SM), 2% cobbles, mps 3 in., no structure, no odor, moist	5	15	20	20	30	10				
1				-FILL-										
2														
3		12.7												
		3.0	SP	Black poorly graded SAND with gravel (SP), 10% oversize as rubble fill, mps 6 in., no structure, no odor, wet, up to approximately 30% cinders with ash, trace brick/wood, scrap metal	5	10	20	25	35	5				
4				-FILL-										
		10.9												
		4.8		BOTTOM OF EXPLORATION 4.8 FT										

Obstructions: None

Remarks: Standard backfill

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth 3.5 ft
measured after 5 min. hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	= -
over 24	-	= -

Test Pit Dimensions (ft)

Pit Length x Width (ft) 8.0 x 4.0
Pit Depth (ft) 4.8

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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TEST PIT LOG

Test Pit No. TP12-25

Project	SUFFOLK DOWNS DEVELOPMENT	**File No.**	37181-003
Location	EAST BOSTON, MA	**H&A Rep**	S. Shay
Client	STERLING SUFFOLK RACECOURSE, LLC	**Date**	8 May 2012
Contractor	JAMES W. FLETT COMPANY, INC.	**Weather**	Light rain, 50s
Equipment Used	CAT M318		

Ground El.: 16.9 (est.) **El. Datum:** BCB

Location: See Plan

Groundwater depths/entry rates (in./min.): 2.3 ft, and at 4.3 ft slowly

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0			SM	Dark brown silty SAND (SM), 0% oversize, mps 2 in., no structure, no odor, moist, 20% rootlets, trace slag, trace brick, trace glass -FILL-		5	15	20	30	30				
		16.0 0.9												
1			SM	Olive-brown to brown silty SAND with gravel (SM), 3% cobbles, mps 6 in., no structure, no odor, moist, appears to be disturbed -FILL-	5	15	15	20	20	25				
2		14.6 2.3												
			SM	Olive-brown silty SAND with gravel (SM), 5% cobbles, two boulders, mps 1.1 in., no structure although frequent irregular silty sand pockets, no odor, wet, mottling observed at 2.3 ft	5	15	15	20	20	25				
3				Note: Soils difficult to excavate -REWORKED GLACIAL TILL-										
4				Note: Probable boulder broke off in angular pieces.										
5				Note: Bottom of pit varies from 4.5- to 6-ft depth on probable boulder surface.										
6		10.9 6.0		BOTTOM OF EXPLORATION 6.0 FT										

Obstructions: Probable boulder; irregular surface from 4.5 to 6.0 ft.

Remarks: Standard backfill
Mottling present at 2.3 ft

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth N/E ft
measured after 0.25 hours elapsed

Boulders

Diameter (in.)	Number		Approx. Vol. (cu.ft)
12 to 24	2	=	2.1
over 24	-	=	-

Test Pit Dimensions (ft)

Pit Length x Width (ft) 12.0 x 4.0
Pit Depth (ft) 6.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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TEST PIT LOG

Test Pit No. TP12-26

Project	SUFFOLK DOWNS DEVELOPMENT	**File No.**	37181-003
Location	EAST BOSTON, MA	**H&A Rep**	S. Shay
Client	STERLING SUFFOLK RACECOURSE, LLC	**Date**	8 May 2012
Contractor	JAMES W. FLETT COMPANY, INC.	**Weather**	Light rain, 50s
Equipment Used	CAT M318		

Ground El.: 16.7 (est.) **El. Datum:** BCB | **Location:** See Plan | **Groundwater depths/entry rates (in./min.):** 2.5 ft/ rapidly

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0			SM	Dark brown silty SAND (SM), 0% oversize, mps 3 in., no structure, no odor, moist, 30% rootlets Note: Grass-covered ground surface.		5	15	15	35	30				
		16.0		-FILL/TOPSOIL-										
		0.7	SP	Brown poorly graded SAND (SP), <1% cobbles, mps 3.5 in., no structure, no odor, moist to wet/saturated at 2.5 ft Note: Appears to be placed material.			10	80	10					
1														
2														
3				-FILL-										
4														
		12.2 4.5		BOTTOM OF EXPLORATION 4.5 FT										

Obstructions: None, except sidewall collapse

Remarks: Standard backfill
Abrupt change in topography noted 20.0 ft to west

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth 2.6 ft
measured after 0.25 hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	-
over 24	-	-

Test Pit Dimensions (ft)

Pit Length x Width (ft) 10.0 x 4.0
Pit Depth (ft) 4.5

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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TEST PIT LOG

Test Pit No. TP12-27

Project	SUFFOLK DOWNS DEVELOPMENT	**File No.**	37181-003
Location	EAST BOSTON, MA	**H&A Rep**	S. Shay
Client	STERLING SUFFOLK RACECOURSE, LLC	**Date**	8 May 2012
Contractor	JAMES W. FLETT COMPANY, INC.	**Weather**	Overcast, 50s
Equipment Used	CAT M318		

Ground El.: 15.8 (est.) **El. Datum:** BCB | **Location:** See Plan | **Groundwater depths/entry rates (in./min.):** 3.0 ft/ rapidly

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0				-ASPHALT-										
		15.5 0.3	SM	Gray silty SAND (SM)		5	20	25	30	20				
1				-FILL-										
		14.3 1.5	SP	Black poorly graded SAND (SP), 20% oversize as rubble fill, mps 5 in., no structure, no odor, wet, approximately 30% ash and cinders, 10% wood, 5% glass, porcelain, brick		10	25	30	30	5				
2				Note: Loose, easy to excavate.										
3				-FILL-										
4		11.8 4.0		BOTTOM OF EXPLORATION 4.0 FT										

Obstructions: None

Remarks: Standard backfill
Water overflow during backfill

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth 3.0 ft
measured after 10 min. hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	= -
over 24	-	= -

Test Pit Dimensions (ft)

Pit Length x Width (ft) 8.0 x 5.0
Pit Depth (ft) 4.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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TEST PIT LOG

Test Pit No. TP12-28

Project	SUFFOLK DOWNS DEVELOPMENT	**File No.**	37181-003
Location	EAST BOSTON, MA	**H&A Rep**	S. Shay
Client	STERLING SUFFOLK RACECOURSE, LLC	**Date**	8 May 2012
Contractor	JAMES W. FLETT COMPANY, INC.	**Weather**	Light rain, 50s
Equipment Used	CAT M318		

Ground El.: 15.6 (est.) **El. Datum:** BCB

Location: See Plan

Groundwater depths/entry rates (in./min.): 4.0 ft/ rapidly; bubbling at floor

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0				-ROOTMAT-										
		15.3 0.3	SM	Brown silty SAND with gravel (SM), 0% oversize, mps 2 in., no structure, no odor, moist		20	15	15	35	15				
1				-FILL-										
		14.1 1.5	SM/ OL/ OH	Olive-gray to black silty SAND (SM) intermixed with ORGANIC SOIL (OL/OH), trace amounts of brick, porcelain, glass			10	10	30	50				
2				-FILL-										
3				Note: Slight sheen on water observed in pit.										
4		11.6 4.0		BOTTOM OF EXPLORATION 4.0 FT										

Obstructions: None

Remarks: Standard backfill

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth 3.1 ft
measured after 0.25 hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	= -
over 24	-	= -

Test Pit Dimensions (ft)

Pit Length x Width (ft) 8.0 x 4.0
Pit Depth (ft) 4.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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TEST PIT LOG

Test Pit No. TP12-29

Project	SUFFOLK DOWNS DEVELOPMENT
Location	EAST BOSTON, MA
Client	STERLING SUFFOLK RACECOURSE, LLC
Contractor	JAMES W. FLETT COMPANY, INC.
Equipment Used	CAT M318
File No.	37181-003
H&A Rep	S. Shay
Date	8 May 2012
Weather	Overcast, 50s

Ground El.: 23.7 (est.) **El. Datum:** BCB

Location: See Plan

Groundwater depths/entry rates (in./min.): Water not entering pit

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0			SM	Dark brown silty SAND (SM), 0% oversize, mps 1/4 in., no structure, no odor, moist, 20% rootlets			20	20	40	20				
		23.2 0.5		Note: Grass-covered ground surface. -FILL/TOPSOIL-										
			SP- SM	Brown poorly graded SAND with silt (SP-SM), 1% cobbles, mps 4 in., no structure, no odor, moist, trace brick, trace cinders, trace wood	5	5	25	25	30	10				
2				-FILL-										
4														
		18.7 5.0	OL/ OH	Gray sandy ORGANIC SOIL (OL/OH), 0% oversize, mps 2 in., no structure, no odor, moist, occasional intermixed irregular peat pockets, trace wood, disturbed			5	10	10	75				
6				-FILL-										
8				Note: Brick pieces at 8.0 ft. Appears to be disturbed to 10.0 ft.										
10		13.7 10.0		BOTTOM OF EXPLORATION 10.0 FT										

Obstructions: None

Remarks: Standard backfill

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth N/E ft
measured after - hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	-	= -
over 24	-	= -

Test Pit Dimensions (ft)

Pit Length x Width (ft) 8.0 x 4.0
Pit Depth (ft) 10.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

HA TESTPIT-07-1 HA-LIB07-1-BOS.GLB HA-TP07-1.GDT G:\37181\003\TEST PITS\36171-003_TP.GPJ 4 Jun 12

HALEY & ALDRICH

TEST PIT LOG

Test Pit No. TP12-30

Project	SUFFOLK DOWNS DEVELOPMENT
Location	EAST BOSTON, MA
Client	STERLING SUFFOLK RACECOURSE, LLC
Contractor	JAMES W. FLETT COMPANY, INC.
Equipment Used	CAT M318
File No.	37181-003
H&A Rep	S. Shay
Date	8 May 2012
Weather	Light rain, 50s

Ground El.: 27.7 (est.) **El. Datum:** BCB | **Location:** See Plan | **Groundwater depths/entry rates (in./min.):** No water entering pit

Depth (ft)	Sample ID	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0			SM	Dark brown silty SAND (SM), 0% oversize, mps 2 in., no structure, no odor, dry, trace roots, trace brick -FILL/TOPSOIL-		5	20	25	25	25				
		26.7 1.0	SP- SM	Gray-brown poorly graded SAND with silt (SP-SM), 1% cobbles, mps 6 in., no structure, no odor, moist, trace roots, brick and glass -FILL-	5	5	25	25	30	10				
2		25.3 2.4	ML	Gray-brown to light brown SILT with sand (ML), 0% oversize, mps 2 in., irregular structure, no odor, moist, 20% roots and organic fiber, appears to be disturbed			5	10	10	75				
4			ML	Similar to above except sand content increases, 2% oversize, mps 1.5 in., trace brick, metal, sandy silt			10	10	15	65				
6				-FILL-										
		20.7 7.0	OL/ OH	Dark gray with prominent black coloring, sandy ORGANIC SOIL with gravel (OL/OH), 2% oversize as cobbles and boulders (including boulder-sized rubble), mps 1.2 in., no structure, very slight organic odor, moist, appears to be disturbed	5	10	5	10	10	60				
8				-FILL-										
10				-FILL-										
12				-FILL-										
		14.7 13.0		BOTTOM OF EXPLORATION 13.0 FT										

Obstructions: None

Remarks: Standard backfill

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth N/E ft
measured after - hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24	4	= -
over 24		= -

Test Pit Dimensions (ft)

Pit Length x Width (ft) 12.0 x 4.0
Pit Depth (ft) 13.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

HA TESTPIT-07-1 HA-LIB07-1-BOS.GLB HA-TP07-1.GDT G:\37181\003\TEST PITS\36171-003_TP.GPJ 4 Jun 12

Attachment G

Sample Crisis Management Plan

HORSESHOE®
HAMMOND

CRISIS MANAGEMENT PLAN

777 Casino Center Drive (Main)
1050 Calumet Avenue (Warehouse)
Hammond, IN 46320
(219) 473-7000

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Abbreviations and Acronyms

PCT	Property Crisis Team
CFR	Code of Federal Regulations
CPR	Cardiopulmonary Resuscitation
EMT	Emergency Medical Technician
EOC	Emergency Operation Center (Lake County)
EOP	Emergency Operation Plan (Lake County)
FBI	Federal Bureau of Investigations
IGC	Indiana Gaming Commission
IC	Incident Command
OSHA	Occupational Safety and Health Administration

INTRODUCTION

Caesar's Entertainment priorities will always remain the same regardless of the nature and scope of any crisis facing us. These priorities will be the overriding imperative for all crisis-related decisions and will guide all of our actions. These priorities, in descending order are to protect the health and safety of guests and employees, maintain our reputation for fair gaming, preserve our critical assets and other corporate property, and to maintain business operations. Our consistent message will be the health and safety of our guests and employees and goodwill towards our stakeholders."

The contents of this manual are to be utilized as general guidelines and procedures for handling any emergency situation that may occur at any Caesar's owned or managed property. The primary purpose of an crisis management plan is to provide all affected individuals with a planned response to emergency situations that will protect lives; and secondarily, to protect property and resources, in the safest, most expedient manner

with minimal disruption of operations. Emergencies can arise from natural disasters or from human activities that are intentional or unintentional and have potential for creating devastating destruction.

This manual is intended to provide basic, standard guidelines and will be updated as necessary.

LOCAL GEOGRAPHY AND AREA DEMOGRAPHICS

LAKE COUNTY AREA ANALYSIS

Lake County, which is located in the northwest section of the State of Indiana, encompasses 501 square miles and is divided into eleven township units. The population is approximately 484,500 and includes a diverse minority population in the northern portion.

Lake County is located within the Valparaiso, Moraine, Calumet, Lacustrine, and the Kankakee Basin. The north-south continental divide separates natural drainage ultimately by the St. Laurence Seaway and the Gulf of Mexico.

There are several natural environmentally-sensitive areas located in the northern section, such as dune and swale prairies, wetlands, oak savannas and also some diverse and endangered ecosystems.

Lake County is diverse in its areas and includes the following incorporated areas: Hammond, Gary, Crown Point, Merrillville, Hobart, Cedar Lake, Whiting, Dyer, Highland, Lowell, Lake Station, St. John, Winfield, Griffith, Munster, Schererville and East Chicago.

The major industries include steel, petroleum, chemical products, industrial gases and numerous plastic manufacturing companies. Agriculture was once the primary industry. The communities of Hobart and Lowell are largely farming areas. Approximately 30% of Lake County is residential.

Lake County has several major thoroughfares intersected by many state roads and interstates.

Lake County has seven railroad companies encompassing both freight and passengers.

Three airports of which two are privately owned and operated serve the Lake County area. These airports are located in Hobart, Gary and Griffith.

There are eight hospitals (medical facilities) located in Lake County totaling approximately 3,900 beds, with smaller medical treatment centers surrounding the more densely populated areas.

Law enforcement entities are comprised of the Lake County Sheriff's Police, Indiana State Police the F.B.I Merrillville Office, and fifteen other police departments.

Fire and rescue services are provided by twenty-two fire departments with most of them operating with mutual aid agreements. The majority of the departments are volunteer.

Numeric's based on the 2000 census.

The berthing area where the Horseshoe Casino resides is surrounded by a two-part breakwater. The channel to open water is approximately 150 (one hundred and fifty) feet wide, and is slightly curving. The water depth is about 16 (sixteen) feet at mean lower depth.

AUTHORITIES AND REFERENCES

Caesar's Entertainment Risk Management Toolbox, Specialized Programs, Emergency Preparedness

Avian Influenza Outbreak Guidelines
Norovirus Outbreak Prevention and Remediation Guidelines
Harrah's Crisis Communications Manual, Dated 2001
This information is located at: http://entweb1/rm/risk_control.htm

The legal entities in the Horseshoe Casino jurisdiction whose emergency response roles are described in the Crisis Management Plan are listed below.

Agency/Person	Description of Role of Agency During Practice Session	Business Address	Phone No.

City of Hammond Mayor	Advised	5925 Calumet, Hammond, IN	(219) 853-6301
F.B.I.	Advised	1277 East 85th Ave, Merrillville, IN	219-769-3719
City of Hammond Police Chief	Advisor/Participant	509 Douglas St. Hammond, IN	911 (219) 852-6310
City of Hammond Fire Chief	Advisor/Participant	6110 Calumet, Hammond, IN	911 (219) 853-6416
Emergency Management Agency	Advisor/Participant	5925 Calumet, Hammond, IN	(219) 853-6393
Lake County Sheriff's Police Dive Team	Advised	2293 N. Main Crown Point, IN	(219) 755-3300
Marine Unit	Advised	2293 N. Main Crown Point, IN	(219) 755-3300
Lake County Emergency Management Agency	Advised	2293 N. Main Crown Point, IN	(219) 755-3549
Indiana Director of Emergency Management	None	2900 West 93rd Street, Crown Point IN	(219) 755-3549
United States Coast Guard	Advised	1240 E. 9th Street Cleveland, OH	(414) 747-7190
Indiana State Gaming Commission or Agent	Advised	777 Casino Center Dr., Hammond, IN	(219) 473-1457
Indiana State Police	Advised	1550 East 181st Avenue Lowell, IN	(219) 696-6242
American Red Cross	None	791 East 83rd Ave Merrillville IN	(219) 756-5360

CONCEPT OF EMERGENCY OPERATIONS

Response to emergencies or crisis situations at Horseshoe Casino Hammond will always be guided by the priorities of protecting the health and safety of guests and employees, maintaining our reputation for fair gaming, preserving our critical assets and other corporate property, and maintaining business operations. It is the General Manager's intent that all natural and manmade emergencies occurring on our premises, or affecting our business operations, be handled in a rapid and effective manner, consistent with our stated priorities and by trained and properly equipped personnel using emergency response best practices. To the extent possible, the emergency will be contained, isolated, and controlled so as to not become more widespread and further interrupt normal business operations. In all cases, we will responsibly cooperate with government authorities concerned with the emergency. In all cases, we will speak with one *properly authorized* voice to employees, guests, corporate, and the media.

Without sacrificing adequacy, our response to emergency situations will be proportional to the crisis. When appropriate, emergencies will be handled by the relevant department (e.g. Security, Facilities) with notification to management. Significant emergencies, or crisis situations that rise to the level of a corporate-wide crisis, requires activation of the Property Crisis Team (PCT). However, nothing precludes the activation of the PCT in cases where the standard of a corporate crisis is not satisfied and declared, but the GM believes such activation beneficial for incident management.

Corporate crises must be declared by proper authority at the executive-level and must generally satisfy the following criteria:

- ☐ Escalates in intensity.
- ☐ Adversely impacts shareholder value or the corporation's financial position, Causes harm to people or damage to property or the environment.
- ☐ Falls under close media or government scrutiny.
- ☐ Interferes with normal operations and consumes significant management time and/or financial resources.
- ☐ Jeopardizes the organization's reputation, products, or officers, and therefore negatively impacts its future.

The Property Crisis Team will be responsible for collaboratively coordinating the response, making decisions, and returning operations to normal as soon as feasible after an emergency. If required, the Property Crisis Team will exercise its responsibilities from a designated Command Center which will serve as the focal point for the receipt of information, making decisions, issuing orders, and maintaining control of the emergency.

The Crisis Management Plan defines the concepts, resources and methodology for a competent, practical and compliant response to an emergency incident for the Horseshoe Casino. The plan is based on criteria established by the Indiana State Gaming Commission under Indiana 68 Administrative Code (IAC) 8-12-3 and the Occupational Safety and Health Administration (OSHA) under 29 CFR 1910.38 Emergency Action Plan and 29 CFR 1910.120 – Emergency Response to Hazardous Substance Releases. The CMP identifies, implements and correlates the Horseshoe Casino and local, state and federal agencies, departments and private sector companies to allocate those resources to properly manage an emergency incident.

The Horseshoe Casino Crisis Management Plan becomes incorporated into state (Indiana), county (Lake), and local (Hammond) emergency plans. All emergency

coordinating contacts, structures, responsibilities, and agreements will be covered in this Plan.

PROPERTY CRISIS TEAM

The Property Crisis Team (PCT) is the property level team activated by the General Manager (GM) to handle both localized emergencies and situations that rise to the level of a declared corporate crisis. When operating as part of a corporate-wide response effort, the PCT is activated upon declaration of a corporate crisis by the President and CEO, or earlier if activated by the GM, and remains in operation until the crisis is satisfactorily resolved. The GM chairs the PCT and has the primary responsibility for response to the crisis at the property. The PCT physically occupies a Command Center from which response and mitigation efforts can be safely and effectively coordinated and managed. The PCT functionally mirrors the Enterprise Crisis Team and is the property's focal point for management to receive information, make decisions, issue orders, and maintain effective control of the emergency.

The PCT is charged with the following responsibilities:

(1) In a deteriorating situation, determines if a crisis is actually occurring and makes a recommendation to the GM for a corporate crisis declaration.

(2) Activates and staffs the Command Center when conditions warrant.

(3) Continually evaluates the situation and makes time sensitive, critical decisions regarding the health and safety of guests and employees including ordering an evacuation if necessary.

(4) Interacts with government authorities.

(5) Organize Guest and Employee Assistance Teams as dictated by circumstances.

(6) Coordinates with and provides all pertinent information to the corporate Enterprise Crisis Team.

(7) Assesses impact and determines required support.

(8) Interacts with the media. Only one individual member of the PCT will be designated to speak to the media on behalf of the property. That person would be the Manager of Internal Communications. If they are unavailable then the GM will designate another member of the PCT.

(9) Implements prepared contingency plans as appropriate (Medical Emergency, Bomb Threat, Power Failure, Evacuation, Fire, Civil Disturbance, Natural Disaster, etc.)

Property Crisis Team
Horseshoe Casino Hammond

Departmental Managers/Supervisors	Phone Ext.	Home Phone	Cellular Phone
Dan Nita, Regional President and General Manager	6000	(219) 924-7444	(219) 902-4531
Erin Chamberlin, Vice President and Assistant General Manager	6343	(312) 496-3876	(219) 201-0092
Dawn Reynolds-Pettit, Vice President of Human Resources	6126	(219) 923-1478	(219) 588-5970
Jennifer Galle, Vice President of Casino Marketing	6343	(314)-805-1658	(609) 418-3838
John Houchin, Director of Facility Operations	5947	(219) 462-1691	(219) 313-9730
Steve Cox, Director of Finance	5986	(219) 923-2117	(219) 928-8180
Mike Montgomery, Director of Casino Operations	6309	(708) 357-4086	(219) 670-6816
Kevin McDonald, Director of Surveillance	6190	(219) 759-3413	(219) 218-5698
Tim Compton, Vice President of Compliance	5970	(219) 218-5700	(219) 218-5700
Mitzie Slavicek, Director of Table Games	5961	(219) 473-0528	(219) 808-6892
Mike Urbanczyk, Manager of Security	6180	(219) 746-9719	(219) 293-6042
Kelley Stephens, Manager of Market Technology (IT)	6142	(219) 306-3656	(219) 306-3656
Tom Kokandy, Manager of Risk	6163	(219) 845-3227	(219) 313-6855
Tim Lambert, Vice President of Legal Affairs (Central Division)	6013	(815)254-0047	(815) 341-4239

COMMAND CENTER

During emergencies, except for those only requiring medical attention, a command center may be necessary for the effective direction of operations. The Command Center will serve as a focal point for management to receive information, make decisions, issue orders, and maintain effective control of the emergency.

The senior ranking member of management will respond to this location when there is a fire alarm, bomb threat, power outage, weather emergency, earthquake, or other serious conditions affecting the welfare of guests and employees. The decision to activate the Command Center will be based on the severity of the emergency and made by General Manger or there designee.

COMMAND CENTER OPERATION

Mission:

- To utilize the various components of the Property Crisis Team (PCT) to respond to localized emergencies and situations that rise to the level of a corporate crisis.
- It is important to understand PCT members' responsibilities may change depending upon the Crisis Incident
- While all PCT members are involved in a Crisis Incident, not all PCT members' will be assigned at the Command Center

Location:

- **Primary:** Security Control/Security Supervisors Office
- **Alternate #1:** Pavilion Valet
- **Alternate #2:** Training Trailers.
- **Alternate #3:** Hammond Fire Department / Hammond Police Department Mobile Command Center.

Activation:

- The Security Manager/Highest member of Security Management Team will respond to the location of any Crisis Incident affecting the welfare of guests and employees.
- The decision to activate the Command Center will be based on the severity of the emergency and made by the General Manager or their designee.

Responsibilities:

- The below listed responsibilities are not all inclusive, but intended to give a general outline from which the On Scene Incident Commander may begin an operation.
- It is recognized that you will still possess an expertise and concern for your permanent assigned position within the Casino operation.

General Manager: On Scene Incident Commander:

- Activates and staffs the Command Center when conditions warrant.
- Evaluates the situations, assessments, and recommendations.
- Makes time sensitive, critical decisions regarding the health and safety of guests and employees.
- Orders and evacuation, if deemed necessary.
- Interacts with assisting government authorities.

Assistant General Manager/Director of Finance: Assistant to On Scene Incident Commander:

- Assumes the On Scene Incident Commander responsibilities in absence of General Manager.
- Establishes and maintains direct communications with Corporate Headquarters and the Corporate Enterprise Crisis Team.
- Assist the Manager of Internal Communication in the preparation of all media contacts and releases.
- Liaisons with the Legal Advisor.

Director of Casino Operations: Intelligence Officer

- Will serve as the Command Center's Intelligence Officer.
- Will review all incoming information, prioritize and forward to On Scene Incident Commander.
- Will disseminate the On Scene Incident Commanders decisions to the appropriate PCT member for action.
- Will ensure that arrangements have been made to provide the Command Center with Food and beverage.

Life threatening information (Demands, Deadlines, Chemical threats, etc) must be taken to On Scene Commander by person have first hand knowledge.

Director of Facility Operations: Operations Officer, CSO

- Will address any emergency needs pertaining to the physical plant.
- Provide any prints, drawings, or plans available for the property to the Command Post upon request of the On Scene Commander.
- Provide consultation to the On Scene Commander or the commanding officials of responding governmental agencies.
- Assist Coordinator of Facility/ Security Operations.
- Assists General Manager with the hand over of command operations to the appropriate responding government agencies (Police, Fire, Medical, etc).

Manager of Security: Security Operations Officer, VSO/FSO

- Implements the prepared contingency plans as appropriate (Bomb, Hostage, Fire, Etc.).

- Coordinates all Security responses.
- Liaisons with IGC.
- Assists in the implementation of the prepared contingency plans.
- Respond to precise scene of the crisis incident, when appropriate and be in charge.

Capitan on Duty or Marine Shift Supervisor: Facility Security Officer/Vessel Security Officer

- Ensure that adequate coordination of security issues takes place between the vessel and facilities; this includes the execution of a Declaration of Security when necessary.
- Ensure that security communication is readily available.
- Ensure that security systems and equipment are installed and maintained.
- Ensure that vessel access, including the embarkation of persons and their effects, is controlled.
- Ensure that restricted areas are controlled.
- Ensure that vessel stores are handled in compliance with this Security Plan.
- Ensure that restricted areas, deck areas, and areas surrounding the vessel are monitored;
- Provide the CSO and Shift Manager of Security with information while executing these duties.

Vice President of Legal Affairs: Legal Advisor

- Provide Legal advice to the On Scene Incident Commander
- Research, write and implement legal policy as needed during the crisis incident
- Maintain contact with Corporate Legal Department

Vice President of Casino Marketing: Media Representative

- Develop the appropriate public information releases to be given to the media outlets upon approval by the On Scene Incident Commander
- Provide liaison between on Scene Incident Commander and the media
- Establish pre-incident list of newspapers, radio stations and television stations
- Ensure all media releases during an on-going crisis incident have been approved by the On Scene Incident Commander, Law Enforcement authorities, and Tactical/Negotiations Coordinators.

Vice President of Compliance: Assistant to Legal Advisor

- In the absence of the Legal Advisor he will provide advice to the On Scene Incident Commander.
- Assist the Legal Advisor in researching legal issues that may arise during the Crisis Incident.

Manager of Risk: Risk Manager

- Be responsible for advising the On Scene Incident Commander and the PCT members of appropriate Risk Management issues.
- Provide advice to the Legal Advisor with issues concerning Risk Management.
- Notify OSHA of mandatory reporting requirements.

Manager of Market Technology (IT): IT Coordinator

- Provide the On Scene Incident Commander and PCT team with IT assistance.
- Pre-determine basic equipment needed in a Command Center and have it programmed and ready for an emergency.
- Assist in the establishment of extra phone/computer lines in a specific area in requested by Command Center.

Director of Table Games: Guest & Employee Assistance Coordinator

- Assure the implementation of Guest Assistance Teams as dictated by the incident.
- Coordinate with Valet the release of vehicles to guests on property.
- Assist with any unforeseen guests' problems.
- Assure the implementation of Employee Assistance Teams as dictated by the incident.
- Coordinate with the Command Center the release of employees from the property.
- Assist with any unforeseen employee problems.

Vice President of Human Resources: Human Resource Coordinator

- Address any problems directed to you by the On Scene Incident Commander concerning employee issue.
- Assist in the preparation of immediate shift changes.
- Assist in the immediate call of employees to report for duty.
- Assist in the call of employees to not to report for duty.
- Coordinate Human Resource staff's responsibility to act as a "copy center" for the Command Center.
- Will ensure a liaison person has been sent to Surveillance to communicate with the Command Center.

Director of Surveillance: Director of Surveillance

- DOES NOT respond to the Command Center.
- Will continue to coordinate all Surveillance activities.
- Will ensure that a liaison has been sent from the Command Center to your location by the Human Service Coordinator.

**** Keep in mind that in the event of an emergency and the Crisis Management Team is unavailable Security may be required to fill these roles and should use the above as a reference to ensure all tasks and duties outlined are accomplished.***

Items to be located at Command Center:

- Set of master keys (Key Watcher or Emergency Box in Security Control)
- A member of the Facilities Department with elevator keys (elevator machine room, recall switch key and elevator door emergency access key)
- Flashlights with spare batteries
- Bullhorn
- Emergency lighting/Emergency Power
- Telephones (dedicated outside phone lines or cellular)
- Battery powered portable AM/FM radios with spare batteries (National weather radio if possible)
- Emergency procedure manuals
- Floor plans of the hotel/casino (architectural, mechanical and electrical)
- Hard hats
- First aid kits
- Fire extinguisher
- Radio communications with spare batteries and charging system
- Office supplies
- This plan and updated emergency contact numbers
- Duct Tape
- Leather man Pliers

PLANNING AND TRAINING

Description of Facility

The Horseshoe Casino is a multi-story facility containing restaurants, gift shops and administrative offices to support the Casino located in the Hammond Marina, City of Hammond, and Lake County, Indiana. An attached nine-story parking garage is located next to the main building an additional seven-story parking garage is in the immediate vicinity of the building. The property footprint also contains two storage warehouse buildings and a training center located approximately a quarter of a mile from the main building. The facilities conform to all applicable codes and regulations.

EMERGENCY INCIDENT ASSUMPTIONS

The table below provides a list of potential realistic emergency incidents and the most likely time period that the incident would occur at the support facility and Casino.

Potential Incidents	Most Likely Time Period That an Incident Would Occur (Critical Time Variables)		
	Time of Day	Day of Week	Time of Year
Medical Emergency	Anytime	Anytime	All Year
Fuel Spill-Water	Anytime	Anytime	All Year
Fuel Spill-Land	Day	Anytime	All Year
Person(s) overboard	Anytime	Anytime	All Year
Fire	Anytime	Anytime	All Year
Power Outage	Anytime	Anytime	All Year
Robbery	Anytime	Anytime	All Year
Transportation Accident	Anytime	Anytime	Spring and Summer
Local operators of tug and barge equipment will be reached, when sighted, by VHF radio and tracked by radar to avoid close aboard passing situations. See attached charts.	Day	Weekends and Holidays	Spring and Summer
Inclement weather: Thunderstorms Tornado/Wind Storm Flooding Earthquakes Winter Storms	Spring and Summer	Any Day	All Year

Terrorism: Biological Bomb (Nuclear Attack Threat) Sabotage Hostage	Any Time	Any Day	All Year

FACILITIES AND VESSELS IN OPERATION AREA

Facilities near the dock or on the excursion route that might be a hazard to the operation of the Horseshoe Casino if an incident were to occur within the boundaries of the identified facilities are listed in the table below.

Hazardous Facilities in Operation Area	Description of Potential Hazards Affecting the Casino
Steel, gas, petroleum, chemical products and plastic manufacturing.	Release of chemical plume during a fire or explosion. Radiological Accidents
Recreational boats and commercial shipping. Land transportation	Incidents involving these facilities and vessels may block emergency routes to the Casino

INCIDENT TYPES

Incident	Criteria	Response
Level I Potential Emergency Incident	☐ An incident or threat of an incident ☐ Confined to small area. ☐ No immediate threat to life or property. ☐ Can be controlled by Horseshoe Casino personnel. ☐ Evacuation may or may not be required.	Most likely handled by Horseshoe Casino trained personnel
Level II Limited Emergency Incident	☐ An actual incident ☐ A potential hazard or large area. ☐ May pose a threat to life and/or property. ☐ May require limited evacuation.	May require outside emergency services and/or mutual aid response.
Level III Full Emergency Incident	☐ An actual incident. ☐ Presents a severe hazard or a large area. ☐ Poses a threat to life and/or property. ☐ Will require evacuation.	Will require outside emergency services and/or mutual aid response.

Organizations and agencies that provide initial response or support are listed in the Table Below. Each may have their own standard operating procedures that will govern their actions for response and action.

Organizations and Agencies That Provide Response Support

Organization or Agency	Primary Responsibility	Support Roles
☐ Caesar's Entertainment, Inc.	☐ Policy and plans for emergency incident management. ☐ Direction and control of the Emergency Operations Center. ☐ Coordination of communications ☐ Plan and resource management	☐ Warnings, public information education.
☐ United States Coast Guard	☐ Waterway enforcement and management	☐ Warnings, communications and information ☐ Inter-agency coordination
☐ Law Enforcement	☐ Law, order and protection ☐ Warning and communications ☐ Traffic control	☐ Evacuation ☐ Search & Rescue ☐ Disaster response
☐ Fire Fighting/Emergency Medical Services	☐ Fire ☐ Emergency Medical - on scene ☐ Hazardous Materials ☐ Evacuation	☐ Cause determination ☐ Warnings and communications ☐ Damage control and assessment
☐ Medical and Human Services	☐ Medical triage and emergency medical ☐ Disaster and mass casualty care and management ☐ Shelter, food, etc.	☐ Human Services ☐ Relocation and public services
☐ Public Works and Services	☐ Utilities, streets and sanitation clearance and restoration	☐ Utilities, streets and sanitation clearance and restoration
☐ Indiana State Emergency Management	☐ Damage assessment ☐ Law enforcement ☐ Resources	☐ Support for local level emergency operations by request
☐ Federal Emergency Management/Disaster Assistance	☐ Emergency Protective Measures	☐ Support of local and state operations

LAKE COUNTY EMERGENCY OPERATIONS CENTER

The table below provides a description of the procedures and support roles for the activation and operation of the Lake County Emergency Operations Center (EOC). The authority person activating the EOC will establish an Incident Command Unit (ICU) at the emergency incident site and appoint an ICU Commander.

Procedures and Support Roles for the Activation and Operation of the Lake County Emergency Operations Center

Purpose	Location	**Activation and Operations Authority**	Organization and Responsibilities
To provide a centralized direction and control together with coordination logistical, administrative and operational support for an emergency incident. The EOC is responsible and has authority for direction and control for all emergency incidents except those that occur in and/or on the pavilion or parking structure of the Horseshoe Casino.	Primary: 2900 W. 93rd Ave Crown Point, IN 219-775-3549 Alternate: May be selected by EOC personnel contingent upon the specific requirements of the incident. Activation, control and authority will be transferred to the Executive Group.	Activation: The President of the Lake County Board of Commissioners (or designee), Lake County Emergency Management Director or Sheriff may activate the Primary or Alternate EOC Operation: The Lake County Emergency Management Director will coordinate all operations and any notifications for EOC operations	Executive Group: Policy development, coordination of EOC activities and overall management of the emergency response. Disaster Analysis: Assessment, determination and documentation of damage and ramification. Operations: Coordination and implementing personnel assigned by title to an emergency incident. Resource: Coordination, deployment and identifying the necessary resources for management of an emergency incident.

MUTUAL AID AGREEMENTS

Land-based mutual aid is available from the following agencies listed below:

- ☐ Lake County Emergency Management Agency
- ☐ Lake County Fire Chief's Association
- ☐ American Red Cross of Northwest Indiana

FIRE AND RESCUE

The Horseshoe Casino has implemented the fire prevention and response capabilities listed in the table below.

Fire Prevention Equipment

Equipment	Personnel	Procedures
The Horseshoe Casino has engineered, installed, maintained, tested and inspected all equipment with compliance to local, state and Federal requirements and fire safety codes.	The Horseshoe Casino has personnel that are trained for an emergency incident, from Security, Facilities/Marine and Support Services.	Horseshoe Casino has developed a Fire and Alarm Plan.

EVACUATION

The Horseshoe Casino has developed Evacuation Plans. The Horseshoe Casino is designed and conforms to all local, State and Federal requirements for emergency lighting, exits signs and means of egress. Security personnel are trained in evacuation procedures. Written evacuation procedures are part of this Crisis Management Plan.

COMMUNICATION AND IMPLEMENTATION

Horseshoe Casino Communications Systems

- The Horseshoe Casino is equipped with a public address system, paging system and personnel are equipped with cellular and/or portable radio communications.
- All Property Crisis Team members and Horseshoe Casino officials will communicate via the system designated by the On-Scene Incident Commander or his designee and Incident Command.
- Response personnel and the EOC will communicate in accordance with the Lake County EOC procedures. Coordination of all radio communications will be done through the EOC for a common frequency.

Warnings or Announcements

- Any emergency warning may be made over the public address system at the direction of the On-Scene Incident Commander or his designee.

On-Scene Commander

- The highest-ranking Security Supervisor/Manager will serve as the On-Scene Commander in the event that a designate On-Scene Incident Commander is unavailable (GM/AGM).
- The On-Scene Commander of the Horseshoe Casino will coordinate with the Response Agency's Incident Commander and remain in control of the Horseshoe Casino response.

Lake County EOC

- Notification for activation for the EOC will be in accordance with the Lake County Emergency Notification Roster.

TRAINING

Horseshoe Casino will conduct initial and continuing orientation training for all affected personnel in the policies and procedures to provide for the safety and emergency response to effectively manage an incident. Training programs are listed in Table B-1.

Table B-1
Health and Safety Training Programs

Training Programs	Initial Orientation	Annual Refresher
Emergency Evacuation	Upon Hire	X
Fire Emergencies	Upon Hire	X
Fire Extinguishers Use	Upon Hire	X
Hazardous Material Release	Upon Hire	X
Hazard Communication	Upon Hire	X
Bloodborne Pathogens	Upon Hire	X

THE SCHEDULE OF TRAINING WILL BE UPDATED ANNUALLY AND A COPY WILL BE SENT TO THE EXECUTIVE DIRECTOR OF THE INDIANA GAMING COMMISSION BY JANUARY 31 OF EACH YEAR.

In addition to the training listed in Table B-1, Horseshoe Casino will provide its Security personnel training as outlined in the Security Operations Manual

Horseshoe Casino will conduct initial and continuing orientation training for all effected local emergency response and medical personnel.

TESTING, MAINTAINING AND REVISING THE CRISIS MANAGEMENT PLAN

The CMP will be maintained through documented amendments identified in testing or updates, or from any follow-up investigative documentation. The test will be reviewed for compliance with the existing policies and procedures to determine their effect and suitability and make the necessary revisions. The frequency of testing of the CMP is provided in the table below.

Frequency of Crisis Management Plan Testing

Drills/Test	Daily	Weekly	Monthly	Quarterly	Semi-Annual (ABS)	Annual
Crisis Management Plan				X	X	X
Public Address System/Communications Systems			X		X	
Medical Emergency	X				X	
Emergency Equipment Inspections		X	X		X	X
Emergency Evacuation				X	X	
Power Failure				X	X	
Selective Contingency Plans				X		

THE SCHEDULE OF TRAINING WILL BE UPDATED ANNUALLY AND A COPY WILL BE SENT TO THE EXECUTIVE DIRECTOR OF THE INDIANA GAMING COMMISSION EACH YEAR.

Training for Local Emergency Response and Medical Personnel

Training Programs	Initial Orientation	Annual Refresher
Overview of the Crisis Management Plan	Upon Hire	TBA

The Manager of Security is responsible for preparing or having prepared the documents listed above.

Required Submittals

Program Area	Agency	Due Date
☐ CMP Training Schedule for the current year.	☐ Executive Director of the Indiana Gaming Commission	☐ January 31, of each year.
☐ CMP Practice schedule for the current year.	☐ Executive Director of the Indiana Gaming Commission	☐ January 31, of each year.
☐ Incident Information Summary	☐ Only need to maintain on file.	☐ 10 days following an incident
☐ Amendments to the CMP	☐ Executive Director of the Indiana Gaming Commission	☐ 60 days prior to their implementation.

RESPONSE EVALUATIONS

At the conclusion of the annual CMP exercises, Horseshoe Casino will evaluate and review the effectiveness of the CMP and will contact the following personnel and response agencies for their input and suggestions:

- ☐ Director of Facility Operations
  Manager of Security
- ☐ Shift Manager of Security
- ☐ City of Hammond Police and Fire
- ☐ Lake County Sheriff's Police
- ☐ Mutual Aid Responders
- ☐ Lake County Emergency Management Personnel
- ☐ Marine Operations

Any changes to the written CMP will be made as necessary based on factors learned during the exercise and documented on Amendments to the Plan.

RESPONSE EVALUATIONS

At the conclusion of the actual CMP incident, Horseshoe Casino will evaluate and review the effectiveness of the CMP and will contact the following personnel and response agencies for their input and suggestions:

- ☐ Director of Facility Operations
  Manager of Security
- ☐ Shift Manager of Security
- ☐ City of Hammond Police and Fire
- ☐ Hammond Emergency Management Personnel
- ☐ Marine Operations
- ☐ Other Agencies as Directed

INCIDENT INFORMATION SUMMARY

Within 10 days following an incident the Horseshoe Casino will complete a Situation Report, and maintain a copy on file. Depending on the nature of the incident, other relative Horseshoe Casino forms will be completed (e.g. OSHA Injury and Illness Logs, Workers' Compensation forms, etc.) and will be available for review.

MEDICAL STAFFING

Horseshoe Casino has a full-time on-site EMT (24 hours a day/7 days a week) and a number of CPR/First Aid trained employees to assist in medical emergencies in addition to local fire and ambulance series. There is an on-site Medial Facility equipped with first aid and medical supplies for use until outside medical personnel arrive.

EVACUATION PLANS

The Horseshoe Casino has developed an Evacuation Action Plan (Specifics listed in the Emergency Response Plan document are attached) As part of this Crisis Management Plan, facility diagrams with the following information are posted at various locations throughout the land based facility and Casino:

Primary and alternative evacuation routes
Staging Areas
Fire Alarm Pull Stations
Tornado/Severe Weather Shelters
Fire Protection Equipment (e.g. Fire Extinguishers)
Fire and Police emergency Phone Numbers

EMERGENCY RESPONSE PLAN

INSTRUCTIONS

1. Entire crew shall familiarize themselves with the location and duties of their emergency stations immediately upon reporting on board.
2. Emergency Squad upon receipt of alarm will muster at the Emergency Equipment Locker, establish communications with the bridge and proceed to the scene to make an initial assessment of situation.
3. Person discovering FIRE shall immediately notify bridge.
4. Upon hearing the signal "MAN OVERBOARD" throw life rings overboard, stop engines, and post lookouts. Rescue Boat crew will immediately prepare the boat for launching.
5. Non-boat operations department crew will help calm and direct patrons to egress routes, and clear passageways as instructed by the Captain.

	FIRE	MAN OVERBOARD	VESSEL EVACUATION	GENERAL EMERGENCY
SIGNAL	Continuous ringing of the ship's whistle and general alarm for 10 or more seconds followed by a verbal announcement.	Hail and pass the word "MAN OVERBOARD" to the bridge. 3 short blasts followed by 1 long blast on ship's whistle and general alarm if to starboard, 3 shorts and 2 long if to port.	More than 6 short blasts and 1 long blast on ship's whistle and general alarm.	Continuous ringing of the ship's whistle and general alarm for 10 or more seconds followed by a verbal announcement.
POSITION	RESPONSIBILITIES	RESPONSIBILITIES	RESPONSIBILITIES	RESPONSIBILITIES
Captain/ Supervisor	In command of all operations, establish communications with emergency squad, sound alarm, start fire pumps, close all fire doors, secure ventilation, alert Coast Guard and shipping in area.	In command of all operations, sound alarm, alert Coast Guard and all shipping in area.	In command of all operations, sound alarm, alert Coast Guard and all shipping in area.	In command of all operations, establish communications with damage control squads, sound alarm, start fire pumps, close all fire doors, secure ventilation, alert Coast Guard and shipping in area.
SUPERVISOR/ON-SCENE LEADER	At scene in charge, lead Emergency Squad.	At scene in charge, supervise the launching of Rescue Boat. Control traffic.	Direct crewmembers to abandon ship stations, evacuate event level 4 theater area with PSO assigned, oversee sweep of vessel, report status to Captain.	Damage Control Squad #1 Leader, Bow - Frames 0-60, Modules A, B, C.
Marine Operations LEAD TECHNICIAN #1	Nozzle man with fire team #1, Don SCBA and fire fighting suit.	Coxswain Rescue Boat.	Evacuate casino level 2 - area 1 and high limit area with PSO assigned. Direct patrons to proper egress routes. Report to Captain when casino level 2 - area 1and high limit area is clear.	Damage Control Squad #2 Leader, Bow - Frames 60-92, Modules A, B, C.
Marine Operations LEAD TECHNICIAN #2	Nozzle man with fire team #2, Don SCBA and fire fighting suit.	Bow-hook in Rescue Boat.	Evacuate event level 4 promenade and buffet areas with PSO assigned. Direct patrons to proper egress routes. Report to Captain when event level 4 promenade and buffet areas are clear.	Damage Control Squad #3 Leader, Bow - Frames 92-137, Modules A, B, C.
Deckhand # 1	Hose man Team #1, Don SCBA and fire fighting suit.	Assist Launching Rescue Boat.	Evacuate mezzanine level 3 with PSO assigned. Direct patrons to proper egress routes. Report to Captain when mezzanine level 3 is clear.	Damage Control Squad #4, Stern - Frames 137-92, Modules D, E, F.
Deckhand # 2	Hose man team #2, Don SCBA and fire fighting suit.	Assist Launching Rescue Boat.	Evacuate theater loggia level 5 with PSO assigned. Direct patrons to proper egress routes. Report to Captain when theater loggia level 5 is clear. Evacuate casino level 2 - area 2 with PSO assigned. Direct patrons to proper egress routes. Report to Captain when casino level 2 - area 2 is clear.	Damage Control Squad #1, Bow - Frames 0-60, Modules A, B, C.
Deckhand #3	Valve man Team #1, Rig hose.	Assist paramedic.	Evacuate theater balcony level 6 & 7 with PSO assigned. Direct patrons to proper egress routes. Report to Captain when theater balcony level 6 & 7 is clear. Evacuate casino level 2 - area 3 with PSO assigned. Direct patrons to proper egress routes. Report to Captain when casino level 2 - area 3 is clear.	Damage Control Squad #6, Stern - Frames 60-36, Modules D, E, F.
CHIEF ENGINEER	In charge of engine room.	In charge of engine room.	In charge of engine room, start pumps as directed. Evacuate hold deck stern frames 60-0. Direct employees to proper egress routes. Close watertight doors if directed. Report to Captain when hold deck stern frames 60-0 is clear.	In charge of engine room, start pumps as directed, Damage Control Squad #7 Leader, Stern - Frames 60-0, Modules D, E, F.
FIRST ASST. ENGINEER	Secure power and ventilation as directed.	Assist as directed.	Evacuate hold deck bow frames 0-60. Direct employees to proper egress routes. Close watertight doors if directed. Report to Captain when hold deck bow frames 0-60 is clear.	Damage Control Squad #7, Stern - Frames 60-0, Modules D, E, F.
SECOND ASST. ENG./OILER	Deploy with Emergency Squad; bring CO2 extinguisher & spare hose. Boundary cool.	Assist as directed.	Evacuate hold deck bow frames 60-92. Direct employees to proper egress routes. Close watertight doors if directed. Report to Captain when hold deck bow frames 60-92 is clear.	Damage Control Squad #6 Leader, Stern - Frames 60-36, Modules D, E, F.
Engine Utility #1	Valve man Team #2, Rig hose.	Assist as directed.	Evacuate hold deck bow frames 92-137. Direct employees to proper egress routes. Close watertight doors if directed. Report to Captain when hold deck bow frames 92-137 is clear.	Damage Control Squad #4 Leader, Stern - Frames 137-92, Modules D, E, F.
Engine Utility #2	Deploy with Emergency Squad; bring CO2 extinguisher & spare hose. Boundary cool.	Assist as directed.	Evacuate hold deck stern frames 137-92. Direct employees to proper egress routes. Close watertight doors if directed. Report to Captain when hold deck stern frames 137-92 is clear.	Damage Control Squad #5 Leader, Stern - Frames 92-60, Modules D, E, F.
SECURITY MANAGER/ SECURITY SUPERVISOR #1	Report to the bridge. Assist Captain with communications.	Report to the bridge. Assist Captain with communications.	Evacuate theater balcony level 6 & 7 with boat operations crew assigned. Crowd control. Evacuate casino level 2 - area 3 (evacuate zones A, B, C, D, E, F, bathrooms and service bars adjacent to zones D & P, and table games between zones A & P) with boat operations crew assigned. Crowd control.	Damage Control Squad #3, Bow - Frames 92-137, Modules A, B, C.
SECURITY SUPERVISOR #2	Deploy with Emergency Squad; bring CO2 extinguisher & spare hose. Boundary cool.	At scene, assist Emergency Squad, coordinate medical assistance.	Evacuate theater balcony level 6 & 7 with boat operations crew assigned. Crowd control. Evacuate casino level 2 - area 3 (evacuate zones A, B, C, D, E, F, bathrooms and service bars adjacent to zones D & P, and table games between zones A & P) with boat operations crew assigned. Crowd control.	Damage Control Squad #2, Bow - Frames 60-92, Modules A, B, C.
PATRON SAFETY OFFICER# 1	Assist patrons.	Assist patrons.	Evacuate theater loggia level 5 with boat operations crew assigned. Crowd control.	Damage Control Squad #5, Stern - Frames 92-60, Modules D, E, F.
PATRON SAFETY OFFICER# 2	Assist patrons.	Assist patrons.	Evacuate theater loggia level 5 with boat operations crew assigned. Crowd control.	Assist as directed.
PATRON SAFETY OFFICER# 3	Assist patrons.	Assist patrons.	Evacuate event level 4 promenade and buffet areas with boat operations crew assigned. Crowd control.	Assist as directed.
PATRON SAFETY OFFICER# 4	Assist patrons.	Assist patrons.	Evacuate event level 4 promenade and buffet areas with boat operations crew assigned. Crowd control.	Assist as directed.
PATRON SAFETY OFFICER# 5	Assist patrons.	Assist patrons.	Evacuate event level 4 theater area with boat operations crew assigned. Crowd control	Assist as directed.
PATRON SAFETY OFFICER# 6	Assist patrons.	Assist patrons.	Evacuate event level 4 theater area with boat operations crew assigned. Crowd control	Assist as directed.
PATRON SAFETY OFFICER# 7	Assist patrons.	Assist patrons.	Evacuate mezzanine level 3 with boat operations crew assigned. Crowd control	Assist as directed.
PATRON SAFETY OFFICER# 8	Assist patrons.	Assist patrons.	Evacuate casino level 2 - area 1 (evacuate zones J, K, L, M, table games area directly in front of main cage, total rewards, service bar and bathrooms adjacent to Zone K) with boat operations crew assigned. Crowd control.	Assist as directed.
PATRON SAFETY OFFICER# 9	Assist patrons.	Assist patrons.	Evacuate casino level 2 - area 1 (evacuate zones J, K, L, M, table games area directly in front of main cage, total rewards, service bar and bathrooms adjacent to Zone K) with boat operations crew assigned. Crowd control.	Assist as directed.
PATRON SAFETY OFFICER# 10	Assist patrons.	Assist patrons.	Evacuate casino level 2 - area 2 (Evacuate zones F, G, H, I, N, O, and table games area between zones I & N.) with boat operations crew assigned. Crowd control.	Assist as directed.
PATRON SAFETY OFFICER# 11	Assist patrons.	Assist patrons.	Evacuate casino level 2 - area 2 (Evacuate zones F, G, H, I, N, O, and table games area between zones I & N.) with boat operations crew assigned. Crowd control.	Assist as directed.
PATRON SAFETY OFFICER# 12	Assist patrons.	Assist patrons.	Evacuate casino level 2 - high limit area (evacuate Asian Gaming, HL Tables, HL Slots, Poker Room, 7 Stars Lounge, and all BOH areas from the port mid-ship accelator to the 7 Stars Lounge) with boat operations crew assigned. Crowd control.	Assist as directed.
PATRON SAFETY OFFICER# 13	Assist patrons.	Assist patrons.	Evacuate casino level 2 - high limit area (evacuate Asian Gaming, HL Tables, HL Slots, Poker Room, 7 Stars Lounge, and all BOH areas from the port mid-ship accelator to the 7 Stars Lounge) with boat operations crew assigned. Crowd control.	Assist as directed.

SECURITY CONTROL

The duties and responsibilities of Security are listed in the Job Description in Human Resources. Additional duties are listed in the various Action Plans provided as part of this Crisis Management Plan.

When outside law enforcement is required, Security Control will, under the direction of an On-Scene Commander, contact the appropriate agency (e.g. Hammond Police, FBI, etc.)

HUMAN SERVICES

Horseshoe Casino has contacted the agencies listed below to arrange for the emergency human services should they be necessary.

Human Services Provided	Agency	Telephone No.
Food	American Red Cross	219 756-5360
Shelter	American Red Cross	219 756-5360
Clothing	American Red Cross	219 756-5360
Continuity Medial Care	American Red Cross	219 756-5360
Crisis Counseling	American Red Cross	219 756-5360
Shelter/Alt Transportation	City of Hammond	219 853-6393

MANAGER OF RISK CONTROL

The Manager of Risk Control is responsible for advising the On-Scene Incident Commander and the Personnel Coordinators as listed in the Command Center Instructions some additional duties in execution and maintenance of this plan include but are not limited to:

- Maintaining a liaison with the On-Scene Incident Commander.
- Coordinating and documenting any necessary training of employees, managers and supervisors.
- Assisting the On-Scene Incident Commander in developing, executing and documenting, on a periodic basis, tests and exercises of various components of the CMP.
- Notifying OSHA within 8 hours of an employee death or hospitalization of three or more employees.
- Completing Indiana OSHA Injury and Illness Logs and necessary Workers Compensation forms.
- Notifying the appropriate environmental agencies of any Reportable Quantity releases by telephone initially and with a follow-up report in writing.
- Coordinating of any remediation activities.
- Periodically updating the Plan as needed.

DIRECTOR OF FACILITY OPERATIONS

The Director of Facilities is responsible for instructions pertaining to the facility listed in the Command Center, some additional duties in execution and maintenance of this plan include but are not limited to:

- Advising of the lockout, switching and use of electrical circuits.
- Contacting local utilities regarding power and water during and after the emergency.
- Making available any prints showing company property, utility services and sewer systems.
- Shutting off utilities if necessary and having appropriate tool(s) readily available.
- Ensuring the protection of sanitary and storm drains to the extent possible in the event of a chemical spill in cooperation with the Incident Commander and the First Responders, Operations Level.
- Ensuring the proper maintenance of all facility emergency equipment and systems including the fire alarm, sprinkler systems, fire extinguishers, emergency lighting, exit signs and security systems.
- The maintenance employee controlling the valves will be trained in knowing how to test the valves to ensure that they are open.
- Conducting a yearly check of the sprinkler valves (and fire alarm systems).
- Knowing the location of all of the sprinkler valves outside the facility.
- Testing the emergency lighting units and inspecting the fire extinguishers on a monthly basis and maintaining written records of testing.

DEPARTMENT MANAGERS/SUPERVISORS

Department Managers/Supervisors have the responsibility for sweeping their designated areas and taking a head count of the employee assembly area during an emergency evacuation along with ensuring members of their department attend any safety related training. Some additional duties in execution and maintenance of this plan include but are not limited to:

- Identifying employees in their assigned areas who will require special assistance in evacuating the building and making advanced plans to ensure their safe evacuation.
- Reporting missing employees to Incident Command and/or fire department.
- Patrolling evacuation assembly areas and maintain order.
- Conveying the need for alternative shelter to Incident Command when weather prohibits or the emergency situation dictates that employees cannot stay in the assembly points for long periods.
- Conveying any approved alternative assembly points communicated from the Command Center to the employees in your designated group.
- Ensuring that all employees handle chemicals safely according to facility safety procedures.

- Reviewing with their employee the Material Safety Data Sheet for all new chemicals they will be using.
- Ensuring compliance with the Hazard Communication Procedures.
- Ensuring that personal protective equipment is available and used.

FIRE EXTINGUISHER TRAINED PERSONNEL

Under no circumstances is an employee to extinguish a fire if it would be dangerous to do so. If a fire cannot be readily extinguished, do not continue to try to extinguish it. In this case, activate the nearest fire alarm and evacuate the building. Some additional duties in execution and maintenance of this plan include but are not limited to:

- Participating in annual multipurpose dry chemical fire extinguisher training.
- Using a multipurpose dry chemical fire extinguisher to extinguish small or minor fires class A, B or C fires.
- After extinguishing a fire, immediately notify Security Control.
- Attempting to use only one fire extinguisher before evacuating the area.
- Reporting the location of the fire to their Manager/Supervisor at the assembly point.

MEDICAL COORDINATION TRIAGE OFFICER

The highest-ranking EMT and/or paramedic will maintain communication with responding personnel and act as the triage officer.

CERTIFIED CPR/FIRST AID RESPONDERS

The Certified CPR/First Aid Responders are a group of employees certified to provide CPR and first aid assistance. Some additional duties in execution and maintenance of this plan include but are not limited to:

- Participate in annual CPR/First Aid re-certification training.
- Participate in Horseshoe Casino's Bloodborne Pathogens Training and wear approved personal protective equipment to protect against exposure to bloodborne pathogens.
- Rendering first responder care to any injured or ill employee to the extent that their training allows.
- Moving the injured employee only if he/she is in danger and it is safe for both parties to do so.
- Contacting medical assistance immediately in the event of a life-threatening emergency.
- Following the specific procedures detailed in the Medical Emergencies Action Plan.

ALL FACILITY PERSONNEL

Some additional duties in execution and maintenance of this plan include but are not limited to:

- Know how to implement the Crisis Management Plan.
- Be familiar with the hazards of the chemical you use and have read the MSDS for each new chemical you use.
- Immediately report emergencies to Security Control
- Activate the fire alarm in the event of a fire or explosion.
- Evacuate immediately when the fire alarm sounds using the nearest exit.
- Assist guests in evacuations.
- Remain calm and follow instructions in the event of an emergency.
- Gather outside the facility in the assembly area and take direction from your Manager/Supervisor.
- Remember what, if any, toxic or hazardous materials you may have left open before an evacuation and report this to the Manager/Supervisor if you suspect this may present a danger upon returning to the building.
- Be familiar with the CMP, location of all emergency exits fire extinguisher, telephones, First Aid stations, and fire alarm pull boxes near your work area.

ANNEX 1:

EMERGENCY NOTIFICATION PROCEDURE/LIST

The methods to be used for interdepartmental communication shall be:

- By cellular phone to “911" and interdepartmental.
- NEXTEL/Sprint Cellular and Direct talk.
- VHF radio
- Aboard Horseshoe Casino, dial “3700" on any in house phone or 219-746-1349 to reach Marine Operations.

24-Hour Hotline Number “911" will be displayed prominently in the Bridge by the Marine Operations Duty Phone.

See Emergency Contact List for other numbers.

EMERGENCY NOTIFICATION LIST

(Applicable to all contingencies)

Departmental Managers/Supervisors	Phone Ext.	Home Phone	Cellular Phone
Dan Nita, Regional President and General Manager	6000	(219) 365-8079	(219) 805-9100
Erin Chamberlin, Vice President and Assistant General Manager	6343	(312) 496-3876	(219) 201-0092
Steve Cox, Director of Finance	5980	(219) 923-2117	(219) 928-8180
Dawn Reynolds-Pettit, Vice President of Human Resources	6126	(219) 923-1478	(219) 588-5970
Jennifer Galle, Vice President Marketing	6108	(314)-805-1658	(609) 418-3838
Mike Urbanczyk, Manager of Security	6180	(219) 895-5475	(219) 293-6042
Tom Kokandy, Risk Manager	6163	(219) 845-3227	(219) 313-6855
John Houchin, Director of Facilities and Marine Operations	5947	(219) 462-1691	(219) 3139730
Mike Montgomery, Director of Gaming Operations	6309	(708) 357-4086	(219) 670-6816
Kevin McDonald, Director of Surveillance	6190	(219) 759-3413	(219) 218-5698
Mitzie Slavicek, Director of Table Games	5961	(219) 473-0528	(219) 808-6892
Tim Compton, Vice President of Compliance	5970	(312) 692-0670	(219) 218-5700
Kelley Stephens, Manager of Market Technology (IT)	6142	(219) 306-3656	(219) 306-3656

CSO-VSO/FSO

CSO
John Houchin
Home (219) 462-1691
Office (219) 473-5947
FAX (219) 473-1458

VSO/FSO
Mike Urbanczyk
Home (219) 895-5475
Office (219) 473-6180
FAX (219) 473-6173

Alternates:
Vessel
Captain Michael Junius
Cell (219) 670-6237
Home (708) 369-3988
or
Marine Operations Duty Phone
Cell (219) 746-1349

FIRE AND RESCUE	Primary	Alternate
City of Hammond Fire Department 6110 Calumet Avenue	911	(219) 853-6550
POLICE		
Hammond City - Police Department	911	(219) 853-6490
Lake County Sheriff's Police	(219) 755-3300	
Indiana State Police	(800) 552-8917	(219) 696-6242
Indiana Gaming Commission	(219) 473-5980	(317) 233-0046
U.S. Marshal	(219) 937-5229	(219) 937-5229
Bureau of Alcohol, Tobacco and Firearms and Explosives	(800) 800-3855	
F.B.I.	(219) 769-3719	(317) 639-3301
MEDICAL		
St. Margaret Mercy Hospital 5454 Hohman Ave, Hammond, IN	(219) 932-2300	
Methodist Hospital	(219) 738-5500	(219-738-5500)
Loyola Life Star	(800) 888-5862	
UCAN Helicopter	(800) 621-7827	
Sky Care	(800) 752-6621	

Life Flight	(800) 252-5433	
Prompt Ambulance Service	(219) 838-3000	(219) 838-4444
Lake County Coroner's Office	(219) 755-3265	
BOMB THREAT		
Porter County Sheriff Department	(219)477-3000	
COUNTY AND STATE EMERGENCY AGENCIES		
Lake County Emergency Management	(219) 755-3549	
State of Indiana Emergency Management	(800) 669-7362	
Indiana Poison Control Center	(800) 222-1222	
U.S. Coast Guard – Chicago (24 hours)	(414) 747-7190	
U.S. Coast Guard – MSO Chicago	(630) 986-2125	(630) 986-2120 Fax
U.S. Coast Guard Station Calumet Harbor	(773) 768-4093	
U.S.C.G. National Response Center	(800) 424-8802	
HAZARDOUS MATERIAL RELEASE		
Marine Pollution Control	(313) 849-2333	
State Oil Spill Coordinator	(317) 241-4336	
Corp of Engineers (24 hours)	(312) 308-5958	
Dept. of Natural Resources	(812) 426-5511	
American Diving & Salvage	(312) 327-0688	
HUMAN SERVICES		
American Red Cross	(219) 756-5360	
LOCAL AIRPORT		
Gary Chicago International Airport	(219) 949-9722	

CORPORATE CONTACTS	**Primary**	**Alternate**
Name: John Payne Title: Central Division President	(504) 533-6039	(504) 533-6038
Name: Roger Davis Title: Corporate Director Claims Administration	(662)-357-6412	(901) 359-8672

NEWSPAPER CONTACTS AND INFORMATION

Post-Tribune	1065 Broadway, Gary, IN 46320	(219) 648-3082
The Times	601 W. 45th Avenue, Munster, IN 46321	(219) 933-3200
Hobart Gazette	413 Main St., Hobart, IN 46342	(219) 947-6575
Calumet Herald	13403 S. Baltimore Avenue, Chicago, IL 60633	(219) 947-1251
Calumet Press	8411 Kennedy Ave., Highland, IN 46322	(219) 838-1338
Chicago Tribune	200 York Road, Suite 115, Oak Brook, IL 60521	(708) 368-4266
Copley News Svce	70 W. Madison St, Suite 2030, Chicago, IL 60602	(312) 857-2796

TELEVISION CONTACTS AND INFORMATION

WYIN Channel 56	Merrillville, IN 46410	(219) 736-5656
		Fax (219) 755-4312
Cable of Northwest Indiana	Merrillville, IN 46410	(219) 887-6008

The television stations that are listed both have 100 percent coverage in Lake County area, although the cable network will cover only the homes that subscribe.

RADIO CONTACTS AND INFORMATION

WLTH	3669 Broadway, Gary, IN 46409	(219) 884-9409
WWJY	10200 Broadway, Crown Point, IN 46307	(219) 738-2221
WZVN	8105 Georgia St., Merrillville, IN 46410	(219) 738-1071
		Fax (219) 736-6411
WJOB	6405 Olcott, Hammond, IN 46320	(219) 884-1230
		Fax (219) 884-6190
WYCA	6336 Calumet Ave., Hammond, IN 46320	(219) 933-4455

All of the Radio Stations listed have a protected radius of approximately 50 miles and an unprotected radius of 50 mile

ANNEX 2: **EVACUATION PROCEDURES**

(Applicable to all contingencies)

DEFINITIONS AND GENERAL EVACUATION PROCEDURES

Types of Evacuations	Definition
Vertical	The movement of personnel up, down or into emergency exits or stairwells.
Horizontal (Isolation)	The movement of personnel across a floor for safe refuge.
Partial	The movement of a limited number of people that may be immediately endangered or the immediate floors above or below the incident.
Total	The total movement of all personnel from the facility to the staging area.

The General Manager, the General Managers designee or an authorized Public Safety Official are the only persons allowed to completely close this facility. Decisions to evacuate can be made by the highest ranking Security Person on property at the time of the emergency. Decisions to evacuate the vessel can also be made by the Captain of the vessel.

The General Manager, Manager of Security or the Incident Commander and/or Vessel Captain is/are the only one(s) authorized to commence any evacuation procedure unless such an emergency exists that time will not permit the notification.

Prior to making the decision, the following items should be considered:

- Is there a confirmed fire or heavy smoke condition?
- Does the emergency pose any threat, whatsoever, to guests and/or employees?
- Has the emergency condition ended?
- Is there extensive damage that could create risks to evacuating guests and/or employees?

During an evacuation all employees will be directed to Wihala County Beach, The Marina Overflow Parking Lot or other area designated by Security.

Emergency announcements over Public Address or Bull Horn systems:

- The message should be concise and provide all the needed information.
- The instructions should be spoken clearly and slowly so that people can understand the message.
- Persons who make the various announcements during emergencies should receive sufficient training to operate the voice communications equipment.
- Employees shall practice making live announcements at periodic times throughout the year to ensure their messages are loud enough, clearly heard, and understood.

- Content of messages should be reviewed with local fire authorities before adoption as a standard procedure.

Evacuation Message

- "May I have your attention please? May I have your attention please? The casino and Fire Department have determined that for your safety you should move towards the nearest stairway or exit and evacuate your area. Do not use the elevators. Please move toward the nearest stairway or exit and evacuate the hotel/casino. All guests should assemble in (designated evacuation area).
- Message should be repeated three times or until no longer safe to do so or the building/area is clear.

When the decision to evacuate the premises has been made by the Fire Department, or by Senior Management, all employees on duty at the time will assist in an orderly evacuation.

When an evacuation has been ordered if time permits each employee will be responsible for the following:

☐ Shut off all electrical equipment and disconnect power supply cords, (except in bomb threat evacuations. In this case, do not change settings on any electrical equipment, shut off lights or computers, adjust thermostats, etc.)
☐ Clear work area, placing all paperwork inside desk drawers or cabinets
☐ Close all drawers and file cabinets.
☐ Close all windows and doors.
☐ Supervisors should gather shift schedule and immediately proceed to the assembly area.
☐ Leave the building by the closest safe exit while assisting guests having difficulty in the evacuation.
☐ Go to the assigned assembly area and report to your department manager or supervisor.. DO NOT GO HOME.
☐ Employees are NOT to go to their vehicles or leave the property

Supervisors

☐ Will function as evacuation leaders, checking rooms and other enclosed spaces in their assigned areas for employees or guests who may be trapped or otherwise unable to evacuate the area.
☐ Will respond to the evacuation area.
☐ Will utilize on-duty roster to account for all employees.
☐ Will report to the Command Center the results of the employee count.
☐ Will coordinate the dissemination of information to employees concerning the status of the situation.

Food & Beverage

Restaurants

☐ Place all monies in register – close and lock drawer.
☐ Advise patrons: "At this time we are closed for business and request all persons to leave this area." Give directions to nearest safe exit.
☐ Exit building and go to assigned assembly area.

Kitchens
☐ Turn off all stoves and/or electrical equipment.
☐ If safe to do so, check all walk-in boxes, freezers, bakery and butcher shop for personnel and secure before leaving.
☐ Remove all carts from hallways and exits.
☐ Exit building and go to assigned assembly area.

Bars
☐ Advise patron: "At this time we are closed for business and request all persons to leave this area." Give directions to nearest safe exit.
☐ Place all monies in register – close and lock drawer.
☐ Exit building and go to assigned assembly area.

Room Service (If applicable)
☐ Push all carts and other equipment into rooms and out of hallways/pathways that may prevent safe and prompt evacuation.
☐ Proceed to nearest safe exit and assist guests to an assembly area.

Accounting Department

Main Cashier / Employee Cage
☐ Secure all monies and important records and/or documents in the safe.
☐ Inform patrons that chips may be turned in later and direct them to the nearest safe exit.
☐ Exit building and go to assigned assembly area.

Soft Count
☐ Secure all monies and important records / documents in metal boxes and place in drop box cabinets.
☐ Notify Surveillance that personnel are leaving the Soft Count Room
☐ Exit building and go to assigned assembly area.

Gaming Personnel

Casino Pit
☐ Inform patrons that "all bets are off" and chips and money can be exchanged later. Direct them to the nearest safe exit.
☐ Cap chip racks and lock down.
☐ Take issued markers to main cage supervisor if time permits, and if it is safe to do so.

Poker Room

- ☐ Advise patrons that "all bets are off" and that chips or monies may be exchanged later. Give directions to nearest safe exit.
- ☐ Cap chip racks and lock down.
- ☐ Take issued markers to Main Cage to be placed in safe if time permits and it is safe to do so.
- ☐ Place paper money from the Poker Cashier Bank in the Funds Exchange bag and take to the Main Cage if time permits and it is safe to do so.
- ☐ Exit building and go to assigned assembly area.

Slot Area

- ☐ Advise guests: "We are closed for business and request all persons to leave this area." Give directions to nearest safe exit.
- ☐ Secure all monies and important records in drawers and lock.
- ☐ Lock booth doors keeping keys in possession.
- ☐ Exit building and go to assigned assembly area.
- ☐ Collect all other keys from employees in assembly area.

Surveillance

- ☐ Secure all important records/documents in cabinets and drawers.
- ☐ Keep cameras and recorders operational
- ☐ Position PTZ cameras for maximum views of the casino pit and money sensitive areas.
- ☐ Take portable radios/batteries
- ☐ Exit building and go to assigned assembly area.

Hotel (If applicable)

Front Desk

- ☐ Advise guests: "We are closed for business and request all persons to leave this area." Give directions to nearest safe exit.
- ☐ Pick up Alpha and Numeric guest registration list from last run and retain on person.
- ☐ Place money and paperwork in cash drawer, cap lid on back and lock drawer.
- ☐ If time permits, remove registration cards, place them in trashcans. Remove bag from trashcan and retain on person.
- ☐ Exit building and go to assigned assembly area.

Room Reservations

- ☐ Place all advance deposits and monies in trash can, remove bag and retain on person.
- ☐ Exit building and go to assigned assembly area.

PBX

- ☐ Will notify Security Dispatch and the Command Center that they are evacuating the area.
- ☐ If possible, disconnect power cords to the switchboard. If assistance is required to disconnect power, make request of Engineering Department.

☐ Exit the building and go to the assigned assembly area.

Valet

☐ Clear all vehicles from the main entrance and hydrant areas that may hinder emergency equipment.
☐ Push all carts/Wheelchairs and other equipment into rooms and out of hallways/pathways that may prevent safe and prompt evacuation.
☐ Proceed to nearest safe exit and assist guests to an assigned assembly area.

Housekeeping

☐ Push all cars and other equipment into rooms and out of hallways/pathways that may prevent safe and prompt evacuation.
☐ Check laundry and trash chute doors and ensure they are in closed position.
☐ Proceed to nearest safe exit and assist guests to an assigned assembly area.

Receiving/Warehouse/Inventory Control

☐ Place all paperwork in drawers and cabinets, if possible.
☐ Lock freezers and gates
☐ Push all carts and other equipment out of hallways/pathways.
☐ Proceed to nearest safe exit and go to assigned assembly area.
☐ Close all overhead doors but do not lock.

Retail Sales Outlets

☐ Place all monies in registers, close and lock drawer.
☐ Inform patrons business must cease and that transactions will be settled later.
☐ Place all paperwork in drawers/cabinets, retain keys and lock all doors.
☐ Proceed to nearest safe exit and go to assigned assembly area.

Credit Department

☐ Place all paperwork in drawers/file cabinets.
☐ If time permits, place all loose checks in trashcan, remove bag and retain on person.
☐ Retain keys and lock all doors upon leaving.

Other Departments

- Total Reward Center/VIP Services
- Group Sales/Bus Transportation
- Information Technology
- Human Resources
- Purchasing
- Executive Offices
- Wardrobe
- Payroll
- Warehouse Storage
- Records Retention
- All other offices not mentioned above will:

☐ Place all paperwork in drawers/cabinets.
☐ Retain keys and lock all doors.
☐ Proceed to nearest safe exit and go to assigned assembly areas.
☐ Activate alarms if applicable

Security

☐ Officers will then proceed to assigned area and begin evacuation according to the Emergency Response Plan.
☐ If the evacuation is due to fire, Officers will be dispatched to affected area and begin a systematic evacuation.
☐ These officers will then respond to the floor above and the floor below the affected area and begin a systematic evacuation.
☐ Officers will notify Security Control and Marine Operations each floor is evacuated.
☐ Security will request assistance from other Departments and assign various duties to assist in evacuation.
☐ A designated Supervisor should be directed to assembly areas to account for employees and guests.
☐ One officer will be assigned to each entrance/exit to prevent re-entry by anyone other than police and/or fire department.
☐ Officer(s) will be dispatched to Pit areas to ensure all chip rack lids have been placed on chip racks and secured. Security Control will be advised upon completion.
☐ Officer(s) will be dispatched to convention/meeting space to assist in evacuation. Dispatch will be so advised when area is clear.
☐ Upon completion of assigned duties, Officers will advise a Security Supervisor that they are available for re-assignment.
☐ After property partially or totally evacuated, Security will, under guidance of Emergency Service Agencies:
- Conduct a sweep of all areas to ensure that all guest and employees have been evacuated.
- All employee work areas will be checked to ensure no one has remained in evacuated area.
- Security Manager will evaluate situation and determine the extent of security coverage required to protect company assets.
- If required, when evacuation is ordered, Supervisor will obtain telephone list of all off duty officers, and recall them to duty in uniform.
- All days off and/or vacations will be canceled until further notice.

Engineers (Facilities)

- Majority of personnel will be assigned to assist Engineering Supervisor.
- Unassigned Engineers will be assigned to assist Security.
- An Engineering employee will be assigned to call in all off duty Engineers.

Guests

Upon arrival at the assembly area employees will assist guests and other employees by:

☐ Speaking with individuals in a calm, confident manner. Assure them that the management and staff are prepared to handle any situation and further assistance will soon arrive.

☐ Keep everyone in assembly location until emergency is cleared or instructed to proceed elsewhere.

☐ Administer minor first aid if needed and/or attempt to obtain assistance from trained medical personnel.

☐ Compile lists of the guest names of those at that location. List should include:

- Name: _____ ( ) Guest
- Address: _____
- Telephone number: _____
- Room Number: _____
- Any person missing from their party: _____
- Special medical problems or needs: _____
- Any other pertinent information: _____

☐ Keep list with you until it can be given to Command Center Personnel or Security. (Do not leave property with this list!)

☐ Do everything possible to keep order and prevent panic.

☐ Assist Rescue Teams as needed.

☐ All questions from media should be directed to Command Center.

EMPLOYEE'S/MANAGER'S/SUPERVISOR'S
EVACUATION PLAN CHECKLIST

DEPARTMENT NAME: _____

DATE:_____TIME: _____

TYPE OF EVACUATION ORDERED (circle below):

Types of Evacuations	Definition
Vertical	The movement of personnel up, down or into emergency exits or stairwells.
Horizontal (Isolation)	The movement of personnel across a floor for safe refuge.
Partial	The movement of a limited number of people that may be immediately endangered or the immediate floors above or below the incident.
Total	The total movement of all personnel from the facility to the staging area.

TASK	**ACTION TAKEN**
1. EVACUATE EMPLOYEES/GUESTS	_____
2. EVACUATION LOCATION (STAGING AREA)	_____
3. TAKE EMPLOYEE HEAD COUNT	_____
4. REPORT MISSING PERSONNEL TO SECURITY	_____

MANAGER'S/SUPERVISOR'S SIGNATURE:_____

ACTIVE SHOOTER

Active Shooter Defined

A person or persons who participate in a shooting spree with the intent of causing serious physical injury or death.

Caution Statement

- **This subject has taken active measures to initiate injury or death on others.**
- **They maybe targeting specific persons or he may just want to hurt themselves.**
- **Common sense tells us they are not of sound mind at the present time.**
- **If for any reason the Active Shooter indicates a desire to communicate then communications should be established. (See Hostage Taking for general guidelines)**

Mission

- To assist the public and employees in escaping the threat.
- To alert facility occupants of the crisis and provide guidance (evacuate or shelter in place).
- To render aid to victims.
- Locate, isolate, contain, and limit the movement of offenders without confrontation.
- To utilize remote surveillance.

General

☐ The first few minutes of a Critical Incident lends itself to chaos and confusion

☐ Until a Command Center is established, employees and guests may have to make split second decisions concerning their personal safety

Several options are available:

- Escape the threat by putting as much distance between you and the Shooter, as quickly as possible.
- Barricade and hide, lock doors if possible.
- Pretend to be dead.
- Cooperate.
- Fight back.

Person Discovering the Situation

☐ Employees who are made aware of an Active Shooter incident must immediately move to a safe location and notify Security Control of location and known facts.
☐ If safe to do so reporting employee should move directly to Security Control.
☐ The reporting employee must not leave property without physically reporting to Security Control.

Security

☐ Security Control will immediately notify the Security Manager/Shift Supervisors who will insure the proper notifications are completed:
- Local Law enforcement (Hammond Police Dept.)
- Local Fire/Medical Departments (Hammond Fire Dept.)
- Surveillance
- Manager of Security and Shift Manager of Security
- IGC
- Regional President and General Manager
- Security Investigators
- Captain

☐ Security Supervisors/Security Investigators shall respond to an Active Shooter Incident; staging in a safe location and attempting to implement the following:
- Establish an open line of communication with Surveillance to monitor the situation from a distance.
- Identify any witnesses to the Active Shooter Incident and have them escorted to Security Control when this can be safely done. Witnesses should be interviewed.
- Be aware of personal safety first, guests and employees safety second and then assets and property.
- Attempt to determine the number of subjects involved in the Active Shooter Incident.
- Attempt to determine the number and types of weapons being utilized.
- Determine the exact area that the Active Shooter is presently occupying.
- Attempt to determine if the Active Shooter has friends or family on property; if positive, escort them to Security Control and interview when safe to do so.
- If safe to do so, attempt to initiate communication with the Active Shooter.

Police Department

☐ When the Police Department arrives they will assume responsibilities.
☐ Security Manager, Supervisors and Security Investigators will remain to assist in any manner possible. This may include continuing a negotiation process if one has been initiated.

Reports

- A full report will be filed with the Manager of Security on the incident. This report will include statements from witnesses, and the names of all parties and officers involved in the incident.
- Reports shall be completed as quickly as possible.

Final Disposition

- ☐ The final disposition of the Active Shooter will be determined by his actions and the decisions reached by the Police Department and the Crisis Management Team, if activated in time.

Final Actions

- ☐ The Manager of Security/Shift Manager of Security or his designee shall request an immediate debriefing of all Security Personnel involved in the incident at its conclusion.

BOMB THREAT

Even though most bomb threats do not result in the discovery of an explosive device, they create a climate of fear.

"Bomb Threat Response" focuses on providing a flexible process that will work for any business while ensuring that each facility creates an effective plan tailored to its situation.

In the event of a bomb threat, Security Officers should be advised that radio transmissions should be terminated. All communications should be by telephone, as radio transmissions have the potential of detonating a bomb.

If a suspicious object is found, it should NEVER be moved touched or jarred.

Switchboard/Security Dispatcher

Most bomb threats are made by telephone. All bomb threats are to be taken seriously. The safety of guests and employees is of the utmost concern. ***NEVER USE THE WORD "BOMB" WHERE PUBLIC CAN HEAR THE TRANSMISSION OR CONVERSATION***

- Bomb Threat calls will be handled on a priority basis.
- A "Bomb Threat" form should be completed as soon as possible, preferably while the caller is still on the line.
- Person receiving call must remain calm and gather as much information as possible.
- Ask caller to repeat the message, particularly the location of the bomb, time of detonation, etc.

Upon receipt of a bomb threat, the Operator or Security Dispatcher receiving the call will:

☐ Notify Security Shift Manager on Duty
☐ Clear all Radio Traffic
☐ Telephone operator receiving bomb threat should immediately notify another operator informing him/her of the call. That operator will notify the Manager on Duty and Security while the original operator stays on the line attempting to gather all necessary information on a bomb threat information form.
- Do not hang up the phone

Security Shift Manager

☐ Contact Surveillance to direct all equipment to potential areas of suspect location.

☐ Notify local law enforcement and Fire Departments and advise them of information known at this time.

SEARCH TEAMS DEFINED

Team No.	Team Leader	Assistants	Assigned Areas
1	Security Supervisor	Security Officers	Common areas in pavilion/all floors, link hallways, elevators, escalators, vault, and vault area, Security Control and Trauma Room parking garages, Casino and exterior perimeter. **Administration offices will be searched by the respective occupant and/or supervisor of the department area, if present under direction of Security.**
2	Valet Supervisor/Gift Shop Supervisor	Valet Supervisor/Gift Shop Supervisor	Coat check, handicapped parking, valet parking, gift shop and smoke shop.
3	Guest Service Supervisor Cage Supervisor, Total Rewards Supervisor Group Sales Supervisor	Guest Service Representatives, Greeters, Cage Cashiers, Group Sales Coordinators	Total Rewards Area, Group Sales, Concierge Area and Land Cage/Land Vault.
4	Maintenance Supervisor	Maintenance Personnel	All maintenance rooms, maintenance storage areas, all outside areas with HVAC or related equipment, maintenance offices.
5	EVS Supervisor Wardrobe Supervisor	EVS/Wardrobe	All restrooms, locker rooms (employee and guests), pavilion and wardrobe area and all public waste containers.
6	Receiving Supervisor	Receiving Personnel	Receiving dock, storage areas, compactor room, storage area(s)
7	Food and Beverage Supervisor/Kitchen Supervisors.	Servers, Bus Person, Bartenders	Kitchen, Food and Beverage Offices and Food and Beverage area
8	Vessel Captain/Marine Shift Supervisor	Marine Crew	All areas of the vessel and if available assist in land/facilities search.

On-Scene Commander notified and assembled the Property Crisis Team.

Notify IGC Agents per Security Operations Manual policy.

The On-Scene Commander will determine the need to inform employees of the threat and the information that will be disseminated.

Threat Level Determined By On-Scene Commander

Level 1
Take no action due to nature and content of the threat.
Cursory search of general public areas conducted by Security and Marine Operations personnel.
Operations to continue as normal.

Level 2
Threat perceived as genuine, with some specific information and/or location, time, etc. given.
Only one threat.
Search Team Leaders notified for standby of search team(s).
Search Team Leaders to conduct cursory search of their respective area.
Operations to continue as normal.

Level 3
Threat analysis determined to be genuine with a specific location, time and/or some detailed information given, or more than one threat has been received.
Search teams formed for search of general and specific area.
Operations to continue a normal or partial evacuation/isolation.

Level 4
Threat analysis determined to be genuine with a specific location, device and/or detailed information of the property or vessel and/or a specified detonation time. More than two threats received.

Partial and/or total evacuation/isolation.
Contact Search Teams and proceed with Search Procedures
Evacuate accordingly following Evacuation Action Plan

Bomb or suspicious packages found:
Contact Hammond Police Department (219) 853-6489
Porter County Bomb Squad (219)477-3000

- No mention of a bomb threat should be made to guests or non-emergency employees or personnel.
- There should be no discussion with the news media concerning an incident by hotel/casino employees.
- All inquiries by the media should be referred to the Command Center and/or General Manager.
- Searching Security Officers, and Marine Operations personnel should be advised to look, listen and smell and not touch, remove, or tamper with any suspect object or package.
- If there is a suspect vehicle, do not touch or attempt to open any doors, trunk, or hood.

EMPLOYEE BOMB THREAT REPORT

DOCUMENT THE EXACT WORDS OF THE PERSON CALLING:
Listen and do not interrupt the caller

_____
_____
_____
_____
Continue on the back if necessary

ASK QUESTIONS LIKE:
When is the bomb going to go off?
_____
Where is the bomb right now?
_____
What does the bomb look like?
_____
What kind of bomb is it?
_____
Why did you place the bomb?
_____

DESCRIPTION OF CALLER

SPEECH __Fast __Slow __Distinct __Distorted __Stutter __Nasal __Slurred __Other (Describe)	Did caller appear familiar with the vessel or pavilion in description of the bomb location? __ Yes __No	**ACCENT** __Local __Foreign __Not Local __Caucasian __Racial __Regional __Describe on back
LANGUAGE __Excellent __Good __Fair __Poor __Foul __Other (describe)	**MANNER** __Calm __Angry __Rational __Irrational __Coherent __Incoherent __Deliberate __Emotional __Righteous __Laughing __Other (Describe)	**BACKGROUND NOISE** __Office Machines __Bedlam __Factory Machines __Quiet __Street traffic __Voices __Airplanes __Music __Trains __Party __Animals __Mixed __Other (Describe)
VOICE CHARACTERISTICS __Soft __Deep __Pleasant __Loud __High Pitch __Raspy __Intoxicated __Lispy __Mumbled __Other (Describe)	**CALLER'S IDENTITY** __Male __Female Approximate Age	Any other distinguishing characteristics not described. _____ _____ _____ _____

REMARKS: _____
_____
_____
_____
_____
_____

Person receiving
call:_____Badge#_____Time:_____Date:_____

Dept.:_____Telephone
#:_____

NOTIFY YOUR SUPERVISOR AND SECURITY IMMEDIATELY -- TALK TO NO ONE UNLESS INSTRUCTED BY YOUR SUPERVISOR.

THIS FORM SHOULD IMMEDIATELY BE FILLED OUT BY THE PERSON WHO RECIEVES THE THREAT AND TURNED IN TO THE COMMAND CENTER TO BE USED DURING THE INVESTIGATION.

Property Crisis Team:

- ☐ Assess situation for decision whether or not to evacuate
- ☐ Institute evacuation plan if deemed necessary
- ☐ Institute bomb search procedure whether or not evacuation implemented
- ☐ Handle media and employee concerns

Security

- ☐ The Security Manager must be notified upon any information that a bomb threat has been received.
- ☐ Ensure person receiving the call completes the bomb threat form.
- ☐ If demand for ransom or other thing of value is coupled with the bomb threat, also call the FBI promptly.
- ☐ Consult with Property Crisis Team, and/or the General Manager to determine if bomb search is to be conducted.
- ☐ Security Shift Manager on Duty will execute property search plan, if so ordered.
  - All areas of the hotel/casino will be searched, with priority given to any area which the caller may have designated as being the area in which the bomb was placed.
  - Specific assignment for searching particular areas should be given to **key employees**.
  - Each employee participating in the search should have the telephone number of the Command Center, and should report results of search immediately.

A log will be maintained by a Security Supervisor detailing:

- ☐ Identity of employees conducting search and searching areas assigned
- ☐ Areas searched
- ☐ Officers completing the search
- ☐ Time each specific area searched
- ☐ Time each specific area cleared.
- ☐ Time evacuation was ordered
- ☐ Areas ordered to be evacuated
- ☐ Time explosive device(s) located
- ☐ Location of explosive device located and who located it
- ☐ All other information pertinent to the situation
- ☐ Will ensure that the entire property will be searched a minimum of two times by different officers. Employee(s) from each area may be utilized in the search to help identify foreign items. A checklist should be utilized to ensure complete coverage.

Bomb Threat Search Checklist

Department_____ Date_____
Time Started_____

Specific Area Checked_____

	1st Check	2nd Check	N/A
Stairwells	( )	( )	( )
Hallways	( )	( )	( )
Restrooms	( )	( )	( )
Elevators	( )	( )	( )
Exits/Entrances	( )	( )	( )
Trash Containers	( )	( )	( )
Dumpsters	( )	( )	( )
Storage areas	( )	( )	( )
Luggage Storage	( )	( )	( )
Shrub Beds	( )	( )	( )
Drawers	( )	( )	( )
Cabinets	( )	( )	( )
Wall Lockers	( )	( )	( )
Air Handling	( )	( )	( )
Parking Lots	( )	( )	( )
Parking Garages	( )	( )	( )
Vehicles near bldgs.	( )	( )	( )
Cages	( )	( )	( )
Front Desk	( )	( )	( )
Restaurants/Bars	( )	( )	( )
Other_____	( )	( )	( )
Other_____	( )	( )	( )

_____ _____ _____
Signature & Badge # Date Time Ended

Notes:_____
_____
_____
_____
_____

SEARCH TECHNIQUES/GUIDELINES

Search

- The individuals conducting a search should be thoroughly acquainted with the area so they can readily identify items and/or objects as being foreign or out of place.
- The supervisor will normally have this responsibility and will search the immediate area within their respective department.
- Always search in two (2) person teams.
- Enter the room/area; stand still and listen for any clockwork mechanism if possible.
- Make a general, quick look around the entire area/room.
- Divide the room area into equal parts.
- Determine a search height

    1. Waist to floor
    2. Waist to head
    3. Head to ceiling

- Start from one end of the room/area back to back and search the area/room working toward the other person.
- When completed both should be at a middle point.

Return to the starting point and begin the second search.

- Unless caller advises of specific location of bomb, search should begin in public areas:
    - Reception areas
    - Lobbies
    - Rest rooms
    - Restaurants
    - Hallways
    - Lounges
    - Stairwells
- Other areas to be searched should include:
    - False ceiling areas
    - Ventilation ducts
    - Seldom-used storage areas
    - Telephone junction boxes
    - Fan rooms
    - Toilet water reservoir tanks
    - Elevator shafts, special attention should be paid to washrooms, meeting and convention space.
    - Utility rooms
- When searching a room, work around it systematically, checking for items that are normally not present.
- Start searches on lower levels and move up

- Room Searches: If possible, do not change the environment of the room prior to search. Use a flashlight—DO NOT turn on lights or change the setting of thermostats. These actions may activate an explosive device.
    - Divide room in half, then quarters
    - 4-step method
- start at lowest level of room (look under rugs and carpets, under desks and in waste receptacles) waist level, moving up to standing eye level
- From standing persons head, move up to ceiling (air ducts, window tops and light fixtures)
- Above ceiling level (false or suspended ceilings, indirect light fixtures, electrical wiring)
- As each area has been searched, cleared and reported by telephone, the Command Center will be notified.
- Termination of Search will be authorized by Command Center personnel

Found Suspicious Item

- Should a bomb or suspicious item be found, **IT IS NOT TO BE TOUCHED OR DISTURBED IN ANY WAY.** Removal of any strange or suspicious object must be left to Police or Fire Department bomb squads.
- Immediately clear the area for 300 feet around device, including floors above and below device.
    - Command Center will be immediately notified by telephone.
    - Security Officer will remain in vicinity of the item at a safe distance and allow no one to disturb it until Bomb Squad has examined the item.

- Responsibility for evacuation rests with Bomb Squad, law enforcement and/or Fire Department.
- If evacuation is ordered by law enforcement or Fire Departments, the Evacuation Plan will be followed.
- Communication should be by telephone. ***Under no circumstances should radios be used within 50 feet of a suspicious object.***

Post Blast Investigation

- Security personnel shall respond to the scene to ensure maximum protection of life and property and to guard the crime scene that will be investigated by the local police agency.
- **No one** is to be permitted into the area surrounding the post blast scene except Rescue, Police and Fire Agencies. Names, department and time of entry should be noted for the report.

CHEMICAL / BIOLOGICAL THREAT

A chemical attack could utilize chemicals specifically designed as weapons, such as nerve gas, or common commercial chemicals, such as chlorine. The chemicals would most likely be gases or aerosols. If the attack is outdoors, the wind will spread the chemicals but will also quickly disperse them. The key to surviving a chemical attack is to *quickly* get to a place where the air will remain clean.

How to Identify a Chemical Attack:

Some poisonous gases may or may not have an odor. Most will **not be visible**. The most likely **first sign** that you have been exposed to dangerous chemicals will be **symptoms** felt by you and others around you; depending on the chemical used, these symptoms may include:

- Stinging eyes and throat
- Running eyes
- Coughing
- Nausea
- Loss of coordination

General

☐ Seal off the affected area and do not remove the substance from this area.
☐ Notify Security.
☐ Notification will be made to the fire department and police department, advising them of a possible chemical-biological contamination.
☐ Notification should be as follows:
- General Manager or delegated representative
- Security Manager/ Shift Manager of Security
- Local law enforcement/Fire department
- Director of Facilities and Marine Operations
- Risk manager
- Communications personnel
- Surveillance supervisor on property to conduct video search of possible suspect

☐ At minimum, the employee/patron should immediately wash the primary affected area, hands and forearms.
☐ Thereafter, the affected employee/patron should be advised to remove his/her outer layer of clothing and place them into a biohazard bag provided by the EVS and they must seal their clothing in this bag. (remember these articles of clothing are evidence) This biohazard bag should be left in the location where this incident took place. Any personal assistance should, if possible, be provided by a person of like gender.

- ☐ The employee/patron should wash thoroughly with soap and water and be provided with a change of clean clothing.
- ☐ Wardrobe should be notified and temporary replacement clothing should be obtained for the affected employee/patron.
- ☐ Inform the employee/patron involved that they will be notified of the next step pending the results of substance testing.
- ☐ Once the fire and police departments arrive at the property, they will take charge of the scene.
- ☐ The substance will be tested and if this substance is determined to be anthrax or some other biological substance, the responding police, fire or HAZMAT department will handle the clean up and removal of this substance. The police and fire departments will make the determination if we have to evacuate the property.
- ☐ If the tests reveal this substance is not anthrax then EVS will be notified and immediately clean this area.
- ☐ Media inquires should be handled by communications

CHEMICAL SPILLS

Despite the best efforts of personnel, accidents resulting in chemical releases can occur. The two common types of spill are an "Emergency"' spill and an "Incidental" spill.

Emergency response: As defined by OSHA, an emergency response or responding to emergencies means a response effort by employees from outside the immediate release area or by other designated responders (i.e Hazmat team, clean harbors, etc.) To an occurrence which results, or is likely to result, in an uncontrolled release of a hazardous substance.

Incidental release: Response to incidental releases of hazardous substances are not considered to be an emergency response where the substance can be absorbed, neutralized or otherwise controlled at the time of release by employees in the immediate release area, or by members of the hazmat team, provided that the substance is limited in quantity and poses a minor potential safety or health hazard (i.e. Fire, explosion or chemical exposure) to the employees in the immediate vicinity.

General Procedures

- ☐ Immediately alert fellow workers and immediate supervisor.
- ☐ Evacuate the immediate area
- ☐ Check the Material Safety Data Sheet (MSDS) to determine the urgency of the situation.
- ☐ For all spills, all contaminated clothing must be removed immediately and the skin washed with soap and water.
- ☐ Flush skin with water for no less than fifteen minutes.
- ☐ Clothes must be laundered before reuse, and must be washed separately from other clothing.
- ☐ If there is no fire hazard and the material is not particularly volatile or toxic, proceed to clean it up as directed in the MSDS file.
- ☐ If volatile, flammable or toxic material is spilled, immediately warn everyone to extinguish flames and turn off spark producing equipment.
  - Shut down all equipment and vacate the area until it is decontaminated.
  - The supervisor or manager is responsible for designating the extent of evacuation and the proper clean up procedure.
- ☐ For acids and other acid materials use calcite absorbent products.
- ☐ Notify local, state or federal agencies as required in your particular area

CIVIL DISTURBANCE

The following procedures apply should your property and/or community experience a major civil disturbance:

Person Identifying Situation

☐ Observe and report activity of group
☐ Notify Security
☐ Move to a safe environment

Management Procedures:

☐ Establish Command Center (If needed)
☐ Monitor radio and television broadcasts
☐ Schedule Security manpower to 12-hour shifts (If needed)
☐ All days off and vacations should be cancelled (If needed)
☐ Ensure water, power and telephone service are secured
☐ Issue two-way radios to all on-duty security and pertinent management personnel
☐ If deemed necessary, restrict entrance to hotel/casino
- It is permissible to restrict entrance to only registered guests, guests who wish to register or have a confirmed reservation, employees, and only those individuals who have official business in the hotel/casino.
- If an entrance is locked, a security officer should be posted at the entrance with keys to permit emergency entrance/exit by a guests or employees.

☐ Maintain liaison with Law Enforcement
☐ Coordinate media communications
☐ If safe to do so and disturbance is out of range of surveillance cameras then the incident will be recorded with handheld cameras.

Security:

☐ Advise local law enforcement with basics of situation (alleged cause, how many people demonstrating, action being taken by crowd, etc.)
☐ Advise senior management person of what is taking place and available information concerning the group, cause, etc.
☐ Secure the area with assistance of Police
☐ Notify the Property Crisis Team
☐ Cooperate and coordinate with police upon their arrival.
☐ Important to make effort to keep demonstrators out of the property buildings.
☐ Should buildings be closed by order of the property General Manager, Security and Maintenance personnel will install barriers and lock doors.
☐ Security Officers will be assigned to each major entrance/exit

- ☐ Guests attempting to leave the closed building should be advised of the possible danger.
- ☐ Only Law Enforcement, Fire or Emergency Medical Personnel will be allowed in the building.

DEATH ON PROPERTY

In any populated area there is a possibility of death occurring. In the unfortunate event that a death is discovered on property it is important to remain calm and follow the procedure listed below.

Person discovering the situation

In the event that a deceased person is located in the property, do not disturb the scene other than to determine if the person is deceased. Make an immediate notification to the Security Control.

Security

☐ Security Dispatcher will immediately notify:
- Security Shift Manager
- Security E.M.T.
- IGC
- Local law enforcement

☐ The Manager of Security will be notified by the Security Shift Manager.

☐ The crime scene will be secured and all personnel without knowledge of the incident will be removed from the area.

☐ Medical personnel will be summoned. **THEY WILL ONLY CHECK VICTIM FOR VITAL SIGNS. THEY SHOULD NOT DISTURB THE AREA IF AT ALL POSSIBLE.**

☐ Secure the scene until medical and law enforcement authorities arrive to take over the situation.
- **UNDER NO CRICUMSTANCES ALLOW ANYONE TO TOUCH OR DISTURB IN ANY WAY THE CRIME SCENE UNTIL THE PROPER PERSONNEL ARRIVE, THEN REMAIN AT THEIR DISPOSAL UNTIL THE SITUATION IS CLEARED OR YOU ARE RELIEVED BY YOUR SUPERVISOR OR THE SECURITY DIRECTOR.**
- No personnel other than those authorized by your supervisor or manager will be allowed to enter the crime scene until the proper authorities arrive.

☐ Obtain statements from anyone with knowledge of the incident especially the person who found the victim. Remove these persons to Security Control.

☐ Safeguard victim's friends and family and property from any type of publicity other than that being released by the proper authorities.

☐ A full report will be complied by security.

☐ An investigator will be called if on duty to compile a report. If one is unavailable then a Security Supervisor will compile the report. Be sure you have all the information needed before you leave the scene of the incident.
- Remember, it may could look like a suicide, or natural death, and turn out to be a homicide. Treat any and all such incidents as a homicide until you have been relieved by the proper personnel.

- In all cases, extreme care must be taken to avoid undue publicity or embarrassment to the family of the deceased or other guests during the investigation and removal of the body.

☐ Radio traffic should be held to a minimum.

DISCOVERY OF A CRIME AFTER THE FACT

Person discovering the situation

- ☐ Notify Security
- ☐ Go to a safe place and wait for Security. Report anything noted of relevance to Security officer.

Security

- ☐ Respond to area of crime.
- ☐ Administer first aid to victim, if necessary.
- ☐ Secure the area of any crime scene.
- ☐ Security will contact the Property Crisis Team, if necessary.
- ☐ Notify Security Shift Manager, and Manager of Security.

EARTHQUAKE

Due to hazards created during a major earthquake, it is recommended that people be instructed not to leave the building. If a fire or severe structural damage creates a situation where evacuation is ordered, security will follow the procedures outlined in the emergency procedures for evacuation section in this manual. The assembly area will be based on the scope and nature of the emergency. It must be kept in mind that within seconds, minutes or even hours there may be (and usually is) another quake or after-shock which can be even more devastating than the first one.

General Planning Considerations:

Following are guidelines for preparing for earthquakes:

- Assess your facility's vulnerability to earthquakes. Ask local government agencies for seismic information for your area.
- Have your facility inspected by a structural engineer.
- Follow safety codes when constructing a facility or making major renovations.
- Inspect non-structural systems such as air conditioning, communications and pollution control systems. Assess the potential for damage. Prioritize measures to prevent damage.
- Inspect your facility for any item that could fall, spill, break or move during an earthquake. Take these steps to reduce these hazards:
    - Move large and heavy objects to lower shelves or the floor. Hang heavy items away from where people work.
    - Secure shelves, filling cabinets, tall furniture, desktop equipment, computers, printers, copiers and light fixtures.
    - Secure fixed equipment and heavy machinery to the floor. Larger equipment can be placed on casters and attached to tethers which attach to the wall.
    - Add bracing to suspend ceilings, if necessary.
    - Install safety glass where appropriate.
    - Secure large utility and process piping.
- Keep copies of design drawings of the facility to be used in assessing the facility's safety after an earthquake.
- Review processing for handling and storing hazardous materials. Have incompatible chemicals stored separately.
- Ask your insurance carrier about earthquake insurance and mitigation techniques.
- Establish procedures to determine whether an evacuation is necessary after an earthquake.
- Designate areas in the facility away from exterior walls and windows where occupants should gather after an earthquake is an evacuation is not necessary.
- Provide personnel with the following safety information, if feasible:

- In an earthquake, if indoors, stay there. Take cover under a sturdy piece of furniture or counter, or brace yourself against an inside wall. Protect your head and neck.
- If outdoors, move into the open, away from buildings, streetlights, and utility wires.
- After an earthquake, stay away from windows, skylights, and items that could fall.
- Do not use the elevators.
- Use stairways to leave the building if is determined that a building evacuation is necessary.

Engineering

The engineering department will be responsible for shutting off all the gas, if safety permits, and manually securing all guest and service elevators at casino level. In the event of a fire, the procedures outlined in the emergency procedures for fire/smoke section of this manual will be utilized. After all danger has passed and any evacuation completed, all unnecessary entrances will be secured. All broken windows at street level will be boarded up, if necessary. Structural damage will be checked and temporary repairs done.

Security

Procedures will be followed as outlined in the emergency procedures for fire/smoke and the emergency procedures for evacuation sections of this manual if applicable. Officers will be dispatched to check hotel stairwells to see that they are safe to use.

PBX

The notification priorities will be the same as outlines in the emergency procedure for fire/smoke section of this manual. The PBX operators or the staff operating the PA system will advise everyone to remain calm and assure them that there are emergency teams functioning throughout the complex. The following rules must also be announced:

- Do not use smoking materials, matches, lighters, etc.
- Do not attempt to use elevators or stairwells until told to do so.
- Do not use the telephones.
- Stay away from windows.
- Do not attempt to leave the building until told to do so.
- Remain where you are until emergency personnel are able to guide you to safety.

ELEVATOR EMERGENCIES

Upon receiving an emergency call, from patrons in the problem elevator or other parties aware of the situation, security and facilities will carry out the following procedures:

Security

Security will carry out the following procedures:

- ☐ Control the crowd around the emergency
- ☐ Attempt to contact the person(s) inside the elevator, along with Security Control via emergency phones located inside of the elevator
- ☐ Security supervisor will be at the elevator when opened and assist guests in any way possible.
- ☐ Record incident reports from all appropriate parties
- ☐ Secure area with stanchions and signs
- ☐ If unable to open contact the fire department.

Engineering

Engineering will initiate the following:

- ☐ Contact the elevator company. Have them respond to the scene
- ☐ Ascertain the vertical location of the elevator
- ☐ Attempt to open the doors, if it is NOT between floors
- ☐ Assist security in attempting to contact individual(s) inside the elevator
- ☐ Secure the elevator from being used until it has been cleared, in writing, by the elevator service company.

NOTE: At no time should anyone, except the elevator company, attempt to control the motion of the elevator. At all times, the emergency is to be treated as though persons were inside of the stricken elevator.

If removal of persons inside of the elevator is necessary because of medical conditions, circuits must be turned off and locked out.

EXTORTION / KIDNAPPING

Kidnapping

Kidnapping demands are usually accomplished by the use of a telephone/cell phone. Other means available are e-mail, notes, or possibly in person.

The demand is usually accompanied by some type of threat as to what will occur if the demand is not met. The kidnapping demand/ransom will usually involved money. No matter how the demand is received, the kidnapping demands/ransom must be immediately referred to the Security Manager/Supervisor on duty who will make the proper notifications: (See Notification List below):

Extortion

Extortion demands may be accomplished by several means such as telephone/cell phone, in person, by mail, or a note. Some have even been made by e-mail. The demands will usually be accompanied by some threat as to what will happen is the demands are not met. No matter how received, extortion demands must be immediately referred to the Security Manager/Supervisor on duty, who will make the proper notifications: (See Notification List below)

Notification List

- Manager of Security/Security Director
- Hammond Police Department
- General Manager
- Federal Bureau of Investigation
- Command Center should be immediately initiated if necessary
- Corporate Investigations
- Division President

Security

Security Shift Manager should immediately respond to the location of where the demand was received.
Assist personnel with the reporting requirements
Monitor telephones in the area if a call had been received in the event a second call is placed
All Security Officers should be updated with all available information if pertinent.
Security Officers should be observant for any suspicious activity or persons, taking special note of areas containing public phones.
Attempt to determine if there are any pertinent witnesses and if identified escort them to Security Control to be interviewed.

Person Receiving the Threat by Telephone

Complete a Kidnapping/Extortion Initial Report
Security Shift Manager hand deliver the Initial Report to the Command Post or the
Do not leave property until given approval to do so by the Command Post

EXTORTION/KIDNAP INITIAL REPORT

Date: _____ Time: _____Call Display:_____

Exact Wording of the Threat/Demand:

_____
_____
_____
_____

Questions to Ask Caller:

- Why are you doing this?
  _____
- Who is this?
  _____
  _
- Is this a prank?
  _____
- How do I know this is not a prank?
  _____
- Where are you calling from?
  _____
- What do you want?
  _____
- (If Kidnap or hostage situation) May I talk with_____?
  _____
- Is he/she all right?
  _____
- What is he/she wearing?
  _____
- Is there anything else I need to know?
  _____

Type of Speech: (Check all that apply)

( ) Calm	( ) Angry	( ) Excited	( ) Slow	( ) Rapid
( ) Soft	( ) Loud	( ) Laughter	( ) Crying	( ) Normal
( ) Distant	( ) Slurred	( ) Nasal	( ) Stutter	( ) Lisp
( ) Raspy	( ) Deep	( ) Ragged	( ) Accent	( ) Disguised
( ) Familiar	( ) Whispered	( ) Cracking Voice		

Background Sounds: (Check all that apply)

( ) Street Noises	( ) Machinery	( ) Animal Noises	( ) Voices
( ) PA System	( ) House Noises	( ) Music	( ) Motor
( ) Clear	( ) Static	( ) Sirens	
( ) Long Distance	( ) Pay Station	( ) Children	

Threat Language: (Check all that apply)

( ) Well Educated	( ) Incoherent	( ) Foul	( ) Irrational
( ) Taped	( ) Read		

Other:

Sex of Caller: _____ Age:_____ Race:_____

Remarks:_____
_____
_____
_____
_____
_____
_____
_____
_____

Time Ended:

Signature_____

☐ **SUBMIT TO SECURITY AS SOON AS POSSIBLE**

FIRE / SMOKE

☐ Immediately call Security and provide them with the following information:
- Your exact location
- What is burning
- Extent of the fire

☐ If you cannot safely extinguish the fire using the contents of one (1) fire extinguisher:
- Alert all personnel in your area and pull the emergency pull station to activate the alarm.
- Exit the room or hallway immediately following **Emergency Evacuation Plan.**
- Close any office doors.
- **WALK** calmly to the nearest emergency exit or emergency stairwell, exit the building and proceed to the staging area **(A- Whihla County Park or B- Guest Overflow Parking Lot)**
- Do not use the elevators.
- Have an alternate emergency exit in the event yours is blocked.
- All employees will be notified when re-entry into the building is safe.
- **IF IT IS HOT, DO NOT OPEN IT.**
  - If you can reach the phone, call Security giving your exact location, floor number and office number or name.
  - Advise security that you are trapped.
  - Place an article of clothing, blanket or similar item along the bottom of the door to keep the smoke out.
  - Retreat as far from the door and heat source as possible and await rescue personnel.
- **IF THE DOOR IS NOT HOT:**
  - Open slowly, standing behind it.
  - If no danger is present, walk to the nearest emergency exit following **Emergency Evacuation Plan.**
  - If the area is smoke-filled, stay low and/or crawl to the nearest exit.

Security Dispatcher and/or PBX Operator

☐ Advise Fire Department of all known information such as location, type of emergency, easiest access (if known), how the notification to the hotel/casino was made and any other information they request.

☐ Even if there is an automatic Fire Department notification system, the Fire Department should still be contacted by telephone.

☐ Public Address Announcements will be made by appropriate personnel, usually security or engineering. Ensure that the announcements are periodically made until the "all clear" announcement is made.

☐ Notify and advise each of the following individuals with all information known:

1. Fire Department
2. Security Shift Manager
3. Manager of Security
4. Shift Manager of Security
5. General Manager
6. Assistant General Manager
7. Facilities Manager/Vessel Captain or Marine Operations Supervisor

☐ Answer phone calls from guests and employees on the designated phone line(s) advising them:
- If threatened, proceed to the nearest exit/stairway and exit the building and assemble in a designated area.
- State that the hotel/casino is investigating the source of the alarm and that the Fire Department is responding.
- Advise caller(s) that further instructions will be given as soon as the hotel/casino is advised by the Fire Department.

☐ Log the times that the following phone calls were made or received:
- Notification of an emergency situation
- When Fire Department notified
- When senior Manager on duty was notified.
- When Engineering and Security were notified.

☐ Maintain contact with responders and follow their instructions.

Marine Operations (MOPS) personnel along with personnel from facilities and security will respond to fires property-wide. The Marine Operations Supervisor on watch will be the On-Scene Leader for fire operations and will direct personnel from facilities and security. Facilities personnel will be responsible for securing power and ventilation as directed and assisting on-scene with fire-fighting equipment. Security will secure the area of the fire and assist on-scene and with transporting MOPS personnel and equipment. Security will also search and evacuate adjacent areas and make reports to the On-Scene Leader. The Marine Operations Supervisor will give a brief situation report and hand over on-scene leadership to Hammond Fire Department (HFD) if they are called to the incident.

Concept of Operations

☐ GeneralResponsibilities

- Marine Operations: Bring fire-fighting equipment to the scene and attempt to extinguish the fire according to the Emergency Response Plan.

- Security: Secure the area and assist with fire-fighting equipment as directed by the Marine Operations Supervisor. Transport MOPS personnel and equipment. Provide keys to Marine Operations Supervisor. Monitor and provide updates from information displayed on the Fire Control Panel. Security will also direct HFD to the scene if necessary.

- Facilities: Stand by to secure power and ventilation at the direction of the Marine Operations Supervisor. Facilities will also assist Marine Operations or HFD with connections to the fire main system.

- Hammond Fire Department: If HFD assumes on-scene leadership, Horseshoe personnel will stand by to assist as necessary.

Muster Points:

Marine Operations, Security Supervisor, and Facilities Lead will coordinate fire response activities from the muster point specified by the Marine Operations Supervisor.

1. Car Fire
   Pavilion Garage Muster Point: 2nd level elevator lobby
   Marina Garage Muster Point: 1st level elevator lobby

2. Pavilion Building/Garage Fire
   Primary Muster Point: Employee Boarding Ramp
   Secondary Muster Point: Entrance by Pavilion Valet Circle

3. Marina Building/Garage Fire
   Primary Muster Point: Marina Boarding Ramp
   Secondary Muster Point: Marina Garage Freight Elevator

4. Transfer Walkway Building Fire
   Primary Muster Point: Employee Boarding Ramp
   Secondary Muster Point: Marina Garage Elevator Lobby

5. Valet Trailer Fire
   Primary Muster Point: Marina Boarding Ramp
   Secondary Muster Point: Entrance by Pavilion Valet Circle

6. Trailers in Employee Parking Lot
   Primary Muster Point: Entrance by Pavilion Valet Circle
   Secondary Muster Point: Marina Boarding Ramp

7. Warehouse Building Fire
   Primary Muster Point: Entrance by Pavilion Valet Circle
   Secondary Muster Point: Marina Boarding Ramp

Assets

- (2) mobile fire fighting equipment carts pre-positioned near the elevators in each garage. Each cart will contain:
  - (2) turnout jackets
  - (2) turnout pants

- (2) sets of fire fighting boots
- (2) flash hoods
- (2) sets of fire fighting gloves
- (2) SCBA's
- (2) fire fighting helmets
- (1) Mulligan bar
- (1) fire ax
- (1) seatbelt cutting tool
- (4) lantern battery size flashlights
- (1) 2-1/2" to 1-1/2" wye gate
- (1) 50' section of 2-1/2" fire hose
- (2) 50' sections of 1-1/2" fire hose
- (2) fire hose nozzles
- (5) 15lb "Cold Fire" fire extinguishers (or equivalent)
- (1) Hand portable vehicle loading ramp for cart

Blanket drag:

- Remove blanket or sheet from bed.
- Place blanket/sheet beside victim and spread fully.
- Roll victim to center of blanket/sheet.
- Roll edges of blanket/sheet on either side close to victim.
- Grasp blanket/sheet edges beside the victim's head.
- Lift and pull at the same time.
- Drag victim to a safe area.

NOTE: These methods enable a smaller person to assist a larger victim. The blanket drag is one of the fastest yet safest methods for removing a victim from a danger area.

- If there is reason to believe that more than one victim is involved; remove one victim to a place of safety then return to search for additional victims.

☐ First aid for victims with breathing difficulty

Conscious victim with breathing difficulty:

- Administer oxygen.

Unconscious victim not breathing:

- Establish airway.
- Mouth to mouth resuscitation.
- Mouth to nose resuscitation.
- Bag mask resuscitation

Unconscious victim not breathing, no pulse:

- Establish airway, begin assisted breathing.
- Cardio-Pulmonary Resuscitation (CPR).
- Automatic External Defibrillator (AED).

☐ Assist in accessing secured areas of the hotel/casino.

☐ Establish liaison with senior police and fire officials and investigators of the incident.

☐ Make a full investigation, compile names of involved persons, and complete an incident report.

☐ Assist Management in restoring hotel operations after a fire alarm or evacuation.
☐ Refer all media inquiries to the General Manager or Property Crisis Team.

Housekeeping/ Maintenance Personnel

Housekeeping and Maintenance personnel working on guestroom floors and the public areas of the casino have the best chance of detecting a fire condition. These personnel, if fire or smoke is detected, should:

☐ Sound the fire alarm
☐ Call the Switchboard or Security Dispatcher and give location and description of the fire.
☐ Close doors to confine the smoke/fire.
☐ Move carts into guestrooms or closets to clear corridors.
☐ Assist guests in evacuating the hotel/casino and advise them of the location of the designated assembly area for housekeeping/maintenance personnel.

Back of the House Personnel

Personnel assigned to the back of the house areas such as the laundry, tailoring room, uniforms, and storage areas, should accomplish the following tasks during a fire/smoke emergency situation:

☐ Sound the fire alarm
☐ Call the Switchboard or Security Dispatcher and give location and description of the fire.
☐ Ensure exits and various evacuation routes are clear.
☐ Evacuate the building.
☐ Assemble in the designated area after evacuating the hotel/casino.

SECURITY MANAGER'S/SUPERVISOR'S
FIRE ACTION PLAN CHECKLIST
SECURITY MANAGER/SUPERVISOR

TASKS	**ACTION TAKEN**
Respond to the scene and assess the situation reporting to Security Control the following:	
Type of fire	_____
Exact location	_____
Extent of fire	_____
Trapped/injured persons	_____
Smoke conditions, if any	_____
Can extinguishment be accomplished	_____
Type of Evacuation ordered	_____
Confirmation that Fire Dept. has been called	_____

Manager's/Supervisor's Signature:
_____

SECURITY CONTROL
FIRE ACTION PLAN CHECKLIST

SECURITY CONTROL

Date: _____ Time: _____ Dispatcher: _____

TASKS	ACTION TAKEN
Confirmation of the exact location	_____
Fire alarm activated	_____

NOTIFICATIONS

Security personnel	_____
On-Scene Commander	_____
Facilities/Marine	_____
Fire Department	_____
Surveillance	_____
Property Crisis Team	_____

Dispatcher's Signature:
_____

Manager's/Supervisor's Signature:
_____

DEPARTMENTAL
FIRE ACTION PLAN CHECKLIST

DEPARTMENT NAME: _____

ASSESS THE SITUATION REPORTING TO SECURITY CONTROL THE FOLLOWING:

TASKS	**ACTION TAKEN**
Exact location	_____
Type of fire	_____
Extent of fire	_____
Trapped/injured persons	_____
Smoke conditions, if any	_____
Can extinguishment be accomplished with one fire extinguisher?	_____
Evacuation ordered	_____

IF EVACUATION IS ORDERED

Assign employees to outside emergency exits

Inform and assist all employees, guests and vendors to evacuate to the nearest emergency exit

Close all office doors

Account for all employee at the staging area

Completed by: _____

Manager's/Supervisor's Signature: _____

FACILITIES
FIRE ACTION PLAN CHECKLIST

TASKS	**ACTION TAKEN**
Respond to the fire alarm control panel	_____
Determine zone of alarm	_____
Respond to the scene with security and assess fire	_____
Assess with security if extinguishment can be accomplished by extinguishers or sprinkler system.	_____

If extinguishment has been accomplished:

Shut off sprinkler system	_____
Reset fire doors	_____
Reset fans and/or open doors/windows for ventilation	_____
Assess damage of fire and smoke, report to Security	_____

Facilities Representative's Signature:

_____

FLOOD

Most floods develop slowly over a period of days. Flash floods, however, are like a wall of water that develop in a matter of minutes. Flash floods can be caused by intense storms or dam failure.

General

- Power to lower levels may be cut off.
- Lover level area may be totally evacuated.
- Emergency procedures will be the same as outlined in the emergency procedures for fire/smoke section in this manual.
- Listen and follow instruction given over PA system.
- Remain calm and assist in whatever actions are necessary.
- Do not handle or operate live electrical equipment in wet areas.
- Electrical equipment must be checked and cleaned before returning to service after becoming wet.
- All employees will aid in clean-up and salvage operations as directed by the Property Crisis Team.

Planning Considerations

Consider the following when preparing for floods:

- Vital records stored in low-level area must be transported to upper levels.
- Ask your local emergency management office whether your facility is located in a flood plain. Learn the history of flooding in your area. Learn the elevation of your facility in relation to streams, rivers and dams.
- Review the community's emergency plan. Learn the community's evacuation routes. Know where to find higher ground in case of a flood.
- Establish warning and evacuation procedures for the facility. Make plans for assisting employees who may need transportation.
- Inspect areas in your facility subject to flooding. Identify records and equipment that can be moved to a higher location. Make plans to move records and equipment in case of flood.
- Purchase a National Weather radio with a warning alarm tone and battery backup. Listen for flood watches and warnings.
    - **Flood Watch** – Flooding is possible. Stay tuned to radio. Be prepared to evacuate. Tune to local radio and television station for additional information.
    - **Flood Warning** – Flooding is already occurring or will soon. Take precaution at once. Be prepared to go to higher ground. If advised, evacuate immediately.
- Ask your insurance carrier for information about flood insurance. Regular property and casualty insurance does not cover flooding.

- Emergency flood proofing measures include:
    - Building walls with sandbags.
    - Constructing a double row of walls with boards and posts to create a "crib," then filling the crib with coil.
    - Constructing a single wall by stacking small beams or planks on top of each other.
- Consider the need for backup systems:
    - Portable pumps to remove flood water
    - Alternate power sources such as generators or gasoline-powered pumps
    - Battery-powered emergency lighting
- Participate in community flood control projects.

FOOD BORNE CRISIS

Operational Response

When a food borne crisis occurs, it is of utmost importance that all employees clearly understand the procedure to be followed.

General

- The procedures for a food borne crisis consists of three distinct sections that mirror the actual phases of a crisis situation:
  - Pre-Crisis Preparation
  - Operational Response
  - External Communication
- Each section must be clearly integrated into each hotel/casino's standard operating procedures and clearly communicated to all current and future employees.

Pre-Crisis Preparation

- A management person must be designated to take charge during a food borne crisis. Backups must be clearly assigned to ensure seven-day-a-week coverage.
- Emergency telephone numbers must be maintained and should include business and after-hour numbers for local Health Department and Poison Control Center.
- Ensure all potentially involved employees are trained in your policy and procedures regarding this issue. This should be done during Management meetings and Food and Beverage staff meetings.

Person Receiving Complaint

☐ Follow standard hotel emergency procedures.

☐ Contact manager or designated hotel/casino representative immediately, and forward the call or information immediately.

- Do not have extensive conversation or discussion with the complainant regarding the situation.

Manager or Designated Hotel/Casino Supervisor

☐ Record complaint by obtaining all information required to clearly identify the affected individual, the specifics of the occurrence and the action taken to date.

- The following information is required:
  - Guest's Name, address and phone numbers (home and work)
  - Specific signs and symptoms of the complaint
  - Names, addresses and phone numbers (if possible) of other guests in the party
  - To whom it was previously reported, if any
  - Date and time the guest became ill

- Duration of the illness
- Symptoms of the illness
- Details of the suspected food items consumed and other foods or beverages consumed or medications taken before or after
- Name of the physician or hospital consulted
- Any known allergies or medication/inoculation taken before the illness

☐ During conversations with complainant, show compassion and express concern for their well being.
- Advise that we intend to investigate the complainant and are requesting the above information to assist in the investigation.
- Caution should be exercised during conversations to ensure understanding that the information being requested is "not for the purpose of invading their privacy, but because we want to accurately determine the facts surrounding the incident.
- Also relate clearly that all personal information will be kept confidential.
- If an individual refuses to provide any of the requested information, do not pressure them to provide it.

☐ Remain polite and concerned even if you doubt the legitimacy of the complaint. Do not argue, but do not admit liability.

☐ Let the person tell their own story—do not suggest symptoms.
- Be sure to record the time of the onset of the symptoms.
- Try to get a food history. If possible, attempt to include foods eaten or medications taken before or after the person was at our operation.

☐ **Do not offer medical advice.** Simply gather the information

External Communication

Corporate communications should be contacted to assist with the dissemination of information to the media.

HOSTAGE TAKING

Person Discovering the Situation

Employees who are made aware of a hostage situation should immediately move to a safe location and notify Security Control.

Security

☐ Security Control must immediately notify the Security Manager/Supervisor on duty who will insure the proper notifications are made:
- Local law Enforcement (Hammond police Department)
- Local fire/Medical department (Hammond fire Department)
- Surveillance
- Manager of Security and Shift Manager of Security
- Security investigators
- IGC
- Regional Vice President and General Manager
- Captain

☐ Security Supervisor/Security Investigators shall respond to the hostage taking scene.

☐ The area should be cleared of all persons except Security/police. Onlookers and curiosity seekers must be kept clear of the area

☐ Any witnesses to the hostage taking should immediately be escorted to Security Control for interviewing.
- Attempt to determine if subject came to the property alone, or with someone.
- If subject has friends or family on property they should be escorted to Security Control immediately and have them interviewed.

☐ President/General Manager and Manager of Security will determine the need for evacuation.

☐ Security supervisors/Security Investigators responding to the hostage situation should attempt to implement the following procedures:
- Determine if weapons are involved, and what type.
- Use extreme caution in approaching the subject: Understand cover and concealment.
- If safe to do so, engage the subject in a dialogue.
- Determine subject's name.
- Determine if subject and hostages are okay.
- Keep in mind a subject who has taken a hostage/hostages may have serious emotional/mental problems.
- Never attempt to negotiate face to face if a subject is armed.
- Remain calm, logical, and proceed in a slow and deliberate pace.
- Never negotiate alone

☐ Care must be taken to protect security officers, hostages, and guests

- Be aware that a subject who has taken Hostage/hostages is a real threat to officers and guests and may even want to hurt himself.

☐ Contact with the subject should be immediately initiated. Only one person conducts the verbal negotiations, a second person should be taking notes.

☐ Certain attitudes should be used when dealing with a hostage situation

- Use Active listening Skills (ALS)
- Assume a gentle, firm, positive demeanor
- Use a soft, calm, reassuring voice
- Do not ask for demands, or what the subject wants. If it is important to them they will bring them up.
- Do not make a promise you can't keep
- Try to avoid saying "No"

☐ When the Hammond Police Department arrives they will assume responsibilities.

☐ Security Supervisors/Security Investigators will remain to assist in any manner possible. This may mean continuing with the negotiation process.

☐ A full report will be filed with the Security Manager on the incident. This report will include statements from witnesses, names of all parties and officers involved in the incident. Also include all actions taken by the Security Officers in contact with the subject.

- The final disposition of the subject will be determined by his actions and the decisions reached by the Crisis Management team involved in the situation.
- The Manager of Security/ Shift Manager of Security should request an immediate debriefing of all Security personnel involved in the incident at its conclusion.

MEDICAL EMERGENCY

DEFINITIONS

Medical emergencies: May include, but are not limited to, choking, heart attacks, chemical exposure, cuts, burns, loss of consciousness and illness.

Universal Precautions: The Horseshoe Casino employees practices "Universal Precautions" when dealing with blood or body fluids. As a result, we treat all human blood and body fluids such as vomit, saliva and sweat as if they are known to be infectious for HBV, HIV and other bloodborne pathogens. In circumstances where it is difficult or impossible to differentiate between body fluid types, ***assume all body fluids to be potentially infectious.***

WARNING: Exposure to blood and body fluid may cause the transfer of infectious diseases. Follow Universal Precautions and wear appropriate personal protective equipment to protect against bloodborne pathogens when there is the possibility of exposure to blood or other body fluids. For more information on Universal Precautions and appropriate personal protective equipment, refer to Horseshoe Casino's Bloodborne Pathogens Exposure Control Plan.

TRANSPORTING VICTIMS TO A MEDICAL FACILITY

- For medical emergencies, call an ambulance.
- For non-emergency situations that still require medical treatment, the employee may transport him/herself, call someone or have Security transport them.

MEDICAL CLEANUP

- To clean up or/or decontaminate items contaminated with blood or body fluids, follow the procedures detailed in Horseshoe Casino Bloodborne Pathogens Exposure Control Plan.

INJURY/ILLNESS NOTIFICATION

- All employee injuries, illnesses or accidents must be reported within 24 hours on the Horseshoe Casino Injury, Illness and Incident Report and documented in applicable OSHA Logs. OSHA will be contacted by the Manager of Risk Control within 8 hours of an employee death or hospitalization of three or more employees.

GENERAL PROCEDURES

Medical Emergency:

All Employees

- Stay with the victim and have another employee call Security Control.
- DO NOT CONTACT BLOOD OR BODY FLUIDS.

EMT-B and/or Paramedic

- Use Universal Precautions.
- Have another employee Notify Security Control, if necessary.
- The highest-ranking EMT will maintain communication with responding personnel and act as the triage officer.

Security Control

- Call for an ambulance – "911"
- Contact the on-site EMT or CPR/First Aid trained employee as appropriate.
- Meet the outside EMTs at the front door and escort them to the victim's location.
- Ensure the victim completes a Horseshoe Casino Accident/Incident Report Form.

CPR/First Aid Trained Employees

- Use Universal Precautions
- Have another employee notify Security Control, if necessary
- Evaluate the situation surrounding the accident using the SETUP method:
- Stop: Take a breath, think primary assessment, think mechanism of injury (forces involved)
- Environment: Consider the limitations
- Traffic: Vehicle position, safe approach, remain alert
- Unknown Hazards: Consider limitations, gas, chemical, electrical, fire, collapse, explosion, radiation, lack of oxygen, weapons
- Protect Self and Patient: Use barriers, prevent further harm
- If it is not safe to approach the victim, contact other Crisis Management Team Members as appropriate. For example, you may have spotted the victim down in a room lying next to a spilled or releasing chemical substance. This spilled or releasing chemical substance may have overcome the victim and is the reason he/she is unconscious. In this case, call the On-Scene Incident Commander or a Hazardous Materials First Responder.
- If it is safe to approach the victim, evaluate his/her condition and perform the necessary ABCs of emergency care.

In the event of a medical emergency please pick up any house phone and dial "6165" or "0" the person reporting the emergency will be responsible for the following:

☐ Obtain as much information from individual or witnesses as possible.
☐ Notify switchboard or security dispatcher and indicate the medical emergency. They will contact emergency response and ambulance(s) if necessary.
☐ Be available to provide information to crisis management team or security about the situation.

Instructions for the Call Center

- Emergency calls will be handled on a priority basis.
- The operator will determine whether the call is an emergency or a non-emergency request for medical assistance.
- The following data must be readily available to telephone operators:
  - Telephone numbers of responsible paramedic unit, public emergency and/or rescue service.
  - Name and telephone number of a nearby private ambulance service for specific guest requests.
  - Name, address, and telephone number of a clinic with 24 hour emergency service.
  - Name, address, and telephone number of a hospital with 24 hour emergency service.
  - Name, location, and shifts of all personnel trained in CPR and/or AED.

Instructions for Security Control

- If guest is unconscious, has stopped breathing, has severe bleeding or other situation requiring immediate professional attention, IMMEDIATELY call paramedics, public emergency or rescue service for an ambulance, thereafter notifying security CPR trained employee to respond.
- A designated employee should be dispatched to meet the ambulance and direct attendants to the guest.
- The highest ranking member of management must be notified.
- The following data must be readily available to security dispatchers:
  - Telephone numbers of responsible paramedic unit, public emergency and/or rescue service.
  - Name and telephone number of a nearby private ambulance service for specific guest requests.
  - Name, address, and telephone number of a clinic with 24 hour emergency service.
  - Name, address, and telephone number of a hospital with 24 hour emergency service.
  - Name, location, and shifts of all personnel trained in CPR and/or AED.

Security

- ☐ Will contact senior management person on duty who will make decision as to whether or not to implement Crisis Management plan.
- ☐ Will have a presence at the scene, record all activity and maintain contact with senior management official.
- ☐ Will contact health authority, police, fire, etc.
- ☐ Will maintain records of all contacts (time, person contacted, etc)
- ☐ Will prepare written report of the incident and all actions taken

Surveillance

- ☐ If incident occurs within area covered by cameras, continuous monitoring of situation should be maintained
- ☐ A copy of the tape should be made and provided to security department. The original tape should be retained in the surveillance department and handled as evidence

Property Crisis Team (If activated)

- ☐ Set up Command Center if warranted
- ☐ Prepare for appropriate communication
- ☐ Arrange for hot-line, if necessary, for employees and families
- ☐ Coordinate activities with public service agencies

NATURAL DISASTERS

In the event of a major natural disaster, the emergency organization should basically remain the same as in a fire situation. However due to natural disasters encompassing the entire region, the Property Crisis Team will be relied on very heavily. It must be remembered that there may no outside emergency services available for some time, such as telephone, power, ambulance or rescue, water, etc., Therefore, the property may be strictly on it's own in handling the emergency for an undetermined amount of time, possibly several hours.

In a major disaster, it may become necessary to set up a temporary hospital or first aid station. This must be in a safe area and cannot be designated until after damage can be assessed. All emergency first aid equipment will be moved to this location and all trained personnel from all departments will be utilized along with employees and/or guest volunteers. Personnel will be requested to respond to the area with blankets, pillows and sheets (which may be used for bandages and slings if necessary).

POWER FAILURE

If for any reason, there is a total power failure at a property, each property is equipped with a back-up system. This system is started within a few seconds of a power failure. It should be noted that all lighting and power systems are not necessarily on this back-up system, but emergency lights and power will be maintained in public areas.

At first sign of power failure, all personnel must be particularly alert for the prevention of injury and crime. Engineering personnel will follow power failure protocol.

Personnel operating equipment using more than 110 volts should shut down equipment until power returns to normal. Heavy motors may burn out due to power fluctuation.

Telephone Operator

☐ Will advise Security and Engineer on Duty of power outage.

Security Dispatcher

☐ Will advise Security Shift Manager and Engineer on Duty of power outage.
☐ Will dispatch a Security Supervisor to meet Engineering to take report of situation.
☐ Officers should be dispatched to locations where money is handled to observe and protect the assets.
☐ Notify Slots, Table Games, restaurants, gift shops, Cages, and soft count room, to protect or secure all money.
☐ Keep communication open with Surveillance Department.
☐ Notify utility company and determine how soon help will be available.
☐ Will contact Surveillance to see if anyone is inside of the elevators. **If so, institute elevator emergency procedures.**

Security

☐ Will contact the Facilities Manager/Vessel Captain.
☐ Inspect all emergency lighting systems to ensure all systems are operational
☐ When dispatched to a money handling facility, will be observant and remain at that location until "all clear" is received.
☐ Inspect all elevator systems to determine if any elevators are stalled with passengers on board, and advise Security Dispatch.
☐ Pits: Close tables.
☐ Cage: Officers are to patrol the cage area to observe for any suspicious activity and to assist guests with any questions they might have.
☐ Soft Count: Consideration should be given to shutting down these operations.

- ☐ Hotel: Officer will maintain a constant patrol of all floors and stairwells to ensure guests are not trapped.
- ☐ Escalators/Main Entrance: Officers should be posted at these locations to assist guests.

Engineering

- ☐ Will immediately determine the cause of the power failure and advise the Telephone Operator/Security Dispatch.
- ☐ Will ensure emergency power is instituted.
- ☐ Will stay in constant communication with the Senior Manager, advising him/her of the facts and information needed to make decisions.

Management

- ☐ Institute plans for control of building, occupants and their needs.
- ☐ Communicate with the utility company to determine the time and duration so that preparations can be made to restart the building systems when power is restored.
- ☐ A Command Post should be created and the Property Crisis Team called to respond, if necessary.
- ☐ Avenues of communication with guests, public and employees should be instituted, with up-to-the-minute information disseminated.

ROBBERY

Cages, vaults, soft count, and pits in the casino are equipped with an approved type of hold-up alarm. These alarms are silent at the location of activation and monitored in-house by the Security and Surveillance Departments.

Cage Personnel

- ☐ Stay calm, give money or meet demands if possible.
- ☐ Take no aggressive action. Do not attempt to stop the robbery or apprehend the perpetrator.
- ☐ Avoid eye contact with the robber(s).
- ☐ Cooperate with the robber(s) and do exactly what they tell you to do.
- ☐ If safe to do so, activate the silent alarm.
- ☐ Secure the area and move to a safe environment. **Do not touch or in any way disturb the area where the crime occurred**.
- ☐ Keep all other employees and/or customers away from the area.
- ☐ Security will notify local law enforcement.
- ☐ Try to remember the physical description, voice, clothing and any other significant characteristics of the robber. Be systematic. Look at him/her from head to foot. Mentally note as many details as you can.
- ☐ Step away from the immediate area of the crime and notify Security Dispatch.
- ☐ When Security arrives, advise if you or anyone is in need of medical assistance.
- ☐ Give all pertinent information to Security concerning the details of the crime and description of the perpetrators.
- ☐ Identify all witnesses to the Security Officer.
- ☐ If the robbery took place at a casino cage, make arrangements to close all windows.

Security Dispatcher

- ☐ Notify the Hammond Police Department at 911
- ☐ Notify the On-Scene Commander
- ☐ Notify surveillance and IGC immediately
- ☐ Refrain from radio use, turn volume down.
- ☐ Monitor escape routes of the offenders for direction of travel
- ☐ When informed of the robbery by phone, immediately determine the following:
  - Location
  - If the robbery still in progress
  - Identify the caller
  - If there are any injuries
  - Direction of escape
  - How many robbers involved
- ☐ The Security Dispatcher will notify Security of the location of the alarm and whether or not the robbery is still in progress.

☐ Security Dispatcher should maintain a log of events as they occur, such as:
- Receipt of call (from whom, what time)
- Robbers' description
- Pertinent radio transmissions
- Time police department was notified
- Time of "all clear"
- Means and direction of escape

☐ If there are any resulting injuries or trauma, the dispatcher should immediately notify Emergency Medical Technician on property.

Security

☐ Isolate the area if the robbery is still in progress.
☐ Notify local law enforcement if actual robbery occurred.
☐ No aggressive action should be taken that will endanger any persons.
☐ If the alarm is found to be false, notify the Security Dispatcher of the fact so an "all clear" can be broadcast.
☐ Security will contact the Property Crisis Team if warranted or instructed by senior management.
☐ Security Supervisor(s) responding to the scene must keep their own safety in mind and obtain pertinent details such as robber description, direction of escape, description of vehicle, weapons, etc. This information should be immediately relayed to the Security Dispatcher for dissemination to law enforcement.
☐ If a Security Investigator is on property they must be called to the scene.
☐ Move everyone away from the area and create a perimeter.
☐ A Security Officer should be posted at the crime scene and not allow anyone without a specific need to enter the area. A log should be maintained of the identities of everyone entering the area.
☐ Once law enforcement officers arrive on the property, cooperate fully and assist in every way possible.
☐ All witnesses (employees and guests) should be identified, separated and interviewed, with a report filed for each witness. Obtain a written statement if possible.
☐ All Security personnel who witnessed the robbery will submit a written report.
☐ Do not allow representatives of the media to photograph or conduct interviews inside the premises. Refer all media inquiries to the appropriate company spokesperson.

Surveillance

☐ When advised that a robbery is in progress or has just ended, the Surveillance Department will:

- Monitor and record all activity at the scene.
- Advise Security as to suspect description, type of weapon(s), vehicle information and direction of escape.

☐ Notify the Surveillance Director

☐ Maintain logs, reports and videotape of the incident for law enforcement authorities.

Property Crisis Team

☐ Set up command center if required

☐ Human Resources PCT rep will arrange counseling or victim services for victims and affected individuals

☐ Make necessary press or other releases.

EMPLOYEE'S/MANAGER'S/SUPERVISOR'S
HOLDUP/ROBBERY
ACTION PLAN CHECKLIST

DATE: _____ TIME: _____

EMPLOYEE'S NAME: _____

TASKS	**ACTION TAKEN**
Activate alarm if present	_____
Notify Supervisor and Security	_____

Information on Holdup/Robbery:

Description: _____

Direction of travel: _____

Weapon involved: _____

What was taken: _____

Manager's/Supervisor's Signature: _____

SECURITY
HOLDUP/ROBBERY
ACTION PLAN CHECKLIST

DATE: _____ TIME: _____

EMPLOYEE'S NAME: _____

TASKS	**ACTION TAKEN**
Ascertain the correct location and immediately isolate the area.	_____
If possible, evacuate the area near the holdup/robbery of guests and/or employees to a safer location.	_____
Notify surveillance and the immediately.	_____
Notification of Security Supervisor/Manager	_____
Monitor exits for escape routes of the offenders for direction of travel.	_____
Notify the Police Department	_____
Isolate employees involved in the holdup/robbery to fill out Holdup Description Form(s).	_____
Affirm what/how much company assets were taken and any information related to this.	_____
Notify the On-Scene Commander	_____

Manager's/Supervisor's Signature: _____

RUPTURED WATER PIPES / SPRINKLER HEAD

In the event of a ruptured water line or sprinkler head, the following procedures should be followed:

In the Event of Main Water Supply Loss

- ☐ Water District will be so advised by Switchboard/Security Control.
- ☐ Security will monitor rest rooms and ensure they are not being used.
- ☐ Security Manager on duty will monitor the situation.

Security Control

- ☐ Notify Engineers, Maintenance and Security of location of leak and dispatch them to area.
- ☐ Notify senior management.
- ☐ Notify Security Shift Manager.
- ☐ Notify Surveillance to ensure camera coverage of affected area.

Slots

- ☐ Upon notification, Engineers, Maintenance and Security will respond to the affected area.
- ☐ If water is leaking onto and over slot machines, slot personnel will respond to the area.
- ☐ If determined necessary, power will be turned off.
- ☐ If practical, before power is turned off, credits should be noted along with identification of persons playing machines.
- ☐ Plastic sheeting will be place by maintenance and slot personnel over affected slot machines.
- ☐ EVS will be notified to respond with cleanup equipment.
- ☐ If warranted, area will be cordoned off to prevent guests from walking through area.

Pit Area

- ☐ Engineers, Maintenance and Security will respond to the area.
- ☐ Surveillance should be notified.
- ☐ Pit supervisor will decide if tables need to be closed in the affected area, and notify casino dealers as to safekeeping their banks and locking tables
- ☐ Maintenance and EVS will respond to area and either move tables or place plastic sheeting over tables. Buckets should be placed under leaks to minimize damage. "Wet–vac" area as soon as practical to minimize carpet damage.
- ☐ Guests should be advised to take their chips, cash, etc. from the tables.

☐ If needed, area should be cordoned off to prevent guest or employee injury and to prevent traffic from entering area.

Restaurants/Bars

☐ Shift supervisors or Food and Beverage manager on duty will determine if partial or all areas need to be closed.
☐ If so, bartenders and cashiers will be directed as to safe keeping of their banks.
☐ Maintenance will move tables and chairs, or plastic sheeting will be placed over area to help eliminate water damage.
☐ Affected area will be cordoned off to prevent guests moving through the area.

Hotel Room Water Leaks (If applicable)

☐ Engineers and Security will be notified and respond to the affected room(s).
☐ If extensive water leakage, all rooms on lower floors will be checked for additional water damage.
☐ Hotel Manager of Duty will determine and coordinate with guests for any room changes, if needed.
☐ Maintenance will respond with cleanup equipment.

THREATENED SUICIDE

Person discovering the situation

Employees who are made aware of a threatened or attempted suicide should immediately move to a safe location and notify Security.

Security

☐ In the event the officer is made aware of a threatened or attempted suicide, the following procedures should be implemented:
- Attempt to determine the name of the subject
- Attempt to determine if the subject is armed
- Ask subject: "Are you trying to kill yourself?"
- Determine if the subject has done anything to injure himself
- Attempt to determine if the subject is at the casino by himself or with other persons

• Keep in mind that a subject who is seriously considering suicide has emotional problems, is in a state of depression, and believes he/she has exhausted all possible alternatives for living.
- Use extreme caution in approaching such a subject: Understand cover and concealment.
- Never attempt to negotiate face to face if a subject is armed.
- Remain calm, logical and proceed at a slow, deliberate pace

☐ Notify a Security Supervisor as soon as you receive notification.
- Hammond Police Department will be contacted in all cases involving threatened suicide.
- All steps possible should be taken to safeguard the subject. It is the officers' duty to make all reasonable efforts to safeguard the life of a potential suicide subject.

☐ The Security Supervisor will notify the Security Shift Manager on duty. Notifications will be made by the Shift Manager to the following:
- IGC
- Manager of Security
- Shift Manager of Security

☐ The area should be cleared of all persons except Security/Police. Onlookers and curiosity seekers should be kept clear of the area.

☐ Care must be taken to protect the officer and any other persons involved.
- Be aware that a subject who is threatening or has attempted suicide is a very real threat to the officer and any other person involved because of the state of mind of the subject.

☐ Contact with the subject should be immediately initiated. Only one person conducts the negotiations. A second person should be taking notes.
- Certain attitudes should be used when dealing with such a subject.

- Use Active Listening Skills (ALS)
- Assume a gentle, but positive demeanor
- Use a soft, calm, reassuring voice

- When the local Police Department arrives they will assume the responsibilities, and Security Officers will remain to assist in any manner possible. This may mean continuing the negotiations.

☐ An investigator will be called if on duty to compile a report. If one is unavailable then a Security Supervisor will compile the report. Be sure you have all the information needed before you leave the scene of the incident.

- The final disposition of the subject will be determined by the actions of the subject and the decisions reached by the Crisis Management Team if involved in this situation.

TORNADO

A tornado is a violently rotating column of air extending from a thunderstorm to the ground. Tornadoes can occur at any time of the day or night and in any month of the year. Tornadoes usually come from the southwest at speeds of 20-40 mph. However, they have traveled at speeds near 70 mph. The average tornado is on the ground less than 10 minutes and travels a distance of about five miles. The width of the tornado as it touches the ground averages 300 to 400 yards but may be wider. Tornadoes wind speed varies from 100 mph to nearly 300 mph. Tornadoes usually develop from thunderstorms and normally occur at the trailing edge of the storm. Tornadoes do their destructive work through the combined action of their strong rotary winds, flying debris and the partial vacuum in the center.

General

- The activation of the Property Crisis Team and command center may be necessary.
- If enough advance warning is given, the PA system should be activated throughout the complex giving guests and employees the following instructions:

  All:
  This area is under a tornado warning.
  Towers:
  Open all windows and doors approximately ½ inch.
  The bathrooms provide the best shelter should the tornado strike, further information to follow.
  Casino Property:
  Move all patrons to Zones P, N, & D. All non-Security or Marine Operations personnel should move to the hold deck of the casino.
  Pavilion: Move all patrons to the area between JB's and the restrooms. All employees should move to the hallway between the EDR and Security Control.
  Marina Garage: Move all Patrons and employees to Zones P, N, & D in the Casino.
  Marine Operations: Stand by Fire Control Room, Ballast Control System, and Watertight Door Panel.
  Stay away from windows, doors and outside walls. Lie flat on the floor and cover your head.
- After the tornado passes, the same procedures will be followed as outlined in the earthquake section.

Planning Considerations

The following are considerations when planning for tornadoes:

- Ask your local emergency management office about the community's tornado warning system.

    - Tornado Watch – Tornadoes are likely. Be ready to take shelter. Stay tuned to radio and television stations for additional information.
    - Tornado warning – A tornado had been sighted in the area or is indicated by radar. Take shelter immediately.
- Establish procedures to inform personnel when tornado warnings are posted. Consider the need for spotters to be responsible for looking out for approaching storms.
- Work with a structural engineer or architect to designate shelter areas in your facility. Ask your local emergency management office or National Weather Service for guidance.
- Consider the amount of space you will need. Adults require about six square feet of space; nursing home and hospital patients require more.
- The best protection in a tornado is usually an underground area. If an underground area is not available consider:
    - Small interior rooms on the lowest floor and without windows.
    - Hallways on the lowest floor away from doors and windows.
    - Rooms constructed with reinforced concrete, brick or block with no windows and a heavy concrete floor or roof system overhead.
    - Protected areas away from doors and windows.
    - Note: Auditoriums, cafeterias and gymnasiums that are covered with a flat, wide-span roof are not considered safe.

☐ Make plans for evacuating personnel away from lightweight modular offices or mobile home-sized buildings. These structures offer no protection from tornadoes.

SECURITY CONTROL
SEVERE WEATHER
ACTION PLAN CHECKLIST

Date: _____ Time: _____ Dispatcher: _____

NOTIFICATIONS	ACTION TAKEN
Security Manager/Supervisor	_____
On-Scene Commander	_____
Manager on Duty	_____
Captain of Vessel	_____
Surveillance	_____
Director of Facilities/Marine Operations	_____

DEPARTMENT NOTIFICATION

Administration _____	Accounting _____	Payroll _____
Internal Audit _____	Games_____	Slots _____
Housekeeping _____	Group Sales _____	Guest Services _____
Human Resources _____	Main Kitchen _____	Food Outlets _____
Bars _____	Cage _____	Credit _____
Diamond Lounge _____	Marine Ops. _____	Wardrobe _____
Receiving _____	Gift Shop _____	Valet _____

All Notifications completed Time:

Weather radio on and monitored

Dispatcher's Signature:_____

TOTAL REWARDS
SEVERE WEATHER
ACTION PLAN CHECKLIST

TASK	**ACTION TAKEN**
Contact Security to confirm weather warning	_____
Place radio on security channel	_____
Move guests to Zones P, N, and D in the casino.	_____
Secure front counter	_____

Manager's/Supervisor's Signature:_____

VALET
SEVERE WEATHER
ACTION PLAN CHECKLIST

TASK	**ACTION TAKEN**
All attendants brought inside	_____
Assignments to monitor doors made	
Names:	
Front door:	
Shuttle buses notified	_____
All outside operations suspended	_____

Manager's/Supervisor's Signature: _____

F & B OUTLETS
SEVERE WEATHER
ACTION PLAN CHECKLIST

TASK	**ACTION TAKEN**
Confirm weather warning with Security	_____
Inform employees to move guests to the area between JB's and restrooms.	_____
Close and secure outside exit doors	_____
Turn off appliances/machinery	_____

Manager's/Supervisor's Signature:_____

RECEIVING/PURCHASING
SEVERE WEATHER
ACTION PLAN CHECKLIST

TASK	**ACTION TAKEN**
Secure all overhead doors and outside entrances	_____
Notify housekeeping staff	_____
Evacuate to the Hallway between the EDR and Security Control.	_____

Manager's/Supervisor's Signature: _____

CREDIT
SEVERE WEATHER
ACTION PLAN CHECKLIST

TASK	**ACTION TAKEN**
Confirm weather warning with security	_____
Secure doors and office doors	_____
Evacuate to the hold deck of the casino	_____

Manager's/Supervisor's Signature:_____

CAGE
SEVERE WEATHER
ACTION PLAN CHECKLIST

TASK	**ACTION TAKEN**
Confirm weather warning with Security	_____
Secure offices and evacuate to hold deck of the casino.	_____

Manager's/Supervisor's Signature:_____

3RD AND 4TH FLOOR OFFICES
SEVERE WEATHER
ACTION PLAN CHECKLIST

TASK	**ACTION TAKEN**
Confirm weather warning with Security	_____
Secure offices and evacuate to the Hallway between the EDR and Security Control.	_____

Manager's/Supervisor's Signature:_____

A

EMPLOYEE BOMB THREAT REPORT

DOCUMENT THE EXACT WORDS OF THE PERSON CALLING:
Listen and do not interrupt the caller

_____
_____
_____
_____
Continue on the back if necessary

ASK QUESTIONS LIKE:
When is the bomb going to go off?
_____
Where is the bomb right now?
_____
What does the bomb look like?
_____
What kind of bomb is it?
_____
Why did you place the bomb?
_____

DESCRIPTION OF CALLER

SPEECH __Fast __Slow __Distinct __Distorted __Stutter __Nasal __Slurred __Other (Describe)	Did caller appear familiar with the vessel or pavilion in description of the bomb location? __ Yes __No	**ACCENT** __Local __Foreign __Not Local __Caucasian __Racial __Regional __Describe on back
LANGUAGE __Excellent __Good __Fair __Poor __Foul __Other (describe)	**MANNER** __Calm __Angry __Rational __Irrational __Coherent __Incoherent __Deliberate __Emotional __Righteous __Laughing __Other (Describe)	**BACKGROUND NOISE** __Office Machines __Bedlam __Factory Machines __Quiet __Street traffic __Voices __Airplanes __Music __Trains __Party __Animals __Mixed __Other (Describe)
VOICE CHARACTERISTICS __Soft __Deep __Pleasant __Loud	**CALLER'S IDENTITY** __Male __Female	Any other distinguishing characteristics not described. _____

__High Pitch __Raspy __Intoxicated __Lispy __Mumbled __Other (Describe)	Approximate Age	_____ _____ _____

REMARKS: _____
_____
_____
_____
_____
_____

Person receiving call:_____Badge#_____Time:_____Date:_____

Dept.:_____Telephone #:_____

NOTIFY YOUR SUPERVISOR AND SECURITY IMMEDIATELY -- TALK TO NO ONE UNLESS INSTRUCTED BY YOUR SUPERVISOR.

THIS FORM SHOULD IMMEDIATELY BE FILLED OUT BY THE PERSON WHO RECIEVES THE THREAT AND TURNED IN TO THE COMMAND CENTER TO BE USED DURING THE INVESTIGATION.

Bomb Threat Search Checklist

Department_____ Date_____

Time Started_____

Specific Area Checked_____

	1st Check	2nd Check	N/A
Stairwells	( )	( )	( )
Hallways	( )	( )	( )
Restrooms	( )	( )	( )
Elevators	( )	( )	( )
Exits/Entrances	( )	( )	( )
Trash Containers	( )	( )	( )
Dumpsters	( )	( )	( )
Storage areas	( )	( )	( )
Luggage Storage	( )	( )	( )
Shrub Beds	( )	( )	( )
Drawers	( )	( )	( )
Cabinets	( )	( )	( )
Wall Lockers	( )	( )	( )
Air Handling	( )	( )	( )
Parking Lots	( )	( )	( )
Parking Garages	( )	( )	( )
Vehicles near bldgs.	( )	( )	( )
Cages	( )	( )	( )
Front Desk	( )	( )	( )
Restaurants/Bars	( )	( )	( )
Other_____	( )	( )	( )
Other_____	( )	( )	( )

_____ _____ _____
Signature & Badge # Date Time Ended

Notes:_____
_____
_____
_____
_____
_____

C

EMPLOYEE'S/MANAGER'S/SUPERVISOR'S EVACUATION PLAN CHECKLIST

DEPARTMENT NAME: _____

DATE:_____TIME: _____

TYPE OF EVACUATION ORDERED (circle below):

Types of Evacuations	Definition
Vertical	The movement of personnel up, down or into emergency exits or stairwells.
Horizontal (Isolation)	The movement of personnel across a floor for safe refuge.
Partial	The movement of a limited number of people that may be immediately endangered or the immediate floors above or below the incident.
Total	The total movement of all personnel from the facility to the staging area.

TASK	**ACTION TAKEN**
1. EVACUATE EMPLOYEES/GUESTS	_____
2. EVACUATION LOCATION (STAGING AREA)	_____
3. TAKE EMPLOYEE HEAD COUNT	_____
4. REPORT MISSING PERSONNEL TO SECURITY	_____

MANAGER'S/SUPERVISOR'S SIGNATURE:_____

Crisis Management Forms

D

EXTORTION/KIDNAP INITIAL REPORT

Date:_____ Time:_____

Call Display:_____

Exact Wording of the Threat/Demand:_____
_____
_____
_____
_____

Questions to Ask Caller:

- Why are you doing this?
  _____
- Who is this?
  _____
  _
- Is this a prank?
  _____
- How do I know this is not a prank?
  _____
- Where are you calling from?
  _____
- What do you want?
  _____
- (If Kidnap or hostage situation) May I talk with_____?
  _____
- Is he/she all right?
  _____

- What is he/she wearing?
  _____

- Is there anything else I need to know?
  _____

Type of Speech: (Check all that apply)

( ) Calm	( ) Angry	( ) Excited	( ) Slow	( ) Rapid
( ) Soft	( ) Loud	( ) Laughter	( ) Crying	( ) Normal
( ) Distant	( ) Slurred	( ) Nasal	( ) Stutter	( ) Lisp
( ) Raspy	( ) Deep	( ) Ragged	( ) Accent	( ) Disguised
( ) Familiar	( ) Whispered	( ) Cracking Voice		

Background Sounds: (Check all that apply)

( ) Street Noises	( ) Machinery	( ) Animal Noises	( ) Voices
( ) PA System	( ) House Noises	( ) Music	( ) Motor
( ) Clear	( ) Static	( ) Sirens	
( ) Long Distance	( ) Pay Station	( ) Children	

Threat Language: (Check all that apply)

( ) Well Educated	( ) Incoherent	( ) Foul	( ) Irrational
( ) Taped	( ) Read		

Other:

Sex of Caller: _____ Age:_____ Race:_____

Remarks:_____
_____
_____
_____
_____
_____
_____
_____
_____

Time Ended:

Signature_____

☐ **SUBMIT TO SECURITY AS SOON AS POSSIBLE**

SECURITY MANAGER'S/SUPERVISOR'S
FIRE ACTION PLAN CHECKLIST
SECURITY MANAGER/SUPERVISOR

TASKS	**ACTION TAKEN**
Respond to the scene and assess the situation reporting to Security Control the following:	
Type of fire	_____
Exact location	_____
Extent of fire	_____
Trapped/injured persons	_____
Smoke conditions, if any	_____
Can extinguishment be accomplished	_____
Type of Evacuation ordered	_____
Confirmation that Fire Dept. has been called	_____

Manager's/Supervisor's Signature:

_____

SECURITY CONTROL
FIRE ACTION PLAN CHECKLIST

SECURITY CONTROL

Date: _____ Time: _____
Dispatcher:_____

TASKS	ACTION TAKEN
Confirmation of the exact location	_____
Fire alarm activated	_____

NOTIFICATIONS

Security personnel	_____
On-Scene Commander	_____
Facilities/Marine	_____
Fire Department	_____
Surveillance	_____
Property Crisis Team	_____

Dispatcher's Signature:

_____

Manager's/Supervisor's Signature:

_____

DEPARTMENTAL
FIRE ACTION PLAN CHECKLIST

DEPARTMENT NAME: _____

ASSESS THE SITUATION REPORTING TO SECURITY CONTROL THE FOLLOWING:

TASKS	**ACTION TAKEN**
Exact location	_____
Type of fire	_____
Extent of fire	_____
Trapped/injured persons	_____
Smoke conditions, if any	_____
Can extinguishment be accomplished with one fire extinguisher?	_____
Evacuation ordered	_____

IF EVACUATION IS ORDERED

Assign employees to outside emergency exits

Inform and assist all employees, guests and vendors to evacuate to the nearest emergency exit

Close all office doors

Account for all employee at the staging area

Completed by:_____

Manager's/Supervisor's Signature:_____

FACILITIES
FIRE ACTION PLAN CHECKLIST

TASKS	**ACTION TAKEN**
Respond to the fire alarm control panel	_____
Determine zone of alarm	_____
Respond to the scene with security and assess fire	_____
Assess with security if extinguishment can be accomplished by extinguishers or sprinkler system.	_____

If extinguishment has been accomplished:

Shut off sprinkler system	_____
Reset fire doors	_____
Reset fans and/or open doors/windows for ventilation	_____
Assess damage of fire and smoke, report to Security	_____

Facilities Representative's Signature:

_____

EMPLOYEE'S/MANAGER'S/SUPERVISOR'S
HOLDUP/ROBBERY
ACTION PLAN CHECKLIST

DATE: _____ TIME: _____

EMPLOYEE'S NAME: _____

TASKS	**ACTION TAKEN**
Activate alarm if present	_____
Notify Supervisor and Security	_____

Information on Holdup/Robbery:

Description: _____

Direction of travel: _____

Weapon involved: _____

What was taken: _____

Manager's/Supervisor's Signature: _____

SECURITY
HOLDUP/ROBBERY
ACTION PLAN CHECKLIST

DATE: _____ TIME:_____

EMPLOYEE'S NAME: _____

TASKS	**ACTION TAKEN**
Ascertain the correct location and immediately isolate the area.	_____
If possible, evacuate the area near the holdup/robbery of guests and/or employees to a safer location.	_____
Notify surveillance and the immediately.	_____
Notification of Security Supervisor/Manager	_____
Monitor exits for escape routes of the offenders for direction of travel.	_____
Notify the Police Department	_____
Isolate employees involved in the holdup/robbery to fill out Holdup Description Form(s).	_____
Affirm what/how much company assets were taken and any information related to this.	_____
Notify the On-Scene Commander	_____

Manager's/Supervisor's Signature: _____

SECURITY CONTROL
SEVERE WEATHER
ACTION PLAN CHECKLIST

Date: _____ Time: _____ Dispatcher: _____

NOTIFICATIONS	ACTION TAKEN
Security Manager/Supervisor	_____
On-Scene Commander	_____
Manager on Duty	_____
Captain of Vessel	_____
Surveillance	_____
Director of Facilities/Marine Operations	_____

DEPARTMENT NOTIFICATION

Administration	_____	Accounting	_____	Payroll	_____
Internal Audit	_____	Games	_____	Slots	_____
Housekeeping	_____	Group Sales	_____	Guest Services	_____
Human Resources	_____	Main Kitchen	_____	Food Outlets	_____
Bars	_____	Cage	_____	Credit	_____
Diamond Lounge	_____	Marine Ops.	_____	Wardrobe	_____
Receiving	_____	Gift Shop	_____	Valet	_____

All Notifications completed Time:_____

Weather radio on and monitored

Dispatcher's Signature:_____

Crisis Management Forms
L

TOTAL REWARDS
SEVERE WEATHER
ACTION PLAN CHECKLIST

TASK	**ACTION TAKEN**
Contact Security to confirm weather warning	_____
Move guests to Zones P, N, and D in the casino.	_____
Evacuate back office	_____
Secure front counter	_____

Manager's/Supervisor's Signature:_____

VALET
SEVERE WEATHER
ACTION PLAN CHECKLIST

TASK	**ACTION TAKEN**
All attendants brought inside	_____
Assignments to monitor doors made	
Names:	
Front door:	
Shuttle buses notified	_____
All outside operations suspended	_____

Manager's/Supervisor's Signature: _____

F & B OUTLETS
SEVERE WEATHER
ACTION PLAN CHECKLIST

TASK	**ACTION TAKEN**
Confirm weather warning with Security	_____
Inform employees to move guests to the middle of the pavilion	_____
Close and secure outside exit doors	_____
Turn off appliances/machinery	_____

Manager's/Supervisor's Signature:_____

RECEIVING/PURCHASING
SEVERE WEATHER
ACTION PLAN CHECKLIST

TASK	**ACTION TAKEN**
Secure all overhead doors and outside entrances	_____
Notify housekeeping staff	_____
Evacuate to the EDR hallway	_____

Manager's/Supervisor's Signature: _____

CREDIT
SEVERE WEATHER
ACTION PLAN CHECKLIST

TASK	**ACTION TAKEN**
Confirm weather warning with security	_____
Secure outside doors and office doors	_____
Evacuate to EDR hallway	_____

Manager's/Supervisor's Signature:_____

CAGE
SEVERE WEATHER
ACTION PLAN CHECKLIST

TASK	**ACTION TAKEN**
Confirm weather warning with Security	_____
Secure offices and evacuate to EDR hallway	_____

Manager's/Supervisor's Signature:_____

3RD AND 4TH FLOOR OFFICES
SEVERE WEATHER
ACTION PLAN CHECKLIST

TASK	ACTION TAKEN
Confirm weather warning with Security	_____
Secure offices and evacuate to EDR hallway	_____

Manager's/Supervisor's Signature:_____

SITUATION REPORT	1. Affected Property(s):	2. Date Prepared:	3. Time Prepared:
4. 24 hour Operational Period (Date/Time)			
5. Summarize situation (What do we know: who, what, when, where)			
6. Analysis, significance, forecast of probable future events:			
7. Priority Information Requirements: (What do we need to know)			
8. Approved For Release By (Enterprise Crisis Team Coordinator)			

Instructions for completing this form: This form should be prepared by the corporate Enterprise Crisis Team and disseminated and/or briefed as appropriate. This form is an executive summary of the updated situation. A new form is completed as required when new information is developed, however a new form is completed every 24 hours even if there is no significant change. Ideally, the reported information is:

☐ Verified for accuracy with an independent source
☐Screened for relevance
☐Summarized for executive review
☐Interpreted and analyzed for significance

Crisis Management Forms
T

CRISIS OBJECTIVES	1. Affected Property(s):	2. Date Prepared:	3. Time Prepared:
4. 24 hour Operational Period (Date/Time)			
5. General Control Objectives For the Crisis (Include alternatives)			

Caesar's Priorities

☐ **Protecting the health and safety of guests and employees**
☐ **Maintaining our reputation for fair gaming**
☐ **Preserving our critical assets**
☐ **Preserving other corporate property, and**
☐ **Maintaining business operations**

6. General Safety Message	
8. Prepared By (Enterprise Crisis Team Coordinator)	9. Approved By (CEO)
Instructions for completing this form: This form should be prepared by the corporate Enterprise Crisis Team and approved by the CEO setting forth the operational objectives for the next 24 hour period. Operational objectives are provided to direct the efforts of employees towards coordinated crisis resolution. After CEO approval, this completed form should be disseminated.	

Crisis Management Forms
U

COURSE OF ACTION #	1. Affected Property(s):	2. Date Prepared:	3. Time Prepared:
4. Set forth major actions to be taken in this course of action:			

5. Advantages	6. Disadvantages
7. Recommendation:	
8. Approved For Release By (Enterprise Crisis Team Coordinator)	
Instructions for completing this form: This form is used by the Enterprise Crisis Team to develop, prepare, and recommend alternative courses of action for approval by the CEO. All relevant Caesar's business units and support functions should participate in the development of courses of action.	

Crisis Management Forms
V

CRISIS ACTION PLAN	1. Affected Property(s):	2. Date Prepared:	3. Time Prepared:
4. 24 hour Operational Period (Date/Time)			

5. Describe significant actions to be taken, person responsible, and any deadlines		
APPOVED ACTION	RESPONSIBLE PERSON	DEADLINE

8. Approved for release (Enterprise Crisis Team Coordinator)	9. Approved by: (CEO)

Instructions for completing this form: This form should be prepared by the corporate Enterprise Crisis Team and disseminated and/or briefed as appropriate. This form reflects courses of action developed by the Enterprise Crisis Team and approved by the CEO. It should reflect major actions to be taken and not "how to" instructions.

Crisis Management Forms
W

CRISIS LOG **(Use additional blank pages)**	1. Affected Property(s):	2. Date Prepared:	3. Time Prepared:

DATE/TIME	EVENT DESCRIPTION	INITIALS

Change Number	Page Number	Change Date	Change Entry Date	Signature of Person Entering Change

Crisis Management Forms
Y

Endorsement of the Crisis Management Plan by the Horseshoe Casino

Plan Number _____. I acknowledge that this information is confidential and that I am to store this plan in a safe and secure area.

I have read and understand the Crisis Management Plan as submitted by the Horseshoe Casino to the Indiana Gaming Commission and understand that in an emergency incident my agency, department company or firm has been identified or implied as one that will assist in any emergency incident as needed. I also understand that I am invited at a mutually agreed upon time between my agency, department company or firm and Horseshoe Casino to visit the Horseshoe Casino facilities and provided the opportunity to tour the facility and view the location of emergency equipment that my agency, department company or firm may use during an incident.

Comments: _____

_____

Signed by: _____ Date: _____

Title/Position: _____

Attachment H

Air Quality Analysis Technical Appendices

ATTACHMENT H AIR QUALITY

Introduction

This Air Quality Appendix provides modeling assumptions and backup for results presented in Section 5.5 of the DPIR/DEIR. Included within this documentation is a brief description of the methodology employed along with pertinent calculations and data used in the emissions and dispersion calculations supporting the mesoscale, microscale, and stationary source air quality analyses.

Motor Vehicle Emission Rates (Microscale & Mesoscale)

The EPA MOBILE6.2 computer program generated motor vehicle emissions used in the garage stationary source analysis along with the mobile source CAL3QHC modeling and mesoscale analysis. The model input parameters were provided by MassDEP. Emission rates were derived for 2012 and 2022 for speed limits of 2.5, 10, 15, and 30 mph for use in the microscale analyses. The 10 mph rate was used to estimate parking garage emissions.

Mesoscale Analysis (including Greenhouse Gases)

A mesoscale analysis consists of using link and intersection data to calculate total emissions of NOx, VOC, and GHG over the project transportation study area. All calculations are made using Microsoft Excel and are presented in this appendix.

CAL3QHC (Microscale) Analysis

For the intersections studied, the CAL3QHC model was applied to calculate CO concentrations at sensitive receptor locations using emission rates derived in MOBILE6.2. The intersection's queue links and free flow links were input to the model along with sensitive receptors at all locations nearby each intersection. The meteorological assumptions input into the model were a 1.0 meter per second wind speed, Pasquill-Gifford Class D stability combined with a mixing height of 1,000 meters. For each direction, the full range of wind directions at 10 degree intervals was examined. In addition, a surface roughness (z_0) of 175 cm was used for all intersections. Idle emission rates for queue links were based on 2.5 mph emission rates derived in MOBILE6.2 and converted from grams per mile to grams per hour. Emission rates for speeds of 10, 15, and 30 mph were used for right turn, left turn, and free flow links, respectively.

Stationary Source Emissions

Emissions for the heating combustion units were calculated using the latest DEP emission limits for boilers based on the Boiler Environmental Results Program (ERP). Boiler stack data were obtained from engineering plans, vendor data, and engineering judgment. The emergency generator emissions were calculated based on a g/bhp-hr emission factor provided by vendor information for typical size units. A combination of vendor data and engineering judgment were also used for the

CHP facility. Since final design has not yet been completed, all equipment provided is subject to change.

The hourly emission rates were converted to grams per second and input to the AERMOD model. For the NAAQS analysis, modeling was conducted for CO, SO_2, NOx, PM-10, and PM-2.5.

All assumptions and data used in the stationary source emissions and stack parameter calculations are provided herein.

AERMOD

The EPA AERMOD model was used to calculate air quality impacts due to the installation of heating combustion boilers, emergency generators, CHP, and cooling towers. For non-combustion sources, ambient temperature releases were assumed; otherwise temperatures of the exhaust gas were used. Urban dispersion coefficients were used. Building downwash was accounted for in the modeling based on the building heights and projected widths of the buildings. The maximum modeled impacts from the stack sources were conservatively added to monitored background values for comparison to the NAAQS.

Boiler, Cooling Tower, Emergency Generator, and CHP Exhaust Emissions Calculations

Caesars Resort at Suffolk Downs

For engineer's stack height analysis, model number of units indicated in column C. For MEPA analysis, exclude future units as indicated in column D, except for DHW blrs - model only 1

Heating Boilers

If Option 1 is a problem, duscuss w/Vanderweil before modeling option 2. Taller stacks may be an alternative.

Option 1

			Notes
Source Name		BLR1-5	Vanderweil 5/6/2013
Make		Vantage	Vanderweil 5/6/2013
Model		VTG-6000	Vanderweil 5/6/2013
Qty.		5	Vanderweil 5/6/2013, **4+1 future**
Boiler Heat Input	MMBtu/hr	6.0	
Boiler Emission Rates	lb/MMBtu	g/s	
NOx	0.036	0.01804	29ppm, Vanderweil
CO	0.044	0.02234	59 ppm, Vanderweil
VOC	0.030	0.01512	ERP limits
PM-2.5	0.007	0.00376	AP-42 @ 1020 Btu/scf
PM-10	0.007	0.00376	PM10=PM2.5
SO2	0.0006	0.00030	AP42 Table 1.4-2 (assuming 1020 Btu/scf)
CO2	117		EIA emission factors
Gas Exit Temp	°F	185	Vanderweil
Gas Exit Temp	°K	358.2	calculated
Exhaust air (CFM)	acfm	1,442	Vanderweil
Gas Exit Velocity	fps	44.06	calculated
Gas Exit Velocity	mps	13.43	calculated
Roof Height	feet	38.00	
Stack height	feet above roofline	10	
Stack height	feet	48	calculated
Stack height	meters	14.630	calculated
Stack Diameter	feet	0.833	Vanderweil (Don changed from 14" to 10")
Stack Diameter	meters	0.254	calculated

Option 2

Source Name		BLR1-7	Vanderweil 5/6/2013
Make		Vantage	Vanderweil 5/6/2013
Model		VTG-4000LE	Vanderweil 5/6/2013
Qty.		7	Vanderweil 5/6/2013, **6+1 future**
Boiler Heat Input	MMBtu/hr	4.000	
Boiler Emission Rates	lb/MMBtu	g/s	
NOx	0.011	0.00560	9ppm vendor guarantee for LE unit
CO	0.030	0.01515	40 ppm, Vanderweil
VOC	0.030	0.01512	ERP limits
PM-2.5	0.008	0.00383	Vanderweil, Assume PM10=PM2.5
PM-10	0.008	0.00383	PM10=PM2.5
SO2	0.0006	0.00030	AP42 Table 1.4-2 (assuming 1000 Btu/scf)
CO2	117.000		EIA emission factors
Gas Exit Temp	°F	185	Vanderweil
Gas Exit Temp	°K	358.2	calculated
Exhaust air (CFM)	acfm	1,200	Vanderweil
Gas Exit Velocity	fps	36.67	calculated
Gas Exit Velocity	mps	11.18	calculated
Roof Height	feet	38.00	
Stack height	feet above roofline	10	
Stack height	feet	48	calculated
Stack height	meters	14.630	calculated
Stack Diameter	feet	0.833	Vanderweil (Don changed from 14" to 10")
Stack Diameter	meters	0.254	calculated

Caesars Resort at Suffolk Downs

Cooling Towers

			Notes
Designation		CT1-4	Vanderweil 5/6/2013
Make		Marley	Vanderweil 5/6/2013
Model		NC8411WLN4	Vanderweil 5/6/2013
Qty.		4	Vanderweil 5/6/2013 3 + 1 future
Cooling Tower Rate	tons	~3000	estimated
Tower Overall Dimensions	feet	22.42x11.9x18.96	Mfg data
CT Stack Height (above ground)	feet	24.00	Mfg data 19' +5' dunnage
Primary Building Height (ft)	feet	0.00	at grade
CT Stack Height	feet	24	calculated
CT Stack Height	meters	7.32	calculated
Number of cells (per tower)	#	1	Mfg data
Cooling Tower Specs			
Cooling Tower Exhaust Flow	CFM	255,600	Mfg data
Cooling Tower Cell Exhaust Flow	CFM	255,600	Mfg data
Cooling Tower Cell Exhaust Flow	kg/s	134.4	calculated
Cooling Tower Exhaust Temp	°F	78	Mfg data
Cooling Tower Exhaust Temp	K	298.7	calculated
Cooling Tower Cell Diameter	feet	11	Mfg data
Cooling Tower Cell Diameter	meters	3.35	calculated
Cooling Tower Stack Velocity	fps	44.83	calculated
Cooling Tower Stack Velocity	mps	13.66	calculated
Cooling Tower Drift			
Drift Rate	% of circ water	0.001	assumed
Circulating Water Rate	gpm	11,000	Mfg data
Circulating Water Rate	gph	660,000	calculated
TDS+TSS concentration in drift	mg/L	1,500	assumed
PM emission rate in drift (per cell)	lb/hr	0.083	calculated
PM emission rate in drift (per cell)	g/s	0.01044	calculated

Caesars Resort at Suffolk Downs

Emergency Generators

			Notes
Designation		EDG1-5	
Qty		5	Vanderweil 5/6/2013, **2+3 future**
Electrical output	kW	2000	Vanderweil 5/6/2013
Make		Caterpillar	Vanderweil 5/6/2013
model		3516CDITA	Vanderweil 5/6/2013
Engine Horsepower	bhp	2,937	Mfg data
Power, mechanical	kW	2,190	calculated
Fuel consumption @full load	gph	138.9	Mfg data
Heat Input	MMBtu/hr	19.0	calculated
Stack Parameters			
Exhaust Temperature	°F	762	Mfg data
Exhaust Temperature	°K	678.7	calculated
Total Exhaust Flow	acfm	15,136	Mfg data
Number of exhausts (typ. 1 or 2)	#	1	
Selected silencer diameter	in	14	Assumed to meet flow area required
Actual silencer opening area	sq. ft each	1.069	calculated
Actual velocity	fpm each	14158.839	calculated
Actual velocity	fps each	235.981	calculated
Single Stack Effective Diameter	in	16.00	nominal
Single Stack Effective Diameter	m	0.406	calculated
Single Stack Effective Velocity	fps	181	calculated
Single Stack Effective Velocity	mps	55.1	calculated
Enclosure height	ft	13.75	Cat dwg plus 1' for skids
Stack Height (10' above roofline)	ft	*23.75*	
Stack Height	m	*7.24*	calculated
Pollutant	Emission factor unit	Emission factor	
NOx	g/bhp-hr	5.39	EF from mfg data (Nominal)
CO	g/bhp-hr	0.29	EF from mfg data (Nominal)
VOC	g/bhp-hr	0.00	EF from mfg data (Nominal)
PM10	g/bhp-hr	0.03	EF from mfg data (Nominal)
PM2.5	g/bhp-hr	0.03	EF from mfg data (Nominal)
SO2	ppm S	15	15 ppm S mass conserved
HAPs	lb/MMBtu	0.00149	AP42 Table 3.4-4 & 3.3-2
CO2	lb/MMBtu	158.79	EF from mfg data (Nominal)
Short Term Emission Rate			
NOx	g/s	0.1506	uses EPA 'intermittent" factor (300 hrs/yr)
CO	g/s	0.2366	calculated
VOC	g/s	0.0000	calculated
PM10	g/s	0.0212	calculated
PM2.5	g/s	0.0212	calculated
SO2	g/s	0.0037	calculated
Long Term (300 hr/yr) Emission Rate			
NOx	g/s	0.1506	calculated
CO	g/s	0.0081	calculated
VOC	g/s	0.0000	calculated
PM10	g/s	0.0007	calculated
PM2.5	g/s	0.0007	calculated
SO2	g/s	0.00013	calculated

Caesars Resort at Suffolk Downs

Cogeneration Unit

			Notes
Designation		CHP1-2	
Number		2	
Electrical output	kW	100	vendor data
Make		Tecogen	Vanderweil
model		In Verde Ultra 100	Vanderweil
Fuel		NatGas	Specified
Horsepower	BrakeHP	145.0	Vanderweil
Power, mechanical	kW	109.6	calculated
Fuel consumption @full load	scf/hr	1,238	Specified
Heat Input	MMBtu/hr	1.26	calculated @ 1020 Btu/scf
Pollutant	Emission factor unit	Emission factor	
NOx	lb/MWh	0.15	ERP
CO	lb/MWh	1.00	ERP
VOC	lb/MWh	0.2000	from Tecogen Specifications
PM10	lb/MMBtu	7.71E-05	From AP-42 Table 3.2-2
PM2.5	lb/MMBtu	7.71E-05	From AP-42 Table 3.2-2
SO2	lb/MMBtu	5.88E-04	From AP-42 Table 3.2-2
HAPs	lb/MMBtu	6.71E-02	From AP-42 Table 3.2-2
CO2	lb/MMBtu	1.17E+02	EIA Emission factors
Controlled Emission Rates			
NOx	g/s	2.07E-03	calculated
CO	g/s	1.38E-02	calculated
VOC	g/s	2.76E-03	calculated
PM10	g/s	1.23E-05	calculated
PM2.5	g/s	1.23E-05	calculated
SO2	g/s	9.36E-05	calculated
Stack Parameters			
Exhaust Temperature	°F	500	from mfg data
Exhaust Temperature	°K	533.2	calculated
Total Exhaust Flow	acfm	525.0	from mfg data
Selected exhaust diameter	in	4	
Single Stack Effective Diameter	ft	0.333	
Single Stack Effective Diameter	m	0.102	calculated
Single Stack Effective Velocity	fps	100.3	calculated
Single Stack Effective Velocity	mps	30.6	calculated
Primary Building Height	ft	38.00	
Stack Height (10' above roofline)	ft	*48.00*	calculated
Stack Height	m	*14.63*	calculated

Caesars Resort at Suffolk Downs

DHW boilers

			Notes
Source Name		DHW 1-3	
Make		Weil-McLain	
Model		1188	
Qty.		3	**2+1 future**
Boiler Heat Input	MMBtu/hr	3.4	
Boiler Emission Rates	lb/MMBtu	g/s	
NOx	0.037	0.01867	30ppm, Vanderweil
CO	0.038	0.01893	50 ppm, Vanderweil
VOC	0.030	0.01512	ERP limits
PM-2.5	0.007	0.00376	AP42 Table 1.4-2 (assuming 1020 Btu/scf)
PM-10	0.007	0.00376	PM10=PM2.5
SO2	0.0006	0.00030	AP42 Table 1.4-2 (assuming 1020 Btu/scf)
CO2	117		EIA emission factors
Gas Exit Temp	°F	450	Vanderweil
Gas Exit Temp	°K	505.4	calculated
Exhaust air (CFM)	acfm	1,265	Vanderweil
Gas Exit Velocity	fps	19.72	calculated
Gas Exit Velocity	mps	6.01	calculated
Roof Height	feet	38.00	
Stack height	feet above roofline	10	
Stack height	feet	48	calculated
Stack height	meters	14.630	calculated
Stack Diameter	in	14	estimated
Stack Diameter	meters	0.356	calculated

Caesar's Resort at Suffolk Downs - Boston & Revere, MA
Background Concentrations

Background Concentrations								
POLLUTANT	AVERAGING TIME	2010	2011	2012	Units	ppm to $\mu g/m^3$ Conversion Factor	Background Concentration ($\mu g/m^3$)	Location
SO_2 [1][7][8]	1-Hour	0.0269	0.049	0.016	ppm	2600	127.4	Kenmore Sq., Boston
	3-Hour	0.034	0.024	0.019	ppm	2600	88.4	Kenmore Sq., Boston
	24-Hour	0.0084	0.0121	0.006	ppm	2600	31.5	Kenmore Sq., Boston
	Annual	0.00224	0.00236	0.0025	ppm	2600	6.5	Kenmore Sq., Boston
PM-10	24-Hour	32	39	41	$\mu g/m^3$	1	41.0	One City Sq. Boston
	Annual	15.1	15.9	17.9	$\mu g/m^3$	1	17.9	One City Sq. Boston
PM-2.5	24-Hour [4]	24.8	23.9	21	$\mu g/m^3$	1	23.2	174 North St., Boston
	Annual [5]	10.03	10.32	9.5	$\mu g/m^3$	1	10.0	174 North St., Boston
NO_2 [3]	1-Hour [6]	0.0503	0.06	0.051	ppm	1880	112.8	390 Parkland, Lynn
	Annual	0.0073	0.01026	0.007	ppm	1880	19.3	390 Parkland, Lynn
CO [2]	1-Hour	1.0	1.0	0.9	ppm	1140	1140	390 Parkland, Lynn
	8-Hour	0.7	0.6	0.7	ppm	1140	798	390 Parkland, Lynn

Notes: From 2007-2011 MA DEP Annual Data Summaries

[1] SO_2 reported in ppm or ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 2600 $\mu g/m^3$.

[2] CO reported in ppm or ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 1140 $\mu g/m^3$.

[3] NO_2 reported in ppm or ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 1880 $\mu g/m^3$.

[4] Background level for 24-hour PM-2.5 is the average concentration of the 98th percentile for three years.

[5] Background level for annual PM-2.5 is the average for three years.

[6] Maximum annual 1-hr concentrations.

[7] The 24-hour and Annual standards were revoked by EPA on June 22, 2010, Federal Register 75-119, p. 35520.

[8] The 2010 & 2011 SO_2 3-hr value is not reported. Years 2007-2009 used instead.

Caesar's Resort at Suffolk Downs - Boston & Revere, MA
AERMOD Dispersion Modeling Analysis
NAAQS Results - All Sources (4 Heating Boilers, 2 CHP, 2 EG, 2 DHWB and 3 CT (PM only))

POLLUTANT	AVERAGING TIME	MAXIMUM MODELED CONCENTRATION ($\mu g/m^3$)	YEAR of MODELED MAX (Meteorological Data)	BACKGROUND CONCENTRATION ($\mu g/m^3$)	TOTAL CONCENTRATION ($\mu g/m^3$)	STANDARD ($\mu g/m^3$)	% of Standard
SO_2	1 HOUR (1)	2.03	5-yr	127.4	129.4	195	66%
	3 HOUR (2)	2.00	2009	88.4	90.4	1300	7%
	24 HOUR (2)	1.50	2011	31.5	33.0	365	9%
	ANNUAL (3)	0.16	2010	6.5	6.7	80	8%
PM_{10}	24 HOUR (4)	13.55	H6H	44.0	57.5	150	38%
	ANNUAL (3)	1.91	2010	17.9	19.8	50	40%
$PM_{2.5}$	24 HOUR (5)	27.70	5-yr	included in modeled	27.7	35	79%
	ANNUAL (6)	1.70	5-yr	10.2	11.9	12	99%
NO_2	1 HOUR (7)	153.98	5-yr	included in modeled	154.0	188	82%
	ANNUAL (3)	17.06	2010	19.3	36.3	100	36%
CO	1 HOUR (2)	146.39	2011	1140.0	1286.4	40000	3%
	8 HOUR (2)	127.43	2009	798.0	925.4	10000	9%

Notes:

(1) Maximum 4th-Highest Maximum Daily 1-Hr Concentration Averaged Over 5 Years
(2) Highest 2nd-High Concentration Over 5 Years
(3) Highest Annual Concentration Over 5 Years
(4) Highest 6th-High Concentration Over 5 Years
(5) Maximum 1st-Highest 24-Hour Concentration Averaged Over 5 Years
(6) Maximum Annual Concentration Averaged Over 5 Years
(7) Maximum 8th-Highest Maximum Daily 1-Hour Concentration Averaged Over 5 Years

Mesoscale and GHG Emissions Calculations

Caesars Resort at Suffolk Downs

Roads

	VOC lbs/day	VOC tons/yr	NOx lbs/day	NOx tons/yr	CO2 lbs/day	CO2 tons/yr
2012 Existing	283.5	44.2	654.9	102.2	487114.1	75989.8
2022 No Build	182.6	28.5	222.7	34.7	551584.9	86047.2
delta from Existing	-101.0	-15.8	-432.2	-67.4	64470.8	10057.4
2022 Build	198.6	31.0	242.4	37.8	600356.8	93655.7
delta from No Build	16.0	2.5	19.7	3.1	48771.9	7608.4

Intersections

	VOC lbs/day	VOC tons/yr	NOx lbs/day	NOx tons/yr	CO2 lbs/day	CO2 tons/yr
2012 Existing	57.2	8.9	35.1	5.5	14515.8	2264.5
2022 No Build	56.3	8.8	16.8	2.6	22398.9	3494.2
delta from Existing	-0.9	-0.1	-18.4	-2.9	7883.1	1229.8
2022 Build	56.7	8.8	16.9	2.6	22546.6	3517.3
delta from No Build	0.4	0.1	0.1	0.0	147.7	23.0

Total

Pollutant	VOC lbs/day	VOC tons/yr	NOx lbs/day	NOx tons/yr	CO2 lbs/day	CO2 tons/yr
2012 Existing	340.7	53.2	690.0	107.6	501629.9	78254.3
2022 No Build	238.9	37.3	239.4	37.4	573983.8	89541.5
delta from Existing	-101.8	-15.9	-450.6	-70.3	72353.9	11287.2
2022 Build	255.3	39.8	259.3	40.4	622903.4	97172.9
delta from No Build	16.4	2.6	19.8	3.1	48919.7	7631.5

Minor differences in sums are due to rounding of individual values.

Pound per day to tons per year is based on an 85% factor to account for peak daily to annual data.

Caesars Resort at Suffolk Downs

	Case 1
	2022
	Build minus No Build
Net VMT, miles/day	38,767
Roadway GHG, tpy	7,608
Net Delay, hrs/day	47
Intersection GHG, tpy	23
Net GHG Emissions, tpy	7,631
Percent Change	---

Caesars Resort at Suffolk Downs	2012 Existing Friday PM Peak			2012 Existing Saturday Afternoon Peak		
Intersections (Signalized and *Unsignalized*)	**LOS**	**Delay (Sec)**	**Traffic Volume**	**LOS**	**Delay (Sec)**	**Traffic Volume**
3: Route 145 & Route 1A on-ramp	A	7.9	3242	A	6.0	2338
4: Route 145 & N Shore Rd (included in #44 in HCA Improvements)	D	50.0	3283	C	24.0	2270
5: Winthrop Avenue & State Road	C	33.8	1813	C	21.7	1452
6: Bennington Street & Saratoga Street	F	368.0	2311	F	59.0	2067
7: Boardman Street & Route 1A Southbound (reconfigured intersection in BUILD)	F	92.4	4287	C	31.9	3975
8: Winthrop Avenue & Route 16	D	48.5	4108	D	38.3	3206
10: State Road & Ocean Avenue	A	8.1	2288	B	13.1	1575
12: Jughandle & Route 1A	B	17.2	3884	A	8.1	3404
13: Bennington Street & Neptune Rd	F	272.7	2284	C	30.1	1626
15: Revere St & Route 60	F	367.2	3380	F	397.3	3200
19: Route 16 (Revere Beach Pkwy) & Garfield Ave	E	78.2	4492	D	47.8	3886
32: Route 1A NB Off Ramp & Neptune Rd	D	42.2	1433	C	32.7	773
44: Winthrop Ave & Suffolk Downs (includes N. Shore Rd. in HCA Improvements)	C	20.4	3116	C	20.7	2392
64: Route 60 (Squire Road) & Charger St	C	31.8	3564	C	30.5	3838
67: Route 60 (Squire Road) & Sigourney Street	D	46.8	3607	F	101.4	3926
72: Revere St & N Shore Rd/Rt.1A	F	112.4	3691	F	110.5	3476
75: Wonderland MBTA Lot & N Shore Rd/Rt.1A	C	26.8	2887	C	22.7	2279
91: Route 60 (Bell Circle) & Rt 60/ American Legion Hwy	C	21.8	3406	C	28.7	3562
92: Rt 1A/VFW Pkwy & Route 60 (Bell Circle)	B	12.0	2716	B	16.3	3006
93: Rt 16 & Beach Street	F	113.2	4349	D	51.3	4438
94: Beach St & Route 60 (Bell Circle)	A	2.2	1622	A	0.4	2115
1: Suffolk Downs & Route 1A (signalized in BUILD)	E	52.6	4004	D	135.8	3566
2: Furlong St & Route 1A	C	1.9	4092	C	1.5	3579
20: Waldemar Avenue & Route 1A (Signalized in BUILD)	D	0.6	4099	C	0.5	3618
78: Crescent Ave & Bennington Street	A	3.1	1365	A	3.3	1574
82: Curtis Street & Route 1A SB	C	23.4	2242	C	5.8	2462
84: Bremen St & Neptune Rd	A	3.3	746	A	2.8	628
87: Saratoga St & Neptune Rd	-	0.0	0	-	0.0	0
180: Route 16 (Revere Beach Pkwy) & Route 1 SB Off Ramp (new intersection)	-	0.0	0	-	0.0	0
181: Route 16 (Revere Beach Pkwy) & Route 1 NB On Ramp (new intersection)	-	0.0	0	-	0.0	0

LOS is HCM value for signalized intersections and ICU value for unsignalized intersections.
Color Code:
Red – Signalized intersections at LOS D or worse.
Green – Top 3 signalized intersections based on volume.

Caesars Resort at Suffolk Downs	2022 No Build Friday PM Peak			2022 No Build Saturday Afternoon Peak		
Intersections (Signalized and *Unsignalized*)	**LOS**	**Delay (Sec)**	**Traffic Volume**	**LOS**	**Delay (Sec)**	**Traffic Volume**
3: Route 145 & Route 1A on-ramp	A	9.8	3525	A	7.0	2551
4: Route 145 & N Shore Rd (included in #44 in HCA Improvements)	E	66.5	3613	C	25.5	2493
5: Winthrop Avenue & State Road	D	49.8	1982	C	26.2	1574
6: Bennington Street & Saratoga Street	F	429.2	2484	F	415.3	2207
7: Boardman Street & Route 1A Southbound (reconfigured intersection in BUILD)	F	158.6	4999	D	51.3	4659
8: Winthrop Avenue & Route 16	D	53.9	4500	D	41.9	3503
10: State Road & Ocean Avenue	A	9.4	2630	B	15.0	1829
12: Jughandle & Route 1A	D	40.2	4471	B	10.9	3937
13: Bennington Street & Neptune Rd	F	300.2	2407	D	49.4	1718
15: Revere St & Route 60	F	456.7	3907	F	483.4	3695
19: Route 16 (Revere Beach Pkwy) & Garfield Ave	F	95.3	4768	D	51.4	4121
32: Route 1A NB Off Ramp & Neptune Rd	D	43.4	1517	C	32.7	813
44: Winthrop Ave & Suffolk Downs (includes N. Shore Rd. in HCA Improvements)	C	21.8	3369	C	21.1	2576
64: Route 60 (Squire Road) & Charger St	D	46.8	4118	D	45.7	4397
67: Route 60 (Squire Road) & Sigourney Street	F	103.4	4018	F	158.7	4354
72: Revere St & N Shore Rd/Rt.1A	F	170.5	4384	F	151.6	4060
75: Wonderland MBTA Lot & N Shore Rd/Rt.1A	C	27.6	3383	C	24.9	2696
91: Route 60 (Bell Circle) & Rt 60/ American Legion Hwy	C	24.1	3964	D	36.6	4090
92: Rt 1A/VFW Pkwy & Route 60 (Bell Circle)	B	14.4	3145	B	18.2	3532
93: Rt 16 & Beach Street	F	127.0	4940	E	72.9	5108
94: Beach St & Route 60 (Bell Circle)	A	0.7	1951	A	0.7	2442
1: Suffolk Downs & Route 1A (signalized in BUILD)	F	48.2	4597	E	126.7	4107
2: Furlong St & Route 1A	D	3.4	4690	C	2.3	4120
20: Waldemar Avenue & Route 1A (Signalized in BUILD)	E	0.6	4697	D	0.5	4162
78: Crescent Ave & Bennington Street	A	3.5	1494	A	3.9	1686
82: Curtis Street & Route 1A SB	D	42.7	2601	C	11.4	2804
84: Bremen St & Neptune Rd	A	3.6	784	A	2.9	661
87: Saratoga St & Neptune Rd	-	0.0	0	-	0.0	0
180: Route 16 (Revere Beach Pkwy) & Route 1 SB Off Ramp (new intersection)	-	0.0	0	-	0.0	0
181: Route 16 (Revere Beach Pkwy) & Route 1 NB On Ramp (new intersection)	-	0.0	0	-	0.0	0

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Color Code:
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Caesars Resort at Suffolk Downs	2022 Build Friday PM Peak				2022 Build Saturday Afternoon Peak			
Intersections (Signalized and *Unsignalized*)	LOS	Delay (Sec)	Traffic Volume	No-Build to Build Volume % Increase	LOS	Delay (Sec)	Traffic Volume	No-Build to Build Volume % Increase
3: Route 145 & Route 1A on-ramp	A	9.5	3846	9%	A	6.7	2876	13%
4: Route 145 & N Shore Rd (included in #44 in HCA Improvements)	E	62.8	3984	10%	C	25.9	2873	15%
5: Winthrop Avenue & State Road	D	50.6	1988	0%	C	26.4	1581	0%
6: Bennington Street & Saratoga Street	F	429.4	2495	0%	F	417.0	2220	1%
7: Boardman Street & Route 1A Southbound (reconfigured intersection in BUILD)	C	34.5	3334	-33%	E	77.7	3412	-27%
8: Winthrop Avenue & Route 16	E	58.7	4821	7%	D	45.2	3827	9%
10: State Road & Ocean Avenue	A	9.4	2640	0%	B	15.1	1843	1%
12: Jughandle & Route 1A	A	9.7	4763	7%	A	7.6	4250	8%
13: Bennington Street & Neptune Rd	F	300.2	2407	0%	D	49.4	1718	0%
15: Revere St & Route 60	F	457.3	4201	8%	F	470.5	3997	8%
19: Route 16 (Revere Beach Pkwy) & Garfield Ave	F	104.7	5082	7%	E	61.4	4438	8%
32: Route 1A NB Off Ramp & Neptune Rd	D	43.4	1517	0%	C	32.7	813	0%
44: Winthrop Ave & Suffolk Downs (includes N. Shore Rd. in HCA Improvements)	C	27.0	3753	11%	C	31.7	2977	16%
64: Route 60 (Squire Road) & Charger St	D	47.3	4362	6%	D	45.8	4641	6%
67: Route 60 (Squire Road) & Sigourney Street	F	134.3	4261	6%	F	220.3	4598	6%
72: Revere St & N Shore Rd/Rt.1A	F	172.0	4431	1%	F	158.7	4113	1%
75: Wonderland MBTA Lot & N Shore Rd/Rt.1A	C	27.9	3431	1%	C	25.1	2727	1%
91: Route 60 (Bell Circle) & Rt 60/ American Legion Hwy	C	32.0	4264	8%	D	37.7	4399	8%
92: Rt 1A/VFW Pkwy & Route 60 (Bell Circle)	B	14.4	3150	0%	B	18.4	3538	0%
93: Rt 16 & Beach Street	F	146.0	5248	6%	F	82.4	5428	6%
94: Beach St & Route 60 (Bell Circle)	A	0.7	1964	1%	A	0.7	2460	1%
1: Suffolk Downs & Route 1A (signalized in BUILD)	B	19.0	6078	32%	-	0.0	0	-100%
2: Furlong St & Route 1A	E	5.3	5003	7%	D	3.5	4449	8%
20: Waldemar Avenue & Route 1A (Signalized in BUILD)	B	16.3	3304	-30%	-	0.0	0	-100%
78: Crescent Ave & Bennington Street	A	3.5	1494	0%	A	3.9	1686	0%
82: Curtis Street & Route 1A SB	E	65.5	3109	20%	D	20.5	3284	17%
84: Bremen St & Neptune Rd	A	3.6	784	0%	A	2.9	661	0%
87: Saratoga St & Neptune Rd	-	0.0	0	0%	-	0.0	0	0%
180: Route 16 (Revere Beach Pkwy) & Route 1 SB Off Ramp (new intersection)	-	0.0	0	0%	-	0.0	0	0%
181: Route 16 (Revere Beach Pkwy) & Route 1 NB On Ramp (new intersection)	-	0.0	0	0%	-	0.0	0	0%

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Caesars Resort at Suffolk Downs

2012 Existing

K Factor	10%	factors peak hour vehicle volumes to daily volumes
Peak hr delay to daily Factor (8hr/day)	33%	Factors peak hour delay to daily delay
Daily delay to annual Factor (6 days/wk, 52 wk/yr)	85%	factors peak daily delay to annual delay

Intersection	Average Peak Delay time (s)	Traffic Volume (adt)	Idle MOBILE6 VOC (g/hr)	VOC (lb/day)	VOC (tpy)	Idle MOBILE6 NOX (g/hr)	NOX (lb/day)	NOX (tpy)	Idle MOBILE6 CO2 (g/hr)	CO2 (lb/day)	CO2 (tpy)
3: Route 145 & Route 1A on-ramp	6.95	32420	5.530	0.25	0.04	3.398	0.16	0.024	1403.250	64.54	10.069
4: Route 145 & N Shore Rd (included in #44 in HCA Improvements)	37.00	32830	5.530	1.37	0.21	3.398	0.84	0.131	1403.250	347.95	54.281
5: Winthrop Avenue & State Road	27.75	18130	5.530	0.57	0.09	3.398	0.35	0.054	1403.250	144.11	22.482
6: Bennington Street & Saratoga Street	213.50	23110	5.530	5.57	0.87	3.398	3.42	0.534	1403.250	1413.34	220.481
7: Boardman Street & Route 1A Southbound (reconfigured intersection in BUILD)	62.15	42870	5.530	3.01	0.47	3.398	1.85	0.288	1403.250	763.21	119.060
8: Winthrop Avenue & Route 16	43.40	41080	5.530	2.01	0.31	3.398	1.24	0.193	1403.250	510.70	79.670
10: State Road & Ocean Avenue	10.60	22880	5.530	0.27	0.04	3.398	0.17	0.026	1403.250	69.47	10.838
12: Jughandle & Route 1A	12.65	38840	5.530	0.55	0.09	3.398	0.34	0.053	1403.250	140.74	21.955
13: Bennington Street & Neptune Rd	151.40	22840	5.530	3.90	0.61	3.398	2.40	0.374	1403.250	990.53	154.523
15: Revere St & Route 60	382.25	33800	5.530	14.58	2.28	3.398	8.96	1.398	1403.250	3700.94	577.347
19: Route 16 (Revere Beach Pkwy) & Garfield Ave	63.00	44920	5.530	3.19	0.50	3.398	1.96	0.306	1403.250	810.64	126.460
32: Route 1A NB Off Ramp & Neptune Rd	37.45	14330	5.530	0.61	0.09	3.398	0.37	0.058	1403.250	153.73	23.981
44: Winthrop Ave & Suffolk Downs (includes N. Shore Rd. in HCA Improvements)	20.55	31160	5.530	0.72	0.11	3.398	0.44	0.069	1403.250	183.42	28.614
64: Route 60 (Squire Road) & Charger St	31.15	38380	5.530	1.35	0.21	3.398	0.83	0.129	1403.250	342.46	53.424
67: Route 60 (Squire Road) & Sigourney Street	74.10	39260	5.530	3.28	0.51	3.398	2.02	0.315	1403.250	833.33	129.999
72: Revere St & N Shore Rd/Rt.1A	111.45	36910	5.530	4.64	0.72	3.398	2.85	0.445	1403.250	1178.34	183.822
75: Wonderland MBTA Lot & N Shore Rd/Rt.1A	24.75	28870	5.530	0.81	0.13	3.398	0.50	0.077	1403.250	204.68	31.930
91: Route 60 (Bell Circle) & Rt 60/ American Legion Hwy	25.25	35620	5.530	1.02	0.16	3.398	0.62	0.097	1403.250	257.63	40.191
92: Rt 1A/VFW Pkwy & Route 60 (Bell Circle)	14.15	30060	5.530	0.48	0.07	3.398	0.29	0.046	1403.250	121.84	19.007
93: Rt 16 & Beach Street	82.25	44380	5.530	4.12	0.64	3.398	2.53	0.395	1403.250	1045.61	163.116
94: Beach St & Route 60 (Bell Circle)	1.30	21150	5.530	0.03	0.00	3.398	0.02	0.003	1403.250	7.88	1.229
1: Suffolk Downs & Route 1A (signalized in BUILD)	94.20	40040	5.530	4.26	0.66	3.398	2.62	0.408	1403.250	1080.42	168.546
2: Furlong St & Route 1A	1.70	40920	5.530	0.08	0.01	3.398	0.05	0.008	1403.250	19.93	3.109
20: Waldemar Avenue & Route 1A (Signalized in BUILD)	0.55	40990	5.530	0.03	0.00	3.398	0.02	0.002	1403.250	6.46	1.007
78: Crescent Ave & Bennington Street	3.20	15740	5.530	0.06	0.01	3.398	0.03	0.005	1403.250	14.43	2.251
82: Curtis Street & Route 1A SB	14.60	24620	5.530	0.41	0.06	3.398	0.25	0.039	1403.250	102.96	16.063
84: Bremen St & Neptune Rd	3.05	7460	5.530	0.03	0.00	3.398	0.02	0.002	1403.250	6.52	1.017
87: Saratoga St & Neptune Rd	0.00	0	5.530	0.00	0.00	3.398	0.00	0.000	1403.250	0.00	0.000
180: Route 16 (Revere Beach Pkwy) & Route 1 SB Off Ramp (new intersection)	0.00	0	5.530	0.00	0.00	3.398	0.00	0.000	1403.250	0.00	0.000
181: Route 16 (Revere Beach Pkwy) & Route 1 NB On Ramp (new intersection)	0.00	0	5.530	0.00	0.00	3.398	0.00	0.000	1403.250	0.00	0.000
Totals hrs		4692.13		57.20	8.92		35.15	5.48		14515.82	2264.47

Caesars Resort at Suffolk Downs

2022 No-Build

K Factor	10%	factors peak hour vehicle volumes to daily volumes
Peak hr delay to daily Factor (8hr/day)	33%	Factors peak hour delay to daily delay
Daily delay to annual Factor (6 days/wk, 52 wk/yr)	85%	factors peak daily delay to annual delay

Intersection	Average Peak Delay time (s)	Traffic Volume (adt)	Idle MOBILE6 VOC (g/hr)	VOC (lb/day)	VOC (tpy)	Idle MOBILE6 NOX (g/hr)	NOX (lb/day)	NOX (tpy)	Idle MOBILE6 CO2 (g/hr)	CO2 (lb/day)	CO2 (tpy)
3: Route 145 & Route 1A on-ramp	8.40	35250	3.580	0.22	0.03	1.065	0.06	0.010	1423.400	86.04	13.422
4: Route 145 & N Shore Rd (included in #44 in HCA Improvements)	46.00	36130	3.580	1.21	0.19	1.065	0.36	0.056	1423.400	482.91	75.334
5: Winthrop Avenue & State Road	38.00	19820	3.580	0.55	0.09	1.065	0.16	0.026	1423.400	218.84	34.139
6: Bennington Street & Saratoga Street	422.25	24840	3.580	7.67	1.20	1.065	2.28	0.356	1423.400	3047.62	475.429
7: Boardman Street & Route 1A Southbound (reconfigured intersection in BUILD)	104.95	49990	3.580	3.83	0.60	1.065	1.14	0.178	1423.400	1524.42	237.810
8: Winthrop Avenue & Route 16	47.90	45000	3.580	1.58	0.25	1.065	0.47	0.073	1423.400	626.31	97.704
10: State Road & Ocean Avenue	12.20	26300	3.580	0.23	0.04	1.065	0.07	0.011	1423.400	93.23	14.544
12: Jughandle & Route 1A	25.55	44710	3.580	0.83	0.13	1.065	0.25	0.039	1423.400	331.92	51.780
13: Bennington Street & Neptune Rd	174.80	24070	3.580	3.07	0.48	1.065	0.91	0.143	1423.400	1222.52	190.714
15: Revere St & Route 60	470.05	39070	3.580	13.42	2.09	1.065	3.99	0.623	1423.400	5336.14	832.438
19: Route 16 (Revere Beach Pkwy) & Garfield Ave	73.35	47680	3.580	2.56	0.40	1.065	0.76	0.119	1423.400	1016.19	158.526
32: Route 1A NB Off Ramp & Neptune Rd	38.05	15170	3.580	0.42	0.07	1.065	0.13	0.020	1423.400	167.72	26.164
44: Winthrop Ave & Suffolk Downs (includes N. Shore Rd. in HCA Improvements)	21.45	33690	3.580	0.53	0.08	1.065	0.16	0.025	1423.400	209.98	32.756
64: Route 60 (Squire Road) & Charger St	46.25	43970	3.580	1.49	0.23	1.065	0.44	0.069	1423.400	590.89	92.179
67: Route 60 (Squire Road) & Sigourney Street	131.05	43540	3.580	4.17	0.65	1.065	1.24	0.194	1423.400	1657.93	258.636
72: Revere St & N Shore Rd/Rt.1A	161.05	43840	3.580	5.16	0.80	1.065	1.53	0.239	1423.400	2051.50	320.034
75: Wonderland MBTA Lot & N Shore Rd/Rt.1A	26.25	33830	3.580	0.65	0.10	1.065	0.19	0.030	1423.400	258.03	40.253
91: Route 60 (Bell Circle) & Rt 60/ American Legion Hwy	30.35	40900	3.580	0.91	0.14	1.065	0.27	0.042	1423.400	360.68	56.266
92: Rt 1A/VFW Pkwy & Route 60 (Bell Circle)	16.30	35320	3.580	0.42	0.07	1.065	0.13	0.020	1423.400	167.28	26.096
93: Rt 16 & Beach Street	99.95	51080	3.580	3.73	0.58	1.065	1.11	0.173	1423.400	1483.45	231.418
94: Beach St & Route 60 (Bell Circle)	0.70	24420	3.580	0.01	0.00	1.065	0.00	0.001	1423.400	4.97	0.775
1: Suffolk Downs & Route 1A (signalized in BUILD)	87.45	45970	3.580	2.94	0.46	1.065	0.87	0.136	1423.400	1168.08	182.221
2: Furlong St & Route 1A	2.85	46900	3.580	0.10	0.02	1.065	0.03	0.005	1423.400	38.84	6.059
20: Waldemar Avenue & Route 1A (Signalized in BUILD)	0.55	46970	3.580	0.02	0.00	1.065	0.01	0.001	1423.400	7.51	1.171
78: Crescent Ave & Bennington Street	3.70	16860	3.580	0.05	0.01	1.065	0.01	0.002	1423.400	18.13	2.828
82: Curtis Street & Route 1A SB	27.05	28040	3.580	0.55	0.09	1.065	0.16	0.026	1423.400	220.39	34.380
84: Bremen St & Neptune Rd	3.25	7840	3.580	0.02	0.00	1.065	0.01	0.001	1423.400	7.40	1.155
87: Saratoga St & Neptune Rd	0.00	0	3.580	0.00	0.00	1.065	0.00	0.000	1423.400	0.00	0.000
180: Route 16 (Revere Beach Pkwy) & Route 1 SB Off Ramp (new intersection)	0.00	0	3.580	0.00	0.00	1.065	0.00	0.000	1423.400	0.00	0.000
181: Route 16 (Revere Beach Pkwy) & Route 1 NB On Ramp (new intersection)	0.00	0	3.580	0.00	0.00	1.065	0.00	0.000	1423.400	0.00	0.000
Totals hrs		7137.783		56.34	8.79		16.76	2.61		22398.91	3494.23

Caesars Resort at Suffolk Downs
2022 Build

K Factor	10%	factors peak hour vehicle volumes to daily volumes
Peak hr delay to daily Factor (8hr/day)	33%	Factors peak hour delay to daily delay
Daily delay to annual Factor (6 days/wk, 52 wk/yr)	85%	factors peak daily delay to annual delay

Intersection	Average Peak Delay time (s)	Traffic Volume (adt)	Idle MOBILE6 VOC (g/hr)	VOC (lb/day)	VOC (tpy)	Idle MOBILE6 NOX (g/hr)	NOX (lb/day)	NOX (tpy)	Idle MOBILE6 CO2 (g/hr)	CO2 (lb/day)	CO2 (tpy)
3: Route 145 & Route 1A on-ramp	8.10	38460	3.580	0.23	0.04	1.065	0.07	0.011	1423.400	90.52	14.121
4: Route 145 & N Shore Rd (included in #44 in HCA Improvements)	44.35	39840	3.580	1.29	0.20	1.065	0.38	0.060	1423.400	513.40	80.090
5: Winthrop Avenue & State Road	38.50	19880	3.580	0.56	0.09	1.065	0.17	0.026	1423.400	222.39	34.693
6: Bennington Street & Saratoga Street	423.20	24950	3.580	7.72	1.20	1.065	2.30	0.358	1423.400	3068.00	478.609
7: Boardman Street & Route 1A Southbound (reconfigured intersection in BUILD)	56.10	34120	3.580	1.40	0.22	1.065	0.42	0.065	1423.400	556.18	86.763
8: Winthrop Avenue & Route 16	51.95	48210	3.580	1.83	0.29	1.065	0.54	0.085	1423.400	727.72	113.524
10: State Road & Ocean Avenue	12.25	26400	3.580	0.24	0.04	1.065	0.07	0.011	1423.400	93.97	14.659
12: Jughandle & Route 1A	8.65	47630	3.580	0.30	0.05	1.065	0.09	0.014	1423.400	119.71	18.675
13: Bennington Street & Neptune Rd	174.80	24070	3.580	3.07	0.48	1.065	0.91	0.143	1423.400	1222.52	190.714
15: Revere St & Route 60	463.90	42010	3.580	14.24	2.22	1.065	4.24	0.661	1423.400	5662.61	883.367
19: Route 16 (Revere Beach Pkwy) & Garfield Ave	83.05	50820	3.580	3.08	0.48	1.065	0.92	0.143	1423.400	1226.35	191.310
32: Route 1A NB Off Ramp & Neptune Rd	38.05	15170	3.580	0.42	0.07	1.065	0.13	0.020	1423.400	167.72	26.164
44: Winthrop Ave & Suffolk Downs (includes N. Shore Rd. in HCA Improvements)	29.35	37530	3.580	0.80	0.13	1.065	0.24	0.037	1423.400	320.06	49.929
64: Route 60 (Squire Road) & Charger St	46.55	46410	3.580	1.58	0.25	1.065	0.47	0.073	1423.400	627.73	97.925
67: Route 60 (Squire Road) & Sigourney Street	177.30	45980	3.580	5.96	0.93	1.065	1.77	0.276	1423.400	2368.74	369.523
72: Revere St & N Shore Rd/Rt.1A	165.35	44310	3.580	5.35	0.84	1.065	1.59	0.248	1423.400	2128.85	332.101
75: Wonderland MBTA Lot & N Shore Rd/Rt.1A	26.50	34310	3.580	0.66	0.10	1.065	0.20	0.031	1423.400	264.18	41.213
91: Route 60 (Bell Circle) & Rt 60/ American Legion Hwy	34.85	43990	3.580	1.12	0.17	1.065	0.33	0.052	1423.400	445.45	69.490
92: Rt 1A/VFW Pkwy & Route 60 (Bell Circle)	16.40	35380	3.580	0.42	0.07	1.065	0.13	0.020	1423.400	168.59	26.301
93: Rt 16 & Beach Street	114.20	54280	3.580	4.53	0.71	1.065	1.35	0.210	1423.400	1801.13	280.977
94: Beach St & Route 60 (Bell Circle)	0.70	24600	3.580	0.01	0.00	1.065	0.00	0.001	1423.400	5.00	0.781
1: Suffolk Downs & Route 1A (signalized in BUILD)	9.50	60780	3.580	0.42	0.07	1.065	0.13	0.020	1423.400	167.77	26.173
2: Furlong St & Route 1A	4.40	50030	3.580	0.16	0.03	1.065	0.05	0.007	1423.400	63.96	9.978
20: Waldemar Avenue & Route 1A (Signalized in BUILD)	8.15	33040	3.580	0.20	0.03	1.065	0.06	0.009	1423.400	78.24	12.206
78: Crescent Ave & Bennington Street	3.70	16860	3.580	0.05	0.01	1.065	0.01	0.002	1423.400	18.13	2.828
82: Curtis Street & Route 1A SB	43.00	32840	3.580	1.03	0.16	1.065	0.31	0.048	1423.400	410.31	64.008
84: Bremen St & Neptune Rd	3.25	7840	3.580	0.02	0.00	1.065	0.01	0.001	1423.400	7.40	1.155
87: Saratoga St & Neptune Rd	0.00	0	3.580	0.00	0.00	1.065	0.00	0.000	1423.400	0.00	0.000
180: Route 16 (Revere Beach Pkwy) & Route 1 SB Off Ramp (new intersection)	0.00	0	3.580	0.00	0.00	1.065	0.00	0.000	1423.400	0.00	0.000
181: Route 16 (Revere Beach Pkwy) & Route 1 NB On Ramp (new intersection)	0.00	0	3.580	0.00	0.00	1.065	0.00	0.000	1423.400	0.00	0.000
Totals hrs		7184.86		56.71	8.85		16.87	2.63		22546.64	3517.28

Caesars Resort at Suffolk Downs

Regional Mesoscale Emissions Analysis - Roadway Emissions
Link Data

Link Number	Roadway Segment	Link Distance (miles)	Estimated Average Speed (mph)
1	Rte 1A S of Curtis	0.50	50
2	Curtis St	0.07	30
3	McClellan Hwy Boardman to Curtis	0.72	40
4	Boardman W of McClellan	0.08	30
5	Lee Burbank Hwy Boardman to Waldemar	0.16	40
6	Waldemar Ave	0.29	35
7	Lee Burbank Hwy Waldemar to Tomasello	0.09	40
8	Tomasello Dr (South side)	0.46	35
9	Lee Burbank Hwy Tomasello to Jughandle	0.08	40
10	Jughandle	0.08	20
11	Service Station	0.05	20
12	Lee Burbank Hwy Jughandle to Furlong	0.50	40
13	Furlong Dr	0.45	30
14	Lee Burbank Hwy to Bell Circle	0.54	40
15	Lee Burbank Hwy U-Turn at Rte 145	0.07	25
16	Winthrop Ave W of 1A to Rte 16	0.11	35
17	Winthrop Ave Ramp to 1A S	0.12	30
18	1A N Ramp to Winthrop Ave	0.12	30
19	Winthrop Ave under 1A	0.05	35
20	Winthrop Ave 1A to N. Shore Rd.	0.31	35
21	North Shore Rd	0.18	35
22	Winthrop Ave N Shore Rd to Tomasello	0.05	35
23	Tomasello Dr (North side)	0.52	30
24	Winthrop Ave Tomasello to Bennington	0.32	35
25	Winthrop Ave E of Bennington	0.17	30
26	State Rd N of Winthrop	0.13	35
27	Bennington Winthrop to Crescent	0.05	35
28	Crescent Ave	0.20	30
29	Bennington Crescent to Saratoga	1.10	40
30	Saratoga E of Bennington	0.22	35
31	Bennington S of Saratoga	0.50	35
32	Boardman McClellan to Bennington	0.47	30
33			
34	Rte 60 W of Copeland Circle	0.50	35
35	Rte 1 Ramps S of Copeland Circle	0.18	35
36	Rte 1 Ramps N of Copeland Circle	0.14	35
37	Copeland Circle N	0.11	35
38	Copeland Circle W	0.07	35
39	Copeland Circle S	0.10	35
40	Copeland Circle E	0.09	35
41	Rte 60 Copeland Circle to Sigourney	0.16	35
42	Sigourney S of Rte 60	0.16	30
43	Sigourney N of Rte 60	0.10	30
44	Rte 60 Sigourney to Charger	0.17	35
45	Charger N of Rte 60	0.15	30
46	Charger S of Rte 60	0.13	30
47	Rte 60 Charger to Brown Circle	0.40	35
48	Brown Circle N	0.02	35
49	Brown Circle S	0.02	35
50	Brown Circle E	0.02	35
51	Brown Circle W	0.02	35
52	Rte 107 N of Brown Circle	0.50	45
53	Rte 107 S of Brown Circle (Broadway)	0.50	35
54	Rte 60 Brown Circle to Revere Street	0.37	40
55	Revere St W of Rte 60	0.10	35
56	Revere St E of Rte 60 to Rte 1A	0.70	35
57	Bell Circle to Revere St	0.50	40
58	Bell Circle roundabout pass thru	0.07	40
59	Bell Circle Rte 60 to Beach St W	0.04	35
60	Bell Circle Beach St W to 1A S	0.04	35
61	Bell Circle 1A	0.06	35
62	Bell Circle 1A to Everett St	0.02	35
63	Bell Circle Everett to Rte 60	0.02	35
64	Beach St W	0.10	30
65	Everett St	0.10	30
66	Rte 1A Bell Circle to Butler Circle	0.45	35
67	N. Shore Rd. S of Butler Circle	0.25	35
68	Butler Circle N	0.04	35
69	Butler Circle W	0.04	35
70	Butler Circle S	0.04	35
71	Wonderland Lot	0.10	30
72	Bus Lane	0.02	30
73	Rte 1A N of Butler Circle to Wonderland MBTA	0.07	30
74	Rte 1A Wonderland MBTA to Revere St	0.36	35
75	Revere St E of Rte 1A	0.16	30
76	1A/N. Shore Rd N of Revere St.	0.50	45
77	Revere Beach Blvd N of Eliot Circle	0.50	30
78	Winthrop Pkwy S of Eliot Circle	0.50	30
79	State Rd Ocean Ave to Eliot Circle	0.04	30
80	Ocean Ave N of State Rd	0.18	30
81	Garfield Ave	0.20	30
82	Webster Ave	0.20	30
83	Rte 16 W of Garfield	0.50	45
84	Rte 16 Rte 1 S Ramp to Garfield/Webster	0.16	25
85	Rte 16 W to Rte 1 S OnRamp	0.19	35
86	Rte 1 S to Rte 16 W Offramp	0.22	35
87	Rte 1 N to Rte 16 E Offramp	0.28	35
88	Rte 16 E to Rte 1 N Onramp	0.24	35

Caesars Resort at Suffolk Downs

Regional Mesoscale Emissions Analysis - Roadway Emissions
Link Data

Link Number	Roadway Segment	Link Distance (miles)	Estimated Average Speed (mph)
89	Rte 16 W of Rte 1 Ramp to Ramp	0.09	45
90	Rte 16 E of Rte 1 Ramp to Ramp	0.13	45
91	Rte 16 Rte 1 to Winthrop Ave	1.01	45
92	Rte 16 Winthrop to Bell Circle	0.30	45
93	Harris St	0.16	30
94	Winthrop Ave W of Rte 16	0.15	30
95			
96	Neptune Rd N of Saratoga	0.02	30
97	Saratoga St E of Neptune	0.07	30
98	Saratoga St W of Neptune	0.06	30
99	Neptune Rd Saratoga to Bremen	0.03	30
100	Bremen St N of Neptune	0.05	30
101	Bremen St S of Neptune	0.03	30
102	Neptune Rd Bremen to Bennington	0.02	30
103	Bennington St W of Neptune Rd	0.06	30
104	Bennington E of Neptune Rd	0.08	35
105	Ramp to 1A SB	0.09	30
106	Ramp from 1A NB	0.08	30
107	1A Turnaround	0.03	20
108	Vienna St	0.07	30
109	Neptune Rd Bennington to Vienna	0.04	30
110	Neptune Rd E of Vienna	0.04	30
111			
112	New off ramp from Rte 1 SB to Rte 16 EB	0.02	30
113	New on ramp from Rte 16 WB to Rte 1 NB	0.03	30

Caesars Resort at Suffolk Downs

Regional Mesoscale Emissions Analysis - Roadway Emissions
Link Data

Link Number	Roadway Segment	Link Distance (miles)	Estimated Average Speed (mph)	Friday PM Peak Hour Volume		
				2012 Existing	2022 No-Build	2022 Build
1	Rte 1A S of Curtis	0.50	50	2,113	2,465	2,973
2	Curtis St	0.07	30	539	567	567
3	McClellan Hwy Boardman to Curtis	0.72	40	3,882	4,512	5,679
4	Boardman W of McClellan	0.08	30	151	160	160
5	Lee Burbank Hwy Boardman to Waldemar	0.16	40	3,950	4,540	5,717
6	Waldemar Ave	0.29	35	268	282	282
7	Lee Burbank Hwy Waldemar to Tomasello	0.09	40	3,980	4,571	5,745
8	Tomasello Dr (South side)	0.46	35	251	264	1,730
9	Lee Burbank Hwy Tomasello to Jughandle	0.08	40	3,777	4,359	4,664
10	Jughandle	0.08	20	115	121	121
11	Service Station	0.05	20	7	7	7
12	Lee Burbank Hwy Jughandle to Furlong	0.50	40	3,984	4,577	4,881
13	Furlong Dr	0.45	30	208	219	234
14	Lee Burbank Hwy to Bell Circle	0.54	40	3,992	4,585	4,891
15	Lee Burbank Hwy U-Turn at Rte 145	0.07	25	212	223	223
16	Winthrop Ave W of 1A to Rte 16	0.11	35	2,976	3,206	3,527
17	Winthrop Ave Ramp to 1A S	0.12	30	684	774	774
18	1A N Ramp to Winthrop Ave	0.12	30	535	635	635
19	Winthrop Ave under 1A	0.05	35	3,035	3,233	3,546
20	Winthrop Ave 1A to N. Shore Rd.	0.31	35	3,253	3,528	3,841
21	North Shore Rd	0.18	35	1,109	1,235	1,285
22	Winthrop Ave N Shore Rd to Tomasello	0.05	35	2,556	2,780	3,150
23	Tomasello Dr (North side)	0.52	30	1,046	1,100	1,484
24	Winthrop Ave Tomasello to Bennington	0.32	35	1,651	1,774	1,785
25	Winthrop Ave E of Bennington	0.17	30	399	437	439
26	State Rd N of Winthrop	0.13	35	864	985	989
27	Bennington Winthrop to Crescent	0.05	35	1,302	1,427	1,427
28	Crescent Ave	0.20	30	216	234	234
29	Bennington Crescent to Saratoga	1.10	40	1,168	1,273	1,273
30	Saratoga E of Bennington	0.22	35	1,521	1,621	1,632
31	Bennington S of Saratoga	0.50	35	1,418	1,485	1,485
32	Boardman McClellan to Bennington	0.47	30	790	920	931
33						
34	Rte 60 W of Copeland Circle	0.50	35	1,822	1,969	1,969
35	Rte 1 Ramps S of Copeland Circle	0.18	35	709	765	765
36	Rte 1 Ramps N of Copeland Circle	0.14	35	2,098	2,319	2,562
37	Copeland Circle N	0.11	35	1,226	1,325	1,325
38	Copeland Circle W	0.07	35	1,086	1,204	1,331
39	Copeland Circle S	0.10	35	1,636	1,800	1,927
40	Copeland Circle E	0.09	35	346	364	364
41	Rte 60 Copeland Circle to Sigourney	0.16	35	3,799	4,179	4,423
42	Sigourney S of Rte 60	0.16	30	160	168	168
43	Sigourney N of Rte 60	0.10	30	759	886	886
44	Rte 60 Sigourney to Charger	0.17	35	3,064	3,399	3,642
45	Charger N of Rte 60	0.15	30	740	998	998
46	Charger S of Rte 60	0.13	30	151	159	159
47	Rte 60 Charger to Brown Circle	0.40	35	3,007	3,499	3,743
48	Brown Circle N	0.02	35	1,563	1,834	1,951
49	Brown Circle S	0.02	35	1,922	2,155	2,305
50	Brown Circle E	0.02	35	995	1,101	1,101
51	Brown Circle W	0.02	35	869	943	966
52	Rte 107 N of Brown Circle	0.50	45	2,125	2,281	2,324
53	Rte 107 S of Brown Circle (Broadway)	0.50	35	1,091	1,238	1,238
54	Rte 60 Brown Circle to Revere Street	0.37	40	3,152	3,597	3,883
55	Revere St W of Rte 60	0.10	35	627	728	769
56	Revere St E of Rte 60 to Rte 1A	0.70	35	737	896	896
57	Bell Circle to Revere St	0.50	40	2,351	2,667	2,962
58	Bell Circle roundabout pass thru	0.07	40	1,768	1,993	2,226
59	Bell Circle Rte 60 to Beach St W	0.04	35	1,309	1,575	1,581
60	Bell Circle Beach St W to 1A S	0.04	35	1,259	1,537	1,540
61	Bell Circle 1A	0.06	35	1,769	1,948	1,953
62	Bell Circle 1A to Everett St	0.02	35	1,358	1,633	1,638
63	Bell Circle Everett to Rte 60	0.02	35	1,339	1,626	1,631
64	Beach St W	0.10	30	682	816	829
65	Everett St	0.10	30	217	228	228
66	Rte 1A Bell Circle to Butler Circle	0.45	35	1,971	2,508	2,508
67	N. Shore Rd. S of Butler Circle	0.25	35	724	823	870
68	Butler Circle N	0.04	35	35	28	28
69	Butler Circle W	0.04	35	300	290	316
70	Butler Circle S	0.04	35	1,022	1,269	1,269
71	Wonderland Lot	0.10	30	2	15	15
72	Bus Lane	0.02	30	19	20	20
73	Rte 1A N of Butler Circle to Wonderland MBTA	0.07	30	2,544	2,932	2,981
74	Rte 1A Wonderland MBTA to Revere St	0.36	35	2,940	3,350	3,397
75	Revere St E of Rte 1A	0.16	30	473	895	895
76	1A/N. Shore Rd N of Revere St.	0.50	45	2,952	3,242	3,289
77	Revere Beach Blvd N of Eliot Circle	0.50	30	941	991	991
78	Winthrop Pkwy S of Eliot Circle	0.50	30	1,166	1,275	1,280
79	State Rd Ocean Ave to Eliot Circle	0.04	30	1,671	1,808	1,813
80	Ocean Ave N of State Rd	0.18	30	1,267	1,235	1,240
81	Garfield Ave	0.20	30	774	813	813
82	Webster Ave	0.20	30	1,159	1,218	1,225
83	Rte 16 W of Garfield	0.50	45	3,369	3,584	3,810
84	Rte 16 Rte 1 S Ramp to Garfield/Webster	0.16	25	3,704	3,944	4,340
85	Rte 16 W to Rte 1 S OnRamp	0.19	35	158	171	171
86	Rte 1 S to Rte 16 W Offramp	0.22	35	508	537	579
87	Rte 1 N to Rte 16 E Offramp	0.28	35	1,017	1,087	1,087
88	Rte 16 E to Rte 1 N Onramp	0.24	35	508	534	573

Caesars Resort at Suffolk Downs

Regional Mesoscale Emissions Analysis - Roadway Emissions
Link Data

Link Number	Roadway Segment	Link Distance (miles)	Estimated Average Speed (mph)	Friday PM Peak Hour Volume		
				2012 Existing	2022 No-Build	2022 Build
89	Rte 16 W of Rte 1 Ramp to Ramp	0.09	45	2,970	3,169	3,524
90	Rte 16 E of Rte 1 Ramp to Ramp	0.13	45	2,620	2,805	3,121
91	Rte 16 Rte 1 to Winthrop Ave	1.01	45	3,096	3,359	3,675
92	Rte 16 Winthrop to Bell Circle	0.30	45	1,167	1,329	1,329
93	Harris St	0.16	30	241	271	146
94	Winthrop Ave W of Rte 16	0.15	30	636	715	720
95						
96	Neptune Rd N of Saratoga	0.02	30	1,094	1,172	1,172
97	Saratoga St E of Neptune	0.07	30	782	822	827
98	Saratoga St W of Neptune	0.06	30	268	282	287
99	Neptune Rd Saratoga to Bremen	0.03	30	621	653	653
100	Bremen St N of Neptune	0.05	30	130	136	136
101	Bremen St S of Neptune	0.03	30	137	144	144
102	Neptune Rd Bremen to Bennington	0.02	30	606	636	636
103	Bennington St W of Neptune Rd	0.06	30	1,419	1,500	1,500
104	Bennington E of Neptune Rd	0.08	35	1,362	1,438	1,438
105	Ramp to 1A SB	0.09	30	628	660	660
106	Ramp from 1A NB	0.08	30	957	1,016	1,016
107	1A Turnaround	0.03	20	57	59	59
108	Vienna St	0.07	30	724	771	771
109	Neptune Rd Bennington to Vienna	0.04	30	695	731	731
110	Neptune Rd E of Vienna	0.04	30	546	574	574
111						
112	New off ramp from Rte 1 SB to Rte 16 EB	0.02	30	0	0	0
113	New on ramp from Rte 16 WB to Rte 1 NB	0.03	30	0	0	0

Caesars Resort at Suffolk Downs

Regional Mesoscale Emissions Analysis - Roadway Emissions
Link Data

Link Number	Roadway Segment	Link Distance (miles)	Estimated Average Speed (mph)	Saturday Afternoon Peak Hour Volume		
				2012 Existing	2022 No-Build	2022 Build
1	Rte 1A S of Curtis	0.50	50	2,346	2,681	3,161
2	Curtis St	0.07	30	347	364	364
3	McClellan Hwy Boardman to Curtis	0.72	40	4,054	4,666	5,523
4	Boardman W of McClellan	0.08	30	123	132	132
5	Lee Burbank Hwy Boardman to Waldemar	0.16	40	3,506	4,044	5,238
6	Waldemar Ave	0.29	35	230	242	242
7	Lee Burbank Hwy Waldemar to Tomasello	0.09	40	3,499	4,036	5,226
8	Tomasello Dr (South side)	0.46	35	287	302	1,796
9	Lee Burbank Hwy Tomasello to Jughandle	0.08	40	3,347	3,877	4,197
10	Jughandle	0.08	20	65	68	68
11	Service Station	0.05	20	10	10	10
12	Lee Burbank Hwy Jughandle to Furlong	0.50	40	3,452	3,987	4,306
13	Furlong Dr	0.45	30	265	278	295
14	Lee Burbank Hwy to Bell Circle	0.54	40	3,441	3,975	4,295
15	Lee Burbank Hwy U-Turn at Rte 145	0.07	25	122	128	128
16	Winthrop Ave W of 1A to Rte 16	0.11	35	2,153	2,323	2,648
17	Winthrop Ave Ramp to 1A S	0.12	30	392	463	463
18	1A N Ramp to Winthrop Ave	0.12	30	306	371	371
19	Winthrop Ave under 1A	0.05	35	2,253	2,395	2,709
20	Winthrop Ave 1A to N. Shore Rd.	0.31	35	2,147	2,324	2,637
21	North Shore Rd	0.18	35	689	769	825
22	Winthrop Ave N Shore Rd to Tomasello	0.05	35	1,878	2,035	2,416
23	Tomasello Dr (North side)	0.52	30	1,155	1,214	1,615
24	Winthrop Ave Tomasello to Bennington	0.32	35	1,345	1,440	1,456
25	Winthrop Ave E of Bennington	0.17	30	397	433	435
26	State Rd N of Winthrop	0.13	35	537	612	617
27	Bennington Winthrop to Crescent	0.05	35	1,114	1,202	1,202
28	Crescent Ave	0.20	30	225	244	244
29	Bennington Crescent to Saratoga	1.10	40	1,233	1,202	1,202
30	Saratoga E of Bennington	0.22	35	1,501	873	886
31	Bennington S of Saratoga	0.50	35	1,106	1,595	1,595
32	Boardman McClellan to Bennington	0.47	30	785	1,158	1,171
33						
34	Rte 60 W of Copeland Circle	0.50	35	1,854	2,001	2,001
35	Rte 1 Ramps S of Copeland Circle	0.18	35	822	878	878
36	Rte 1 Ramps N of Copeland Circle	0.14	35	2,500	2,738	2,982
37	Copeland Circle N	0.11	35	1,008	1,092	1,092
38	Copeland Circle W	0.07	35	918	1,022	1,156
39	Copeland Circle S	0.10	35	1,515	1,670	1,804
40	Copeland Circle E	0.09	35	286	300	300
41	Rte 60 Copeland Circle to Sigourney	0.16	35	4,032	4,416	4,656
42	Sigourney S of Rte 60	0.16	30	180	190	190
43	Sigourney N of Rte 60	0.10	30	871	1,021	1,021
44	Rte 60 Sigourney to Charger	0.17	35	3,328	3,668	3,912
45	Charger N of Rte 60	0.15	30	814	1,071	1,071
46	Charger S of Rte 60	0.13	30	127	134	136
47	Rte 60 Charger to Brown Circle	0.40	35	3,145	3,640	3,884
48	Brown Circle N	0.02	35	1,337	1,580	1,689
49	Brown Circle S	0.02	35	1,600	1,825	1,987
50	Brown Circle E	0.02	35	932	1,032	1,032
51	Brown Circle W	0.02	35	782	855	884
52	Rte 107 N of Brown Circle	0.50	45	2,049	2,197	2,246
53	Rte 107 S of Brown Circle (Broadway)	0.50	35	1,030	1,177	1,177
54	Rte 60 Brown Circle to Revere Street	0.37	40	3,002	3,424	3,716
55	Revere St W of Rte 60	0.10	35	580	711	721
56	Revere St E of Rte 60 to Rte 1A	0.70	35	770	910	910
57	Bell Circle to Revere St	0.50	40	1,999	2,674	2,976
58	Bell Circle roundabout pass thru	0.07	40	1,491	1,691	1,993
59	Bell Circle Rte 60 to Beach St W	0.04	35	1,704	1,961	1,967
60	Bell Circle Beach St W to 1A S	0.04	35	1,700	1,974	1,986
61	Bell Circle 1A	0.06	35	1,883	2,181	2,188
62	Bell Circle 1A to Everett St	0.02	35	1,558	1,812	1,819
63	Bell Circle Everett to Rte 60	0.02	35	1,568	1,837	1,844
64	Beach St W	0.10	30	826	968	986
65	Everett St	0.10	30	196	206	206
66	Rte 1A Bell Circle to Butler Circle	0.45	35	2,028	2,488	2,488
67	N. Shore Rd. S of Butler Circle	0.25	35	497	612	665
68	Butler Circle N	0.04	35	38	40	40
69	Butler Circle W	0.04	35	214	225	256
70	Butler Circle S	0.04	35	906	1,100	1,100
71	Wonderland Lot	0.10	30	16	17	17
72	Bus Lane	0.02	30	17	18	18
73	Rte 1A N of Butler Circle to Wonderland MBTA	0.07	30	2,179	2,589	2,621
74	Rte 1A Wonderland MBTA to Revere St	0.36	35	2,318	2,736	2,789
75	Revere St E of Rte 1A	0.16	30	670	995	995
76	1A/N. Shore Rd N of Revere St.	0.50	45	2,738	3,005	3,058
77	Revere Beach Blvd N of Eliot Circle	0.50	30	567	599	599
78	Winthrop Pkwy S of Eliot Circle	0.50	30	1,040	1,153	1,159
79	State Rd Ocean Ave to Eliot Circle	0.04	30	1,159	1,281	1,288
80	Ocean Ave N of State Rd	0.18	30	697	897	904
81	Garfield Ave	0.20	30	686	722	722
82	Webster Ave	0.20	30	985	1,037	1,048
83	Rte 16 W of Garfield	0.50	45	2,813	2,989	3,214
84	Rte 16 Rte 1 S Ramp to Garfield/Webster	0.16	25	3,311	3,520	3,918
85	Rte 16 W to Rte 1 S OnRamp	0.19	35	142	154	154
86	Rte 1 S to Rte 16 W Offramp	0.22	35	882	929	973
87	Rte 1 N to Rte 16 E Offramp	0.28	35	478	514	514
88	Rte 16 E to Rte 1 N Onramp	0.24	35	597	627	664

Caesars Resort at Suffolk Downs

Regional Mesoscale Emissions Analysis - Roadway Emissions
Link Data

Link Number	Roadway Segment	Link Distance (miles)	Estimated Average Speed (mph)	Saturday Afternoon Peak Hour Volume		
				2012 Existing	2022 No-Build	2022 Build
89	Rte 16 W of Rte 1 Ramp to Ramp	0.09	45	2,726	2,903	3,256
90	Rte 16 E of Rte 1 Ramp to Ramp	0.13	45	2,271	2,430	2,746
91	Rte 16 Rte 1 to Winthrop Ave	1.01	45	2,642	2,867	3,183
92	Rte 16 Winthrop to Bell Circle	0.30	45	1,102	1,233	1,233
93	Harris St	0.16	30	169	196	196
94	Winthrop Ave W of Rte 16	0.15	30	471	501	508
95						
96	Neptune Rd N of Saratoga	0.02	30	898	944	944
97	Saratoga St E of Neptune	0.07	30	636	668	674
98	Saratoga St W of Neptune	0.06	30	196	205	211
99	Neptune Rd Saratoga to Bremen	0.03	30	508	533	533
100	Bremen St N of Neptune	0.05	30	134	142	158
101	Bremen St S of Neptune	0.03	30	107	113	113
102	Neptune Rd Bremen to Bennington	0.02	30	509	535	535
103	Bennington St W of Neptune Rd	0.06	30	934	991	991
104	Bennington E of Neptune Rd	0.08	35	978	1,036	1,036
105	Ramp to 1A SB	0.09	30	513	538	538
106	Ramp from 1A NB	0.08	30	520	539	539
107	1A Turnaround	0.03	20	51	53	53
108	Vienna St	0.07	30	346	366	366
109	Neptune Rd Bennington to Vienna	0.04	30	425	446	446
110	Neptune Rd E of Vienna	0.04	30	314	328	328
111						
112	New off ramp from Rte 1 SB to Rte 16 EB	0.02	30	0	0	0
113	New on ramp from Rte 16 WB to Rte 1 NB	0.03	30	0	0	0

Caesars Resort at Suffolk Downs

Regional Mesoscale Emissions Analysis - Roadway Emissions
Link Data

Link Number	Roadway Segment	Link Distance (miles)	Estimated Average Speed (mph)	K-factor	Average Daily Traffic (ADT) Volumes		
					2012 Existing	2022 No-Build	2022 Build
1	Rte 1A S of Curtis	0.50	50	10.0%	23,460	26,810	31,610
2	Curtis St	0.07	30	10.0%	5,390	5,670	5,670
3	McClellan Hwy Boardman to Curtis	0.72	40	10.0%	40,540	46,660	56,790
4	Boardman W of McClellan	0.08	30	10.0%	1,510	1,600	1,600
5	Lee Burbank Hwy Boardman to Waldemar	0.16	40	10.0%	39,500	45,400	57,170
6	Waldemar Ave	0.29	35	10.0%	2,680	2,820	2,820
7	Lee Burbank Hwy Waldemar to Tomasello	0.09	40	10.0%	39,800	45,710	57,450
8	Tomasello Dr (South side)	0.46	35	10.0%	2,870	3,020	17,960
9	Lee Burbank Hwy Tomasello to Jughandle	0.08	40	10.0%	37,770	43,590	46,640
10	Jughandle	0.08	20	10.0%	1,150	1,210	1,210
11	Service Station	0.05	20	10.0%	100	100	100
12	Lee Burbank Hwy Jughandle to Furlong	0.50	40	10.0%	39,840	45,770	48,810
13	Furlong Dr	0.45	30	10.0%	2,650	2,780	2,950
14	Lee Burbank Hwy to Bell Circle	0.54	40	10.0%	39,920	45,850	48,910
15	Lee Burbank Hwy U-Turn at Rte 145	0.07	25	10.0%	2,120	2,230	2,230
16	Winthrop Ave W of 1A to Rte 16	0.11	35	10.0%	29,760	32,060	35,270
17	Winthrop Ave Ramp to 1A S	0.12	30	10.0%	6,840	7,740	7,740
18	1A N Ramp to Winthrop Ave	0.12	30	10.0%	5,350	6,350	6,350
19	Winthrop Ave under 1A	0.05	35	10.0%	30,350	32,330	35,460
20	Winthrop Ave 1A to N. Shore Rd.	0.31	35	10.0%	32,530	35,280	38,410
21	North Shore Rd	0.18	35	10.0%	11,090	12,350	12,850
22	Winthrop Ave N Shore Rd to Tomasello	0.05	35	10.0%	25,560	27,800	31,500
23	Tomasello Dr (North side)	0.52	30	10.0%	11,550	12,140	16,150
24	Winthrop Ave Tomasello to Bennington	0.32	35	10.0%	16,510	17,740	17,850
25	Winthrop Ave E of Bennington	0.17	30	10.0%	3,990	4,370	4,390
26	State Rd N of Winthrop	0.13	35	10.0%	8,640	9,850	9,890
27	Bennington Winthrop to Crescent	0.05	35	10.0%	13,020	14,270	14,270
28	Crescent Ave	0.20	30	10.0%	2,250	2,440	2,440
29	Bennington Crescent to Saratoga	1.10	40	10.0%	12,330	12,730	12,730
30	Saratoga E of Bennington	0.22	35	10.0%	15,210	16,210	16,320
31	Bennington S of Saratoga	0.50	35	10.0%	14,180	15,950	15,950
32	Boardman McClellan to Bennington	0.47	30	10.0%	7,900	11,580	11,710
33				10.0%	0	0	0
34	Rte 60 W of Copeland Circle	0.50	35	10.0%	18,540	20,010	20,010
35	Rte 1 Ramps S of Copeland Circle	0.18	35	10.0%	8,220	8,780	8,780
36	Rte 1 Ramps N of Copeland Circle	0.14	35	10.0%	25,000	27,380	29,820
37	Copeland Circle N	0.11	35	10.0%	12,260	13,250	13,250
38	Copeland Circle W	0.07	35	10.0%	10,860	12,040	13,310
39	Copeland Circle S	0.10	35	10.0%	16,360	18,000	19,270
40	Copeland Circle E	0.09	35	10.0%	3,460	3,640	3,640
41	Rte 60 Copeland Circle to Sigourney	0.16	35	10.0%	40,320	44,160	46,560
42	Sigourney S of Rte 60	0.16	30	10.0%	1,800	1,900	1,900
43	Sigourney N of Rte 60	0.10	30	10.0%	8,710	10,210	10,210
44	Rte 60 Sigourney to Charger	0.17	35	10.0%	33,280	36,680	39,120
45	Charger N of Rte 60	0.15	30	10.0%	8,140	10,710	10,710
46	Charger S of Rte 60	0.13	30	10.0%	1,510	1,590	1,590
47	Rte 60 Charger to Brown Circle	0.40	35	10.0%	31,450	36,400	38,840
48	Brown Circle N	0.02	35	10.0%	15,630	18,340	19,510
49	Brown Circle S	0.02	35	10.0%	19,220	21,550	23,050
50	Brown Circle E	0.02	35	10.0%	9,950	11,010	11,010
51	Brown Circle W	0.02	35	10.0%	8,690	9,430	9,660
52	Rte 107 N of Brown Circle	0.50	45	10.0%	21,250	22,810	23,240
53	Rte 107 S of Brown Circle (Broadway)	0.50	35	10.0%	10,910	12,380	12,380
54	Rte 60 Brown Circle to Revere Street	0.37	40	10.0%	31,520	35,970	38,830
55	Revere St W of Rte 60	0.10	35	10.0%	6,270	7,280	7,690
56	Revere St E of Rte 60 to Rte 1A	0.70	35	10.0%	7,700	9,100	9,100
57	Bell Circle to Revere St	0.50	40	10.0%	23,510	26,740	29,760
58	Bell Circle roundabout pass thru	0.07	40	10.0%	17,680	19,930	22,260
59	Bell Circle Rte 60 to Beach St W	0.04	35	10.0%	17,040	19,610	19,670
60	Bell Circle Beach St W to 1A S	0.04	35	10.0%	17,000	19,740	19,860
61	Bell Circle 1A	0.06	35	10.0%	18,830	21,810	21,880
62	Bell Circle 1A to Everett St	0.02	35	10.0%	15,580	18,120	18,190
63	Bell Circle Everett to Rte 60	0.02	35	10.0%	15,680	18,370	18,440
64	Beach St W	0.10	30	10.0%	8,260	9,680	9,860
65	Everett St	0.10	30	10.0%	2,170	2,280	2,280
66	Rte 1A Bell Circle to Butler Circle	0.45	35	10.0%	20,280	25,080	25,080
67	N. Shore Rd. S of Butler Circle	0.25	35	10.0%	7,240	8,230	8,700
68	Butler Circle N	0.04	35	10.0%	380	400	400
69	Butler Circle W	0.04	35	10.0%	3,000	2,900	3,160
70	Butler Circle S	0.04	35	10.0%	10,220	12,690	12,690
71	Wonderland Lot	0.10	30	10.0%	160	170	170
72	Bus Lane	0.02	30	10.0%	190	200	200
73	Rte 1A N of Butler Circle to Wonderland MBTA	0.07	30	10.0%	25,440	29,320	29,810
74	Rte 1A Wonderland MBTA to Revere St	0.36	35	10.0%	29,400	33,500	33,970
75	Revere St E of Rte 1A	0.16	30	10.0%	6,700	9,950	9,950
76	1A/N. Shore Rd N of Revere St.	0.50	45	10.0%	29,520	32,420	32,890
77	Revere Beach Blvd N of Eliot Circle	0.50	30	10.0%	9,410	9,910	9,910
78	Winthrop Pkwy S of Eliot Circle	0.50	30	10.0%	11,660	12,750	12,800
79	State Rd Ocean Ave to Eliot Circle	0.04	30	10.0%	16,710	18,080	18,130
80	Ocean Ave N of State Rd	0.18	30	10.0%	12,670	12,350	12,400
81	Garfield Ave	0.20	30	10.0%	7,740	8,130	8,130
82	Webster Ave	0.20	30	10.0%	11,590	12,180	12,250
83	Rte 16 W of Garfield	0.50	45	10.0%	33,690	35,840	38,100
84	Rte 16 Rte 1 S Ramp to Garfield/Webster	0.16	25	10.0%	37,040	39,440	43,400
85	Rte 16 W to Rte 1 S OnRamp	0.19	35	10.0%	1,580	1,710	1,710
86	Rte 1 S to Rte 16 W Offramp	0.22	35	10.0%	8,820	9,290	9,730
87	Rte 1 N to Rte 16 E Offramp	0.28	35	10.0%	10,170	10,870	10,870
88	Rte 16 E to Rte 1 N Onramp	0.24	35	10.0%	5,970	6,270	6,640

Caesars Resort at Suffolk Downs

Regional Mesoscale Emissions Analysis - Roadway Emissions
Link Data

Link Number	Roadway Segment	Link Distance (miles)	Estimated Average Speed (mph)	K-factor	Average Daily Traffic (ADT) Volumes		
					2012 Existing	2022 No-Build	2022 Build
89	Rte 16 W of Rte 1 Ramp to Ramp	0.09	45	10.0%	29,700	31,690	35,240
90	Rte 16 E of Rte 1 Ramp to Ramp	0.13	45	10.0%	26,200	28,050	31,210
91	Rte 16 Rte 1 to Winthrop Ave	1.01	45	10.0%	30,960	33,590	36,750
92	Rte 16 Winthrop to Bell Circle	0.30	45	10.0%	11,670	13,290	13,290
93	Harris St	0.16	30	10.0%	2,410	2,710	1,960
94	Winthrop Ave W of Rte 16	0.15	30	10.0%	6,360	7,150	7,200
95				10.0%			
96	Neptune Rd N of Saratoga	0.02	30	10.0%	10,940	11,720	11,720
97	Saratoga St E of Neptune	0.07	30	10.0%	7,820	8,220	8,270
98	Saratoga St W of Neptune	0.06	30	10.0%	2,680	2,820	2,870
99	Neptune Rd Saratoga to Bremen	0.03	30	10.0%	6,210	6,530	6,530
100	Bremen St N of Neptune	0.05	30	10.0%	1,340	1,420	1,580
101	Bremen St S of Neptune	0.03	30	10.0%	1,370	1,440	1,440
102	Neptune Rd Bremen to Bennington	0.02	30	10.0%	6,060	6,360	6,360
103	Bennington St W of Neptune Rd	0.06	30	10.0%	14,190	15,000	15,000
104	Bennington E of Neptune Rd	0.08	35	10.0%	13,620	14,380	14,380
105	Ramp to 1A SB	0.09	30	10.0%	6,280	6,600	6,600
106	Ramp from 1A NB	0.08	30	10.0%	9,570	10,160	10,160
107	1A Turnaround	0.03	20	10.0%	570	590	590
108	Vienna St	0.07	30	10.0%	7,240	7,710	7,710
109	Neptune Rd Bennington to Vienna	0.04	30	10.0%	6,950	7,310	7,310
110	Neptune Rd E of Vienna	0.04	30	10.0%	5,460	5,740	5,740
111				10.0%	0	0	0
112	New off ramp from Rte 1 SB to Rte 16 EB	0.02	30	10.0%	0	0	0
113	New on ramp from Rte 16 WB to Rte 1 NB	0.03	30	10.0%	0	0	0

Mesoscale MOBILE6.2 Emission Factor Summary

MAX Summer/Winter

Year	Speed	VOC	NOX	CO2
2012	Idle	5.53	3.3975	1403.25
2012	2.5	2.212	1.359	561.3
2012	5	0.948	1.221	561.3
2012	10	0.574	1.021	561.3
2012	15	0.462	0.889	561.3
2012	20	0.399	0.812	561.3
2012	25	0.364	0.766	561.3
2012	30	0.341	0.739	561.3
2012	35	0.325	0.733	561.3
2012	35R	0.357	0.773	561.3
2012	40	0.317	0.75	561.3
2012	45	0.312	0.783	561.3
2012	50	0.307	0.832	561.3
2012	55	0.302	0.902	561.3
2012	60	0.301	1.001	561.3
2012	65	0.301	1.194	561.3
2022	Speed	VOC	NOX	CO2
2022	0	0	0	0
2022	Idle	3.58	1.065	1423.45
2022	2.5	1.432	0.426	569.38
2022	5	0.601	0.375	569.38
2022	10	0.357	0.312	569.38
2022	15	0.284	0.27	569.38
2022	20	0.24	0.247	569.38
2022	25	0.216	0.234	569.38
2022	30	0.2	0.226	569.38
2022	35	0.188	0.223	569.38
2022	35R	0.2	0.255	569.38
2022	40	0.181	0.229	569.38
2022	45	0.178	0.238	569.38
2022	50	0.175	0.251	569.38
2022	55	0.173	0.268	569.38
2022	60	0.173	0.292	569.38
2022	65	0.174	0.325	569.38

All factors in grams/mile except Idle (grams/hour)

Caesars Resort at Suffolk Downs

Regional Mesoscale Emissions Analysis - Roadway Emissions
2012 Existing

	Link	Daily Average Volumes	Miles Per Link	Miles Traveled	Vehicle Speed (mph)	Avg Idle Time (hr/veh)	Idle M6.2 VOC (g/hr)	M6.2 VOC (g/mile)	lbs/day	tons/year	Idle M6.2 NOX (g/hr)	M6.2 NOX (g/mile)	lbs/day	tons/year	Idle M6.2 CO2 (g/hr)	M6.2 CO2 (g/mile)	lbs/day	tons/year
1	Rte 1A S of Curtis	23,460	0.50	11730.0	50	0.02	5.530	0.307	8.019	1.251	3.398	0.832	21.565	3.364	1403.250	561.300	14535.580	2267.550
2	Curtis St	5,390	0.07	377.3	30	0.02	5.530	0.341	0.302	0.047	3.398	0.739	0.626	0.098	1403.250	561.300	471.526	73.558
3	McClellan Hwy Boardman to Curtis	40,540	0.72	29188.8	40	0.02	5.530	0.317	20.536	3.204	3.398	0.750	48.347	7.542	1403.250	561.300	36154.844	5640.156
4	Boardman W of McClellan	1,510	0.08	120.8	30	0.02	5.530	0.341	0.096	0.015	3.398	0.739	0.200	0.031	1403.250	561.300	150.783	23.522
5	Lee Burbank Hwy Boardman to Waldemar	39,500	0.16	6320.0	40	0.02	5.530	0.317	4.551	0.710	3.398	0.750	10.532	1.643	1403.250	561.300	7854.699	1225.333
6	Waldemar Ave	2,680	0.29	777.2	35	0.02	5.530	0.325	0.566	0.088	3.398	0.733	1.262	0.197	1403.250	561.300	964.058	150.393
7	Lee Burbank Hwy Waldemar to Tomasello	39,800	0.09	3582.0	40	0.02	5.530	0.317	2.638	0.412	3.398	0.750	6.006	0.937	1403.250	561.300	4466.788	696.819
8	Tomasello Dr (South side)	2,870	0.46	1320.2	35	0.02	5.530	0.325	0.956	0.149	3.398	0.733	2.139	0.334	1403.250	561.300	1636.163	255.241
9	Lee Burbank Hwy Tomasello to Jughandle	37,770	0.08	3021.6	40	0.02	5.530	0.317	2.240	0.349	3.398	0.750	5.075	0.792	1403.250	561.300	3771.570	588.365
10	Jughandle	1,150	0.08	92.0	20	0.02	5.530	0.399	0.085	0.013	3.398	0.812	0.167	0.026	1403.250	561.300	114.835	17.914
11	Service Station	100	0.05	5.0	20	0.02	5.530	0.399	0.005	0.001	3.398	0.812	0.009	0.001	1403.250	561.300	6.273	0.979
12	Lee Burbank Hwy Jughandle to Furlong	39,840	0.50	19920.0	40	0.02	5.530	0.317	14.056	2.193	3.398	0.750	33.020	5.151	1403.250	561.300	24684.462	3850.776
13	Furlong Dr	2,650	0.45	1192.5	30	0.02	5.530	0.341	0.905	0.141	3.398	0.739	1.948	0.304	1403.250	561.300	1477.950	230.560
14	Lee Burbank Hwy to Bell Circle	39,920	0.54	21556.8	40	0.02	5.530	0.317	15.201	2.371	3.398	0.750	35.727	5.573	1403.250	561.300	26710.008	4166.761
15	Lee Burbank Hwy U-Turn at Rte 145	2,120	0.07	148.4	25	0.02	5.530	0.364	0.126	0.020	3.398	0.766	0.255	0.040	1403.250	561.300	185.461	28.932
16	Winthrop Ave W of 1A to Rte 16	29,760	0.11	3273.6	35	0.02	5.530	0.325	2.446	0.382	3.398	0.733	5.352	0.835	1403.250	561.300	4076.527	635.938
17	Winthrop Ave Ramp to 1A S	6,840	0.12	820.8	30	0.02	5.530	0.341	0.640	0.100	3.398	0.739	1.351	0.211	1403.250	561.300	1021.586	159.367
18	1A N Ramp to Winthrop Ave	5,350	0.12	642.0	30	0.02	5.530	0.341	0.501	0.078	3.398	0.739	1.057	0.165	1403.250	561.300	799.048	124.651
19	Winthrop Ave under 1A	30,350	0.05	1517.5	35	0.02	5.530	0.325	1.190	0.186	3.398	0.733	2.515	0.392	1403.250	561.300	1903.928	297.013
20	Winthrop Ave 1A to N. Shore Rd.	32,530	0.31	10084.3	35	0.02	5.530	0.325	7.336	1.144	3.398	0.733	16.364	2.553	1403.250	561.300	12506.884	1951.074
21	North Shore Rd	11,090	0.18	1996.2	35	0.02	5.530	0.325	1.468	0.229	3.398	0.733	3.249	0.507	1403.250	561.300	2479.750	386.841
22	Winthrop Ave N Shore Rd to Tomasello	25,560	0.05	1278.0	35	0.02	5.530	0.325	1.002	0.156	3.398	0.733	2.118	0.330	1403.250	561.300	1603.440	250.137
23	Tomasello Dr (North side)	11,550	0.52	6006.0	30	0.02	5.530	0.341	4.554	0.710	3.398	0.739	9.809	1.530	1403.250	561.300	7442.117	1160.970
24	Winthrop Ave Tomasello to Bennington	16,510	0.32	5283.2	35	0.02	5.530	0.325	3.841	0.599	3.398	0.733	8.572	1.337	1403.250	561.300	6551.943	1022.103
25	Winthrop Ave E of Bennington	3,990	0.17	678.3	30	0.02	5.530	0.341	0.523	0.082	3.398	0.739	1.113	0.174	1403.250	561.300	842.799	131.477
26	State Rd N of Winthrop	8,640	0.13	1123.2	35	0.02	5.530	0.325	0.834	0.130	3.398	0.733	1.833	0.286	1403.250	561.300	1397.341	217.985
27	Bennington Winthrop to Crescent	13,020	0.05	651.0	35	0.02	5.530	0.325	0.511	0.080	3.398	0.733	1.079	0.168	1403.250	561.300	816.776	127.417
28	Crescent Ave	2,250	0.20	450.0	30	0.02	5.530	0.341	0.346	0.054	3.398	0.739	0.738	0.115	1403.250	561.300	558.791	87.171
29	Bennington Crescent to Saratoga	12,330	1.10	13563.0	40	0.02	5.530	0.317	9.521	1.485	3.398	0.750	22.452	3.502	1403.250	561.300	16794.281	2619.908
30	Saratoga E of Bennington	15,210	0.22	3346.2	35	0.02	5.530	0.325	2.449	0.382	3.398	0.733	5.439	0.848	1403.250	561.300	4153.863	648.003
31	Bennington S of Saratoga	14,180	0.50	7090.0	35	0.02	5.530	0.325	5.128	0.800	3.398	0.733	11.487	1.792	1403.250	561.300	8785.785	1370.582
32	Boardman McClellan to Bennington	7,900	0.47	3713.0	30	0.02	5.530	0.341	2.818	0.440	3.398	0.739	6.066	0.946	1403.250	561.300	4601.482	717.831
33	0	0	0.00	0.0	0	0.02	5.530	0.000	0.000	0.000	3.398	0.000	0.000	0.000	1403.250	0.000	0.000	0.000
34	Rte 60 W of Copeland Circle	18,540	0.50	9270.0	35	0.02	5.530	0.325	6.705	1.046	3.398	0.733	15.019	2.343	1403.250	561.300	11487.197	1792.003
35	Rte 1 Ramps S of Copeland Circle	8,220	0.18	1479.6	35	0.02	5.530	0.325	1.088	0.170	3.398	0.733	2.408	0.376	1403.250	561.300	1838.011	286.730
36	Rte 1 Ramps N of Copeland Circle	25,000	0.14	3500.0	35	0.02	5.530	0.325	2.592	0.404	3.398	0.733	5.708	0.890	1403.250	561.300	4352.598	679.005
37	Copeland Circle N	12,260	0.11	1348.6	35	0.02	5.530	0.325	1.008	0.157	3.398	0.733	2.205	0.344	1403.250	561.300	1679.376	261.983
38	Copeland Circle W	10,860	0.07	760.2	35	0.02	5.530	0.325	0.581	0.091	3.398	0.733	1.251	0.195	1403.250	561.300	950.050	148.208
39	Copeland Circle S	16,360	0.10	1636.0	35	0.02	5.530	0.325	1.228	0.192	3.398	0.733	2.678	0.418	1403.250	561.300	2038.545	318.013
40	Copeland Circle E	3,460	0.09	311.4	35	0.02	5.530	0.325	0.235	0.037	3.398	0.733	0.510	0.080	1403.250	561.300	388.319	60.578
41	Rte 60 Copeland Circle to Sigourney	40,320	0.16	6451.2	35	0.02	5.530	0.325	4.759	0.742	3.398	0.733	10.509	1.639	1403.250	561.300	8017.758	1250.770
42	Sigourney S of Rte 60	1,800	0.16	288.0	30	0.02	5.530	0.341	0.223	0.035	3.398	0.739	0.473	0.074	1403.250	561.300	357.936	55.838
43	Sigourney N of Rte 60	8,710	0.10	871.0	30	0.02	5.530	0.341	0.684	0.107	3.398	0.739	1.437	0.224	1403.250	561.300	1085.314	169.309
44	Rte 60 Sigourney to Charger	33,280	0.17	5657.6	35	0.02	5.530	0.325	4.166	0.650	3.398	0.733	9.212	1.437	1403.250	561.300	7029.659	1096.627
45	Charger N of Rte 60	8,140	0.15	1221.0	30	0.02	5.530	0.341	0.945	0.147	3.398	0.739	2.006	0.313	1403.250	561.300	1517.935	236.798
46	Charger S of Rte 60	1,510	0.13	196.3	30	0.02	5.530	0.341	0.153	0.024	3.398	0.739	0.323	0.050	1403.250	561.300	244.211	38.097
47	Rte 60 Charger to Brown Circle	31,450	0.40	12580.0	35	0.02	5.530	0.325	9.120	1.423	3.398	0.733	20.395	3.182	1403.250	561.300	15594.288	2432.709
48	Brown Circle N	15,630	0.02	312.6	35	0.02	5.530	0.325	0.277	0.043	3.398	0.733	0.538	0.084	1403.250	561.300	400.262	62.441
49	Brown Circle S	19,220	0.02	384.4	35	0.02	5.530	0.325	0.341	0.053	3.398	0.733	0.661	0.103	1403.250	561.300	492.197	76.783
50	Brown Circle E	9,950	0.02	199.0	35	0.02	5.530	0.325	0.176	0.027	3.398	0.733	0.342	0.053	1403.250	561.300	254.805	39.750
51	Brown Circle W	8,690	0.02	173.8	35	0.02	5.530	0.325	0.154	0.024	3.398	0.733	0.299	0.047	1403.250	561.300	222.538	34.716
52	Rte 107 N of Brown Circle	21,250	0.50	10625.0	45	0.02	5.530	0.312	7.380	1.151	3.398	0.783	18.385	2.868	1403.250	561.300	13166.286	2053.941
53	Rte 107 S of Brown Circle (Broadway)	10,910	0.50	5455.0	35	0.02	5.530	0.325	3.945	0.615	3.398	0.733	8.838	1.379	1403.250	561.300	6759.726	1054.517
54	Rte 60 Brown Circle to Revere Street	31,520	0.37	11662.4	40	0.02	5.530	0.317	8.257	1.288	3.398	0.750	19.349	3.018	1403.250	561.300	14458.853	2255.581
55	Revere St W of Rte 60	6,270	0.10	627.0	35	0.02	5.530	0.325	0.470	0.073	3.398	0.733	1.026	0.160	1403.250	561.300	781.276	121.879
56	Revere St E of Rte 60 to Rte 1A	7,700	0.70	5390.0	35	0.02	5.530	0.325	3.888	0.607	3.398	0.733	8.726	1.361	1403.250	561.300	6676.533	1041.539
57	Bell Circle to Revere St	23,510	0.50	11755.0	40	0.02	5.530	0.317	8.295	1.294	3.398	0.750	19.486	3.040	1403.250	561.300	14566.559	2272.383
58	Bell Circle roundabout pass thru	17,680	0.07	1237.6	40	0.02	5.530	0.317	0.925	0.144	3.398	0.750	2.083	0.325	1403.250	561.300	1546.675	241.281
59	Bell Circle Rte 60 to Beach St W	17,040	0.04	681.6	35	0.02	5.530	0.325	0.546	0.085	3.398	0.733	1.137	0.177	1403.250	561.300	858.097	133.863
60	Bell Circle Beach St W to 1A S	17,000	0.04	680.0	35	0.02	5.530	0.325	0.545	0.085	3.398	0.733	1.134	0.177	1403.250	561.300	856.082	133.549
61	Bell Circle 1A	18,830	0.06	1129.8	35	0.02	5.530	0.325	0.873	0.136	3.398	0.733	1.865	0.291	1403.250	561.300	1414.265	220.625
62	Bell Circle 1A to Everett St	15,580	0.02	311.6	35	0.02	5.530	0.325	0.276	0.043	3.398	0.733	0.536	0.084	1403.250	561.300	398.982	62.241
63	Bell Circle Everett to Rte 60	15,680	0.02	313.6	35	0.02	5.530	0.325	0.278	0.043	3.398	0.733	0.539	0.084	1403.250	561.300	401.542	62.641
64	Beach St W	8,260	0.10	826.0	30	0.02	5.530	0.341	0.649	0.101	3.398	0.739	1.363	0.213	1403.250	561.300	1029.241	160.562
65	Everett St	2,170	0.10	217.0	30	0.02	5.530	0.341	0.170	0.027	3.398	0.739	0.358	0.056	1403.250	561.300	270.394	42.181
66	Rte 1A Bell Circle to Butler Circle	20,280	0.45	9126.0	35	0.02	5.530	0.325	6.608	1.031	3.398	0.733	14.790	2.307	1403.250	561.300	11310.498	1764.438
67	N. Shore Rd. S of Butler Circle	7,240	0.25	1810.0	35	0.02	5.530	0.325	1.321	0.206	3.398	0.733	2.940	0.459	1403.250	561.300	2246.026	350.380
68	Butler Circle N	380	0.04	15.2	35	0.02	5.530	0.325	0.012	0.002	3.398	0.733	0.025	0.004	1403.250	561.300	19.136	2.985
69	Butler Circle W	3,000	0.04	120.0	35	0.02	5.530	0.325	0.096	0.015	3.398	0.733	0.200	0.031	1403.250	561.300	151.073	23.567
70	Butler Circle S	10,220	0.04	408.8	35	0.02	5.530	0.325	0.328	0.051	3.398	0.733	0.682	0.106	1403.250	561.300	514.657	80.286
71	Wonderland Lot	160	0.10	16.0	30	0.02	5.530	0.341	0.013	0.002	3.398	0.739	0.026	0.004	1403.250	561.300	19.937	3.110
72	Bus Lane	190	0.02	3.8	30	0.02	5.530	0.341	0.004	0.001	3.398	0.739	0.007	0.001	1403.250	561.300	4.866	0.759

Caesars Resort at Suffolk Downs

Regional Mesoscale Emissions Analysis - Roadway Emissions
2012 Existing

	Link	Daily Average Volumes	Miles Per Link	Miles Traveled	Vehicle Speed (mph)	Avg Idle Time (hr/veh)	Idle M6.2 VOC (g/hr)	M6.2 VOC (g/mile)	lbs/day	tons/year	Idle M6.2 NOX (g/hr)	M6.2 NOX (g/mile)	lbs/day	tons/year	Idle M6.2 CO2 (g/hr)	M6.2 CO2 (g/mile)	lbs/day	tons/year
73	Rte 1A N of Butler Circle to Wonderland MBTA	25,440	0.07	1780.8	30	0.02	5.530	0.341	1.425	0.222	3.398	0.739	2.954	0.461	1403.250	561.300	2225.533	347.183
74	Rte 1A Wonderland MBTA to Revere St	29,400	0.36	10584.0	35	0.02	5.530	0.325	7.683	1.199	3.398	0.733	17.165	2.678	1403.250	561.300	13122.554	2047.118
75	Revere St E of Rte 1A	6,700	0.16	1072.0	30	0.02	5.530	0.341	0.829	0.129	3.398	0.739	1.760	0.275	1403.250	561.300	1332.316	207.841
76	1A/N. Shore Rd N of Revere St.	29,520	0.50	14760.0	45	0.02	5.530	0.312	10.253	1.599	3.398	0.783	25.541	3.984	1403.250	561.300	18290.294	2853.286
77	Revere Beach Blvd N of Eliot Circle	9,410	0.50	4705.0	30	0.02	5.530	0.341	3.569	0.557	3.398	0.739	7.685	1.199	1403.250	561.300	5830.341	909.533
78	Winthrop Pkwy S of Eliot Circle	11,660	0.50	5830.0	30	0.02	5.530	0.341	4.422	0.690	3.398	0.739	9.523	1.486	1403.250	561.300	7224.418	1127.009
79	State Rd Ocean Ave to Eliot Circle	16,710	0.04	668.4	30	0.02	5.530	0.341	0.559	0.087	3.398	0.739	1.124	0.175	1403.250	561.300	841.479	131.271
80	Ocean Ave N of State Rd	12,670	0.18	2280.6	30	0.02	5.530	0.341	1.757	0.274	3.398	0.739	3.742	0.584	1403.250	561.300	2833.042	441.955
81	Garfield Ave	7,740	0.20	1548.0	30	0.02	5.530	0.341	1.190	0.186	3.398	0.739	2.538	0.396	1403.250	561.300	1922.241	299.870
82	Webster Ave	11,590	0.20	2318.0	30	0.02	5.530	0.341	1.782	0.278	3.398	0.739	3.801	0.593	1403.250	561.300	2878.395	449.030
83	Rte 16 W of Garfield	33,690	0.50	16845.0	45	0.02	5.530	0.312	11.701	1.825	3.398	0.783	29.148	4.547	1403.250	561.300	20873.984	3256.342
84	Rte 16 Rte 1 S Ramp to Garfield/Webster	37,040	0.16	5926.4	25	0.02	5.530	0.364	4.881	0.761	3.398	0.766	10.085	1.573	1403.250	561.300	7365.520	1149.021
85	Rte 16 W to Rte 1 S OnRamp	1,580	0.19	300.2	35	0.02	5.530	0.325	0.220	0.034	3.398	0.733	0.488	0.076	1403.250	561.300	372.844	58.164
86	Rte 1 S to Rte 16 W Offramp	8,820	0.22	1940.4	35	0.02	5.530	0.325	1.420	0.222	3.398	0.733	3.154	0.492	1403.250	561.300	2408.749	375.765
87	Rte 1 N to Rte 16 E Offramp	10,170	0.28	2847.6	35	0.02	5.530	0.325	2.075	0.324	3.398	0.733	4.623	0.721	1403.250	561.300	3532.534	551.075
88	Rte 16 E to Rte 1 N Onramp	5,970	0.24	1432.8	35	0.02	5.530	0.325	1.047	0.163	3.398	0.733	2.328	0.363	1403.250	561.300	1778.165	277.394
89	Rte 16 W of Rte 1 Ramp to Ramp	29,700	0.09	2673.0	45	0.02	5.530	0.312	1.939	0.303	3.398	0.783	4.676	0.729	1403.250	561.300	3333.256	519.988
90	Rte 16 E of Rte 1 Ramp to Ramp	26,200	0.13	3406.0	45	0.02	5.530	0.312	2.432	0.379	3.398	0.783	5.934	0.926	1403.250	561.300	4237.308	661.020
91	Rte 16 Rte 1 to Winthrop Ave	30,960	1.01	31269.6	45	0.02	5.530	0.312	21.614	3.372	3.398	0.783	54.043	8.431	1403.250	561.300	38721.520	6040.557
92	Rte 16 Winthrop to Bell Circle	11,670	0.30	3501.0	45	0.02	5.530	0.312	2.448	0.382	3.398	0.783	6.068	0.947	1403.250	561.300	4342.380	677.411
93	Harris St	2,410	0.16	385.6	30	0.02	5.530	0.341	0.298	0.046	3.398	0.739	0.633	0.099	1403.250	561.300	479.236	74.761
94	Winthrop Ave W of Rte 16	6,360	0.15	954.0	30	0.02	5.530	0.341	0.739	0.115	3.398	0.739	1.568	0.245	1403.250	561.300	1186.003	185.017
95	0	0	0.00	0.0	0	0.02	5.530	0.000	0.000	0.000	3.398	0.000	0.000	0.000	1403.250	0.000	0.000	0.000
96	Neptune Rd N of Saratoga	10,940	0.02	218.8	30	0.02	5.530	0.341	0.202	0.031	3.398	0.739	0.379	0.059	1403.250	561.300	280.158	43.705
97	Saratoga St E of Neptune	7,820	0.07	547.4	30	0.02	5.530	0.341	0.438	0.068	3.398	0.739	0.908	0.142	1403.250	561.300	684.106	106.721
98	Saratoga St W of Neptune	2,680	0.06	160.8	30	0.02	5.530	0.341	0.130	0.020	3.398	0.739	0.268	0.042	1403.250	561.300	201.287	31.401
99	Neptune Rd Saratoga to Bremen	6,210	0.03	186.3	30	0.02	5.530	0.341	0.161	0.025	3.398	0.739	0.316	0.049	1403.250	561.300	235.876	36.797
100	Bremen St N of Neptune	1,340	0.05	67.0	30	0.02	5.530	0.341	0.055	0.009	3.398	0.739	0.112	0.017	1403.250	561.300	84.061	13.114
101	Bremen St S of Neptune	1,370	0.03	41.1	30	0.02	5.530	0.341	0.036	0.006	3.398	0.739	0.070	0.011	1403.250	561.300	52.037	8.118
102	Neptune Rd Bremen to Bennington	6,060	0.02	121.2	30	0.02	5.530	0.341	0.112	0.017	3.398	0.739	0.210	0.033	1403.250	561.300	155.188	24.209
103	Bennington St W of Neptune Rd	14,190	0.06	851.4	30	0.02	5.530	0.341	0.688	0.107	3.398	0.739	1.417	0.221	1403.250	561.300	1065.769	166.260
104	Bennington E of Neptune Rd	13,620	0.08	1089.6	35	0.02	5.530	0.325	0.827	0.129	3.398	0.733	1.789	0.279	1403.250	561.300	1360.042	212.167
105	Ramp to 1A SB	6,280	0.09	565.2	30	0.02	5.530	0.341	0.446	0.070	3.398	0.739	0.934	0.146	1403.250	561.300	704.810	109.950
106	Ramp from 1A NB	9,570	0.08	765.6	30	0.02	5.530	0.341	0.608	0.095	3.398	0.739	1.267	0.198	1403.250	561.300	955.624	149.077
107	1A Turnaround	570	0.03	17.1	20	0.02	5.530	0.399	0.017	0.003	3.398	0.812	0.032	0.005	1403.250	561.300	21.650	3.377
108	Vienna St	7,240	0.07	506.8	30	0.02	5.530	0.341	0.406	0.063	3.398	0.739	0.841	0.131	1403.250	561.300	633.367	98.805
109	Neptune Rd Bennington to Vienna	6,950	0.04	278.0	30	0.02	5.530	0.341	0.233	0.036	3.398	0.739	0.467	0.073	1403.250	561.300	349.987	54.598
110	Neptune Rd E of Vienna	5,460	0.04	218.4	30	0.02	5.530	0.341	0.183	0.028	3.398	0.739	0.367	0.057	1403.250	561.300	274.954	42.893
111	0	0	0.00	0.0	0	0.02	5.530	0.000	0.000	0.000	3.398	0.000	0.000	0.000	1403.250	0.000	0.000	0.000
112	New off ramp from Rte 1 SB to Rte 16 EB	0	0.02	0.0	30	0.02	5.530	0.341	0.000	0.000	3.398	0.739	0.000	0.000	1403.250	561.300	0.000	0.000
113	New on ramp from Rte 16 WB to Rte 1 NB	0	0.03	0.0	30	0.02	5.530	0.341	0.000	0.000	3.398	0.739	0.000	0.000	1403.250	561.300	0.000	0.000
	Total	1520340.000	22.320	392584.100					283.526	44.230			654.901	102.165			487114.070	75989.795

Notes: Daily to annual factor (6 days/week * 52 weeks per year / 365 days per year) = 85%

Caesars Resort at Suffolk Downs

Regional Mesoscale Emissions Analysis - Roadway Emissions
2022 No-Build

	Link	Daily Average Volumes	Miles Per Link	Miles Traveled	Vehicle Speed (mph)	Avg Idle Time (hr/veh)	Idle M6.2 VOC (g/hr)	M6.2 VOC (g/mile)	lbs/day	tons/year	Idle M6.2 NOX (g/hr)	M6.2 NOX (g/mile)	lbs/day	tons/year	Idle M6.2 CO2 (g/hr)	M6.2 CO2 (g/mile)	lbs/day	tons/year
1	Rte 1A S of Curtis	26,810	0.50	13405.0	50	0.02	3.580	0.175	5.231	0.816	1.065	0.251	7.435	1.160	1423.450	569.380	16850.327	2628.651
2	Curtis St	5,670	0.07	396.9	30	0.02	3.580	0.200	0.187	0.029	1.065	0.226	0.201	0.031	1423.450	569.380	503.161	78.493
3	McClellan Hwy Boardman to Curtis	46,660	0.72	33595.2	40	0.02	3.580	0.181	13.508	2.107	1.065	0.229	16.991	2.651	1423.450	569.380	42211.875	6585.053
4	Boardman W of McClellan	1,600	0.08	128.0	30	0.02	3.580	0.200	0.060	0.009	1.065	0.226	0.065	0.010	1423.450	569.380	162.070	25.283
5	Lee Burbank Hwy Boardman to Waldemar	45,400	0.16	7264.0	40	0.02	3.580	0.181	2.998	0.468	1.065	0.229	3.697	0.577	1423.450	569.380	9157.891	1428.631
6	Waldemar Ave	2,820	0.29	817.8	35	0.02	3.580	0.188	0.345	0.054	1.065	0.223	0.404	0.063	1423.450	569.380	1029.022	160.527
7	Lee Burbank Hwy Waldemar to Tomasello	45,710	0.09	4113.9	40	0.02	3.580	0.181	1.742	0.272	1.065	0.229	2.107	0.329	1423.450	569.380	5203.920	811.812
8	Tomasello Dr (South side)	3,020	0.46	1389.2	35	0.02	3.580	0.188	0.582	0.091	1.065	0.223	0.685	0.107	1423.450	569.380	1746.460	272.448
9	Lee Burbank Hwy Tomasello to Jughandle	43,590	0.08	3487.2	40	0.02	3.580	0.181	1.487	0.232	1.065	0.229	1.789	0.279	1423.450	569.380	4415.392	688.801
10	Jughandle	1,210	0.08	96.8	20	0.02	3.580	0.240	0.054	0.008	1.065	0.247	0.054	0.008	1423.450	569.380	122.565	19.120
11	Service Station	100	0.05	5.0	20	0.02	3.580	0.240	0.003	0.000	1.065	0.247	0.003	0.000	1423.450	569.380	6.364	0.993
12	Lee Burbank Hwy Jughandle to Furlong	45,770	0.50	22885.0	40	0.02	3.580	0.181	9.232	1.440	1.065	0.229	11.584	1.807	1423.450	569.380	28766.857	4487.630
13	Furlong Dr	2,780	0.45	1251.0	30	0.02	3.580	0.200	0.558	0.087	1.065	0.226	0.625	0.098	1423.450	569.380	1572.772	245.352
14	Lee Burbank Hwy to Bell Circle	45,850	0.54	24759.0	40	0.02	3.580	0.181	9.980	1.557	1.065	0.229	12.530	1.955	1423.450	569.380	31119.312	4854.613
15	Lee Burbank Hwy U-Turn at Rte 145	2,230	0.07	156.1	25	0.02	3.580	0.216	0.079	0.012	1.065	0.234	0.082	0.013	1423.450	569.380	197.892	30.871
16	Winthrop Ave W of 1A to Rte 16	32,060	0.11	3526.6	35	0.02	3.580	0.188	1.532	0.239	1.065	0.223	1.755	0.274	1423.450	569.380	4454.799	694.949
17	Winthrop Ave Ramp to 1A S	7,740	0.12	928.8	30	0.02	3.580	0.200	0.427	0.067	1.065	0.226	0.468	0.073	1423.450	569.380	1172.646	182.933
18	1A N Ramp to Winthrop Ave	6,350	0.12	762.0	30	0.02	3.580	0.200	0.350	0.055	1.065	0.226	0.384	0.060	1423.450	569.380	962.055	150.081
19	Winthrop Ave under 1A	32,330	0.05	1616.5	35	0.02	3.580	0.188	0.741	0.116	1.065	0.223	0.816	0.127	1423.450	569.380	2057.334	320.944
20	Winthrop Ave 1A to N. Shore Rd.	35,280	0.31	10936.8	35	0.02	3.580	0.188	4.610	0.719	1.065	0.223	5.400	0.842	1423.450	569.380	13759.441	2146.473
21	North Shore Rd	12,350	0.18	2223.0	35	0.02	3.580	0.188	0.948	0.148	1.065	0.223	1.101	0.172	1423.450	569.380	2801.241	436.994
22	Winthrop Ave N Shore Rd to Tomasello	27,800	0.05	1390.0	35	0.02	3.580	0.188	0.637	0.099	1.065	0.223	0.702	0.109	1423.450	569.380	1769.065	275.974
23	Tomasello Dr (North side)	12,140	0.52	6312.8	30	0.02	3.580	0.200	2.810	0.438	1.065	0.226	3.153	0.492	1423.450	569.380	7934.880	1237.841
24	Winthrop Ave Tomasello to Bennington	17,740	0.32	5676.8	35	0.02	3.580	0.188	2.392	0.373	1.065	0.223	2.802	0.437	1423.450	569.380	7141.407	1114.060
25	Winthrop Ave E of Bennington	4,370	0.17	742.9	30	0.02	3.580	0.200	0.337	0.053	1.065	0.226	0.373	0.058	1423.450	569.380	936.353	146.071
26	State Rd N of Winthrop	9,850	0.13	1280.5	35	0.02	3.580	0.188	0.552	0.086	1.065	0.223	0.636	0.099	1423.450	569.380	1615.966	252.091
27	Bennington Winthrop to Crescent	14,270	0.05	713.5	35	0.02	3.580	0.188	0.327	0.051	1.065	0.223	0.360	0.056	1423.450	569.380	908.078	141.660
28	Crescent Ave	2,440	0.20	488.0	30	0.02	3.580	0.200	0.221	0.034	1.065	0.226	0.245	0.038	1423.450	569.380	614.701	95.893
29	Bennington Crescent to Saratoga	12,730	1.10	14003.0	40	0.02	3.580	0.181	5.616	0.876	1.065	0.229	7.078	1.104	1423.450	569.380	17588.707	2743.838
30	Saratoga E of Bennington	16,210	0.22	3566.2	35	0.02	3.580	0.188	1.514	0.236	1.065	0.223	1.764	0.275	1423.450	569.380	4490.691	700.548
31	Bennington S of Saratoga	15,950	0.50	7975.0	35	0.02	3.580	0.188	3.340	0.521	1.065	0.223	3.931	0.613	1423.450	569.380	10024.719	1563.856
32	Boardman McClellan to Bennington	11,580	0.47	5442.6	30	0.02	3.580	0.200	2.425	0.378	1.065	0.226	2.719	0.424	1423.450	569.380	6842.052	1067.360
33	0	0	0.00	0.0	0	0.02	3.580	0.000	0.000	0.000	1.065	0.000	0.000	0.000	1423.450	0.000	0.000	0.000
34	Rte 60 W of Copeland Circle	20,010	0.50	10005.0	35	0.02	3.580	0.188	4.191	0.654	1.065	0.223	4.932	0.769	1423.450	569.380	12576.465	1961.929
35	Rte 1 Ramps S of Copeland Circle	8,780	0.18	1580.4	35	0.02	3.580	0.188	0.674	0.105	1.065	0.223	0.783	0.122	1423.450	569.380	1991.490	310.672
36	Rte 1 Ramps N of Copeland Circle	27,380	0.14	3833.2	35	0.02	3.580	0.188	1.649	0.257	1.065	0.223	1.902	0.297	1423.450	569.380	4835.586	754.351
37	Copeland Circle N	13,250	0.11	1457.5	35	0.02	3.580	0.188	0.633	0.099	1.065	0.223	0.725	0.113	1423.450	569.380	1841.113	287.214
38	Copeland Circle W	12,040	0.07	842.8	35	0.02	3.580	0.188	0.376	0.059	1.065	0.223	0.422	0.066	1423.450	569.380	1068.441	166.677
39	Copeland Circle S	18,000	0.10	1800.0	35	0.02	3.580	0.188	0.786	0.123	1.065	0.223	0.897	0.140	1423.450	569.380	2275.185	354.929
40	Copeland Circle E	3,640	0.09	327.6	35	0.02	3.580	0.188	0.144	0.022	1.065	0.223	0.163	0.025	1423.450	569.380	414.401	64.647
41	Rte 60 Copeland Circle to Sigourney	44,160	0.16	7065.6	35	0.02	3.580	0.188	3.025	0.472	1.065	0.223	3.502	0.546	1423.450	569.380	8907.763	1389.611
42	Sigourney S of Rte 60	1,900	0.16	304.0	30	0.02	3.580	0.200	0.138	0.022	1.065	0.226	0.153	0.024	1423.450	569.380	383.260	59.789
43	Sigourney N of Rte 60	10,210	0.10	1021.0	30	0.02	3.580	0.200	0.473	0.074	1.065	0.226	0.515	0.080	1423.450	569.380	1290.536	201.324
44	Rte 60 Sigourney to Charger	36,680	0.17	6235.6	35	0.02	3.580	0.188	2.665	0.416	1.065	0.223	3.090	0.482	1423.450	569.380	7859.365	1226.061
45	Charger N of Rte 60	10,710	0.15	1606.5	30	0.02	3.580	0.200	0.732	0.114	1.065	0.226	0.807	0.126	1423.450	569.380	2025.935	316.046
46	Charger S of Rte 60	1,590	0.13	206.7	30	0.02	3.580	0.200	0.095	0.015	1.065	0.226	0.104	0.016	1423.450	569.380	260.851	40.693
47	Rte 60 Charger to Brown Circle	36,400	0.40	14560.0	35	0.02	3.580	0.188	6.115	0.954	1.065	0.223	7.182	1.120	1423.450	569.380	18308.529	2856.130
48	Brown Circle N	18,340	0.02	366.8	35	0.02	3.580	0.188	0.192	0.030	1.065	0.223	0.192	0.030	1423.450	569.380	476.422	74.322
49	Brown Circle S	21,550	0.02	431.0	35	0.02	3.580	0.188	0.226	0.035	1.065	0.223	0.226	0.035	1423.450	569.380	559.809	87.330
50	Brown Circle E	11,010	0.02	220.2	35	0.02	3.580	0.188	0.115	0.018	1.065	0.223	0.115	0.018	1423.450	569.380	286.009	44.617
51	Brown Circle W	9,430	0.02	188.6	35	0.02	3.580	0.188	0.099	0.015	1.065	0.223	0.099	0.015	1423.450	569.380	244.965	38.215
52	Rte 107 N of Brown Circle	22,810	0.50	11405.0	45	0.02	3.580	0.178	4.526	0.706	1.065	0.238	5.999	0.936	1423.450	569.380	14336.291	2236.461
53	Rte 107 S of Brown Circle (Broadway)	12,380	0.50	6190.0	35	0.02	3.580	0.188	2.593	0.404	1.065	0.223	3.051	0.476	1423.450	569.380	7780.942	1213.827
54	Rte 60 Brown Circle to Revere Street	35,970	0.37	13308.9	40	0.02	3.580	0.181	5.390	0.841	1.065	0.229	6.743	1.052	1423.450	569.380	16737.680	2611.078
55	Revere St W of Rte 60	7,280	0.10	728.0	35	0.02	3.580	0.188	0.318	0.050	1.065	0.223	0.363	0.057	1423.450	569.380	920.186	143.549
56	Revere St E of Rte 60 to Rte 1A	9,100	0.70	6370.0	35	0.02	3.580	0.188	2.660	0.415	1.065	0.223	3.138	0.489	1423.450	569.380	8004.032	1248.629
57	Bell Circle to Revere St	26,740	0.50	13370.0	40	0.02	3.580	0.181	5.394	0.841	1.065	0.229	6.767	1.056	1423.450	569.380	16806.331	2621.788
58	Bell Circle roundabout pass thru	19,930	0.07	1395.1	40	0.02	3.580	0.181	0.600	0.094	1.065	0.229	0.717	0.112	1423.450	569.380	1768.607	275.903
59	Bell Circle Rte 60 to Beach St W	19,610	0.04	784.4	35	0.02	3.580	0.188	0.368	0.057	1.065	0.223	0.398	0.062	1423.450	569.380	1001.732	156.270
60	Bell Circle Beach St W to 1A S	19,740	0.04	789.6	35	0.02	3.580	0.188	0.371	0.058	1.065	0.223	0.401	0.063	1423.450	569.380	1008.373	157.306
61	Bell Circle 1A	21,810	0.06	1308.6	35	0.02	3.580	0.188	0.590	0.092	1.065	0.223	0.658	0.103	1423.450	569.380	1661.665	259.220
62	Bell Circle 1A to Everett St	18,120	0.02	362.4	35	0.02	3.580	0.188	0.190	0.030	1.065	0.223	0.190	0.030	1423.450	569.380	470.707	73.430
63	Bell Circle Everett to Rte 60	18,370	0.02	367.4	35	0.02	3.580	0.188	0.193	0.030	1.065	0.223	0.193	0.030	1423.450	569.380	477.201	74.443
64	Beach St W	9,680	0.10	968.0	30	0.02	3.580	0.200	0.448	0.070	1.065	0.226	0.489	0.076	1423.450	569.380	1223.544	190.873
65	Everett St	2,280	0.10	228.0	30	0.02	3.580	0.200	0.106	0.016	1.065	0.226	0.115	0.018	1423.450	569.380	288.190	44.958
66	Rte 1A Bell Circle to Butler Circle	25,080	0.45	11286.0	35	0.02	3.580	0.188	4.733	0.738	1.065	0.223	5.565	0.868	1423.450	569.380	14188.892	2213.467
67	N. Shore Rd. S of Butler Circle	8,230	0.25	2057.5	35	0.02	3.580	0.188	0.871	0.136	1.065	0.223	1.017	0.159	1423.450	569.380	2589.902	404.025
68	Butler Circle N	400	0.04	16.0	35	0.02	3.580	0.188	0.008	0.001	1.065	0.223	0.008	0.001	1423.450	569.380	20.433	3.188
69	Butler Circle W	2,900	0.04	116.0	35	0.02	3.580	0.188	0.054	0.008	1.065	0.223	0.059	0.009	1423.450	569.380	148.140	23.110
70	Butler Circle S	12,690	0.04	507.6	35	0.02	3.580	0.188	0.238	0.037	1.065	0.223	0.258	0.040	1423.450	569.380	648.239	101.125
71	Wonderland Lot	170	0.10	17.0	30	0.02	3.580	0.200	0.008	0.001	1.065	0.226	0.009	0.001	1423.450	569.380	21.488	3.352
72	Bus Lane	200	0.02	4.0	30	0.02	3.580	0.200	0.002	0.000	1.065	0.226	0.002	0.000	1423.450	569.380	5.195	0.810

Caesars Resort at Suffolk Downs

Regional Mesoscale Emissions Analysis - Roadway Emissions
2022 No-Build

	Link	Daily Average Volumes	Miles Per Link	Miles Traveled	Vehicle Speed (mph)	Avg Idle Time (hr/veh)	Idle M6.2 VOC (g/hr)	M6.2 VOC (g/mile)	lbs/day	tons/year	Idle M6.2 NOX (g/hr)	M6.2 NOX (g/mile)	lbs/day	tons/year	Idle M6.2 CO2 (g/hr)	M6.2 CO2 (g/mile)	lbs/day	tons/year
73	**Rte 1A N of Butler Circle to Wonderland MBTA**	29,320	0.07	2052.4	30	0.02	3.580	0.200	0.969	0.151	1.065	0.226	1.042	0.163	1423.450	569.380	2601.884	405.894
74	**Rte 1A Wonderland MBTA to Revere St**	33,500	0.36	12060.0	35	0.02	3.580	0.188	5.072	0.791	1.065	0.223	5.951	0.928	1423.450	569.380	15167.814	2366.179
75	**Revere St E of Rte 1A**	9,950	0.16	1592.0	30	0.02	3.580	0.200	0.724	0.113	1.065	0.226	0.800	0.125	1423.450	569.380	2007.071	313.103
76	**1A/N. Shore Rd N of Revere St.**	32,420	0.50	16210.0	45	0.02	3.580	0.178	6.432	1.003	1.065	0.238	8.527	1.330	1423.450	569.380	20376.262	3178.697
77	**Revere Beach Blvd N of Eliot Circle**	9,910	0.50	4955.0	30	0.02	3.580	0.200	2.207	0.344	1.065	0.226	2.475	0.386	1423.450	569.380	6228.524	971.650
78	**Winthrop Pkwy S of Eliot Circle**	12,750	0.50	6375.0	30	0.02	3.580	0.200	2.839	0.443	1.065	0.226	3.185	0.497	1423.450	569.380	8013.490	1250.104
79	**State Rd Ocean Ave to Eliot Circle**	18,080	0.04	723.2	30	0.02	3.580	0.200	0.359	0.056	1.065	0.226	0.372	0.058	1423.450	569.380	923.575	144.078
80	**Ocean Ave N of State Rd**	12,350	0.18	2223.0	30	0.02	3.580	0.200	1.007	0.157	1.065	0.226	1.116	0.174	1423.450	569.380	2801.241	436.994
81	**Garfield Ave**	8,130	0.20	1626.0	30	0.02	3.580	0.200	0.735	0.115	1.065	0.226	0.815	0.127	1423.450	569.380	2048.164	319.514
82	**Webster Ave**	12,180	0.20	2436.0	30	0.02	3.580	0.200	1.101	0.172	1.065	0.226	1.222	0.191	1423.450	569.380	3068.466	478.681
83	**Rte 16 W of Garfield**	35,840	0.50	17920.0	45	0.02	3.580	0.178	7.111	1.109	1.065	0.238	9.426	1.470	1423.450	569.380	22525.763	3514.019
84	**Rte 16 Rte 1 S Ramp to Garfield/Webster**	39,440	0.16	6310.4	25	0.02	3.580	0.216	3.091	0.482	1.065	0.234	3.281	0.512	1423.450	569.380	7955.665	1241.084
85	**Rte 16 W to Rte 1 S OnRamp**	1,710	0.19	324.9	35	0.02	3.580	0.188	0.138	0.022	1.065	0.223	0.161	0.025	1423.450	569.380	409.329	63.855
86	**Rte 1 S to Rte 16 W Offramp**	9,290	0.22	2043.8	35	0.02	3.580	0.188	0.867	0.135	1.065	0.223	1.011	0.158	1423.450	569.380	2573.628	401.486
87	**Rte 1 N to Rte 16 E Offramp**	10,870	0.28	3043.6	35	0.02	3.580	0.188	1.285	0.201	1.065	0.223	1.503	0.235	1423.450	569.380	3830.029	597.485
88	**Rte 16 E to Rte 1 N Onramp**	6,270	0.24	1504.8	35	0.02	3.580	0.188	0.637	0.099	1.065	0.223	0.744	0.116	1423.450	569.380	1894.403	295.527
89	**Rte 16 W of Rte 1 Ramp to Ramp**	31,690	0.09	2852.1	45	0.02	3.580	0.178	1.189	0.185	1.065	0.238	1.517	0.237	1423.450	569.380	3607.793	562.816
90	**Rte 16 E of Rte 1 Ramp to Ramp**	28,050	0.13	3646.5	45	0.02	3.580	0.178	1.492	0.233	1.065	0.238	1.932	0.301	1423.450	569.380	4601.810	717.882
91	**Rte 16 Rte 1 to Winthrop Ave**	33,590	1.01	33925.9	45	0.02	3.580	0.178	13.387	2.088	1.065	0.238	17.823	2.780	1423.450	569.380	42615.601	6648.034
92	**Rte 16 Winthrop to Bell Circle**	13,290	0.30	3987.0	45	0.02	3.580	0.178	1.594	0.249	1.065	0.238	2.101	0.328	1423.450	569.380	5016.365	782.553
93	**Harris St**	2,710	0.16	433.6	30	0.02	3.580	0.200	0.197	0.031	1.065	0.226	0.218	0.034	1423.450	569.380	546.649	85.277
94	**Winthrop Ave W of Rte 16**	7,150	0.15	1072.5	30	0.02	3.580	0.200	0.489	0.076	1.065	0.226	0.539	0.084	1423.450	569.380	1352.515	210.992
95	**0**	0	0.00	0.0	0	0.02	3.580	0.000	0.000	0.000	1.065	0.000	0.000	0.000	1423.450	0.000	0.000	0.000
96	**Neptune Rd N of Saratoga**	11,720	0.02	234.4	30	0.02	3.580	0.200	0.129	0.020	1.065	0.226	0.124	0.019	1423.450	569.380	304.453	47.495
97	**Saratoga St E of Neptune**	8,220	0.07	575.4	30	0.02	3.580	0.200	0.272	0.042	1.065	0.226	0.292	0.046	1423.450	569.380	729.451	113.794
98	**Saratoga St W of Neptune**	2,820	0.06	169.2	30	0.02	3.580	0.200	0.081	0.013	1.065	0.226	0.086	0.013	1423.450	569.380	214.851	33.517
99	**Neptune Rd Saratoga to Bremen**	6,530	0.03	195.9	30	0.02	3.580	0.200	0.101	0.016	1.065	0.226	0.102	0.016	1423.450	569.380	251.601	39.250
100	**Bremen St N of Neptune**	1,420	0.05	71.0	30	0.02	3.580	0.200	0.034	0.005	1.065	0.226	0.036	0.006	1423.450	569.380	90.362	14.097
101	**Bremen St S of Neptune**	1,440	0.03	43.2	30	0.02	3.580	0.200	0.022	0.003	1.065	0.226	0.022	0.004	1423.450	569.380	55.483	8.655
102	**Neptune Rd Bremen to Bennington**	6,360	0.02	127.2	30	0.02	3.580	0.200	0.070	0.011	1.065	0.226	0.068	0.011	1423.450	569.380	165.215	25.774
103	**Bennington St W of Neptune Rd**	15,000	0.06	900.0	30	0.02	3.580	0.200	0.430	0.067	1.065	0.226	0.458	0.071	1423.450	569.380	1142.823	178.280
104	**Bennington E of Neptune Rd**	14,380	0.08	1150.4	35	0.02	3.580	0.188	0.508	0.079	1.065	0.223	0.575	0.090	1423.450	569.380	1456.603	227.230
105	**Ramp to 1A SB**	6,600	0.09	594.0	30	0.02	3.580	0.200	0.276	0.043	1.065	0.226	0.300	0.047	1423.450	569.380	751.386	117.216
106	**Ramp from 1A NB**	10,160	0.08	812.8	30	0.02	3.580	0.200	0.381	0.059	1.065	0.226	0.412	0.064	1423.450	569.380	1029.144	160.546
107	**1A Turnaround**	590	0.03	17.7	20	0.02	3.580	0.240	0.011	0.002	1.065	0.247	0.010	0.002	1423.450	569.380	22.733	3.546
108	**Vienna St**	7,710	0.07	539.7	30	0.02	3.580	0.200	0.255	0.040	1.065	0.226	0.274	0.043	1423.450	569.380	684.193	106.734
109	**Neptune Rd Bennington to Vienna**	7,310	0.04	292.4	30	0.02	3.580	0.200	0.145	0.023	1.065	0.226	0.150	0.023	1423.450	569.380	373.415	58.253
110	**Neptune Rd E of Vienna**	5,740	0.04	229.6	30	0.02	3.580	0.200	0.114	0.018	1.065	0.226	0.118	0.018	1423.450	569.380	293.215	45.741
111	**0**	0	0.00	0.0	0	0.02	3.580	0.000	0.000	0.000	1.065	0.000	0.000	0.000	1423.450	0.000	0.000	0.000
112	**New off ramp from Rte 1 SB to Rte 16 EB**	0	0.02	0.0	30	0.02	3.580	0.200	0.000	0.000	1.065	0.226	0.000	0.000	1423.450	569.380	0.000	0.000
113	**New on ramp from Rte 16 WB to Rte 1 NB**	0	0.03	0.0	30	0.02	3.580	0.200	0.000	0.000	1.065	0.226	0.000	0.000	1423.450	569.380	0.000	0.000
	Total	1693470.000	22.320	438237.700					182.561	28.480			222.674	34.737			551584.877	86047.241

Notes: Daily to annual factor (6 days/week * 52 weeks per year / 365 days per year) = 85%

Caesars Resort at Suffolk Downs

Regional Mesoscale Emissions Analysis - Roadway Emissions
2022 Build

	Link	Daily Average Volumes	Miles Per Link	Miles Traveled	Vehicle Speed (mph)	Avg Idle Time (hr/veh)	Idle M6.2 VOC (g/hr)	M6.2 VOC (g/mile)	lbs/day	tons/year	Idle M6.2 NOX (g/hr)	M6.2 NOX (g/mile)	lbs/day	tons/year	Idle M6.2 CO2 (g/hr)	M6.2 CO2 (g/mile)	lbs/day	tons/year
1	Rte 1A S of Curtis	31,610	0.50	15805.0	50	0.02	3.580	0.175	6.167	0.962	1.065	0.251	8.767	1.368	1423.450	569.380	19867.170	3099.278
2	Curtis St	5,670	0.07	396.9	30	0.02	3.580	0.200	0.187	0.029	1.065	0.226	0.201	0.031	1423.450	569.380	503.161	78.493
3	McClellan Hwy Boardman to Curtis	56,790	0.72	40888.8	40	0.02	3.580	0.181	16.441	2.565	1.065	0.229	20.680	3.226	1423.450	569.380	51376.176	8014.684
4	Boardman W of McClellan	1,600	0.08	128.0	30	0.02	3.580	0.200	0.060	0.009	1.065	0.226	0.065	0.010	1423.450	569.380	162.070	25.283
5	Lee Burbank Hwy Boardman to Waldemar	57,170	0.16	9147.2	40	0.02	3.580	0.181	3.775	0.589	1.065	0.229	4.655	0.726	1423.450	569.380	11532.084	1799.005
6	Waldemar Ave	2,820	0.29	817.8	35	0.02	3.580	0.188	0.345	0.054	1.065	0.223	0.404	0.063	1423.450	569.380	1029.022	160.527
7	Lee Burbank Hwy Waldemar to Tomasello	57,450	0.09	5170.5	40	0.02	3.580	0.181	2.189	0.342	1.065	0.229	2.648	0.413	1423.450	569.380	6540.477	1020.314
8	Tomasello Dr (South side)	17,960	0.46	8261.6	35	0.02	3.580	0.188	3.464	0.540	1.065	0.223	4.073	0.635	1423.450	569.380	10386.233	1620.252
9	Lee Burbank Hwy Tomasello to Jughandle	46,640	0.08	3731.2	40	0.02	3.580	0.181	1.591	0.248	1.065	0.229	1.914	0.299	1423.450	569.380	4724.337	736.997
10	Jughandle	1,210	0.08	96.8	20	0.02	3.580	0.240	0.054	0.008	1.065	0.247	0.054	0.008	1423.450	569.380	122.565	19.120
11	Service Station	100	0.05	5.0	20	0.02	3.580	0.240	0.003	0.000	1.065	0.247	0.003	0.000	1423.450	569.380	6.364	0.993
12	Lee Burbank Hwy Jughandle to Furlong	48,810	0.50	24405.0	40	0.02	3.580	0.181	9.846	1.536	1.065	0.229	12.353	1.927	1423.450	569.380	30677.525	4785.694
13	Furlong Dr	2,950	0.45	1327.5	30	0.02	3.580	0.200	0.592	0.092	1.065	0.226	0.663	0.103	1423.450	569.380	1668.949	260.356
14	Lee Burbank Hwy to Bell Circle	48,910	0.54	26411.4	40	0.02	3.580	0.181	10.646	1.661	1.065	0.229	13.366	2.085	1423.450	569.380	33196.195	5178.606
15	Lee Burbank Hwy U-Turn at Rte 145	2,230	0.07	156.1	25	0.02	3.580	0.216	0.079	0.012	1.065	0.234	0.082	0.013	1423.450	569.380	197.892	30.871
16	Winthrop Ave W of 1A to Rte 16	35,270	0.11	3879.7	35	0.02	3.580	0.188	1.685	0.263	1.065	0.223	1.930	0.301	1423.450	569.380	4900.834	764.530
17	Winthrop Ave Ramp to 1A S	7,740	0.12	928.8	30	0.02	3.580	0.200	0.427	0.067	1.065	0.226	0.468	0.073	1423.450	569.380	1172.646	182.933
18	1A N Ramp to Winthrop Ave	6,350	0.12	762.0	30	0.02	3.580	0.200	0.350	0.055	1.065	0.226	0.384	0.060	1423.450	569.380	962.055	150.081
19	Winthrop Ave under 1A	35,460	0.05	1773.0	35	0.02	3.580	0.188	0.813	0.127	1.065	0.223	0.895	0.140	1423.450	569.380	2256.513	352.016
20	Winthrop Ave 1A to N. Shore Rd.	38,410	0.31	11907.1	35	0.02	3.580	0.188	5.019	0.783	1.065	0.223	5.879	0.917	1423.450	569.380	14980.163	2336.905
21	North Shore Rd	12,850	0.18	2313.0	35	0.02	3.580	0.188	0.987	0.154	1.065	0.223	1.146	0.179	1423.450	569.380	2914.652	454.686
22	Winthrop Ave N Shore Rd to Tomasello	31,500	0.05	1575.0	35	0.02	3.580	0.188	0.722	0.113	1.065	0.223	0.795	0.124	1423.450	569.380	2004.517	312.705
23	Tomasello Dr (North side)	16,150	0.52	8398.0	30	0.02	3.580	0.200	3.738	0.583	1.065	0.226	4.195	0.654	1423.450	569.380	10555.874	1646.716
24	Winthrop Ave Tomasello to Bennington	17,850	0.32	5712.0	35	0.02	3.580	0.188	2.407	0.375	1.065	0.223	2.820	0.440	1423.450	569.380	7185.689	1120.967
25	Winthrop Ave E of Bennington	4,390	0.17	746.3	30	0.02	3.580	0.200	0.339	0.053	1.065	0.226	0.375	0.058	1423.450	569.380	940.638	146.740
26	State Rd N of Winthrop	9,890	0.13	1285.7	35	0.02	3.580	0.188	0.555	0.087	1.065	0.223	0.639	0.100	1423.450	569.380	1622.528	253.114
27	Bennington Winthrop to Crescent	14,270	0.05	713.5	35	0.02	3.580	0.188	0.327	0.051	1.065	0.223	0.360	0.056	1423.450	569.380	908.078	141.660
28	Crescent Ave	2,440	0.20	488.0	30	0.02	3.580	0.200	0.221	0.034	1.065	0.226	0.245	0.038	1423.450	569.380	614.701	95.893
29	Bennington Crescent to Saratoga	12,730	1.10	14003.0	40	0.02	3.580	0.181	5.616	0.876	1.065	0.229	7.078	1.104	1423.450	569.380	17588.707	2743.838
30	Saratoga E of Bennington	16,320	0.22	3590.4	35	0.02	3.580	0.188	1.524	0.238	1.065	0.223	1.776	0.277	1423.450	569.380	4521.164	705.302
31	Bennington S of Saratoga	15,950	0.50	7975.0	35	0.02	3.580	0.188	3.340	0.521	1.065	0.223	3.931	0.613	1423.450	569.380	10024.719	1563.856
32	Boardman McClellan to Bennington	11,710	0.47	5503.7	30	0.02	3.580	0.200	2.452	0.383	1.065	0.226	2.750	0.429	1423.450	569.380	6918.863	1079.343
33	0	0	0.00	0.0	0	0.02	3.580	0.000	0.000	0.000	1.065	0.000	0.000	0.000	1423.450	0.000	0.000	0.000
34	Rte 60 W of Copeland Circle	20,010	0.50	10005.0	35	0.02	3.580	0.188	4.191	0.654	1.065	0.223	4.932	0.769	1423.450	569.380	12576.465	1961.929
35	Rte 1 Ramps S of Copeland Circle	8,780	0.18	1580.4	35	0.02	3.580	0.188	0.674	0.105	1.065	0.223	0.783	0.122	1423.450	569.380	1991.490	310.672
36	Rte 1 Ramps N of Copeland Circle	29,820	0.14	4174.8	35	0.02	3.580	0.188	1.796	0.280	1.065	0.223	2.072	0.323	1423.450	569.380	5266.515	821.576
37	Copeland Circle N	13,250	0.11	1457.5	35	0.02	3.580	0.188	0.633	0.099	1.065	0.223	0.725	0.113	1423.450	569.380	1841.113	287.214
38	Copeland Circle W	13,310	0.07	931.7	35	0.02	3.580	0.188	0.415	0.065	1.065	0.223	0.467	0.073	1423.450	569.380	1181.142	184.258
39	Copeland Circle S	19,270	0.10	1927.0	35	0.02	3.580	0.188	0.841	0.131	1.065	0.223	0.960	0.150	1423.450	569.380	2435.712	379.971
40	Copeland Circle E	3,640	0.09	327.6	35	0.02	3.580	0.188	0.144	0.022	1.065	0.223	0.163	0.025	1423.450	569.380	414.401	64.647
41	Rte 60 Copeland Circle to Sigourney	46,560	0.16	7449.6	35	0.02	3.580	0.188	3.190	0.498	1.065	0.223	3.693	0.576	1423.450	569.380	9391.881	1465.133
42	Sigourney S of Rte 60	1,900	0.16	304.0	30	0.02	3.580	0.200	0.138	0.022	1.065	0.226	0.153	0.024	1423.450	569.380	383.260	59.789
43	Sigourney N of Rte 60	10,210	0.10	1021.0	30	0.02	3.580	0.200	0.473	0.074	1.065	0.226	0.515	0.080	1423.450	569.380	1290.536	201.324
44	Rte 60 Sigourney to Charger	39,120	0.17	6650.4	35	0.02	3.580	0.188	2.842	0.443	1.065	0.223	3.295	0.514	1423.450	569.380	8382.180	1307.620
45	Charger N of Rte 60	10,710	0.15	1606.5	30	0.02	3.580	0.200	0.732	0.114	1.065	0.226	0.807	0.126	1423.450	569.380	2025.935	316.046
46	Charger S of Rte 60	1,590	0.13	206.7	30	0.02	3.580	0.200	0.095	0.015	1.065	0.226	0.104	0.016	1423.450	569.380	260.851	40.693
47	Rte 60 Charger to Brown Circle	38,840	0.40	15536.0	35	0.02	3.580	0.188	6.524	1.018	1.065	0.223	7.663	1.195	1423.450	569.380	19535.804	3047.585
48	Brown Circle N	19,510	0.02	390.2	35	0.02	3.580	0.188	0.205	0.032	1.065	0.223	0.205	0.032	1423.450	569.380	506.815	79.063
49	Brown Circle S	23,050	0.02	461.0	35	0.02	3.580	0.188	0.242	0.038	1.065	0.223	0.242	0.038	1423.450	569.380	598.775	93.409
50	Brown Circle E	11,010	0.02	220.2	35	0.02	3.580	0.188	0.115	0.018	1.065	0.223	0.115	0.018	1423.450	569.380	286.009	44.617
51	Brown Circle W	9,660	0.02	193.2	35	0.02	3.580	0.188	0.101	0.016	1.065	0.223	0.101	0.016	1423.450	569.380	250.940	39.147
52	Rte 107 N of Brown Circle	23,240	0.50	11620.0	45	0.02	3.580	0.178	4.611	0.719	1.065	0.238	6.112	0.954	1423.450	569.380	14606.549	2278.622
53	Rte 107 S of Brown Circle (Broadway)	12,380	0.50	6190.0	35	0.02	3.580	0.188	2.593	0.404	1.065	0.223	3.051	0.476	1423.450	569.380	7780.942	1213.827
54	Rte 60 Brown Circle to Revere Street	38,830	0.37	14367.1	40	0.02	3.580	0.181	5.818	0.908	1.065	0.229	7.279	1.135	1423.450	569.380	18068.504	2818.687
55	Revere St W of Rte 60	7,690	0.10	769.0	35	0.02	3.580	0.188	0.336	0.052	1.065	0.223	0.383	0.060	1423.450	569.380	972.010	151.634
56	Revere St E of Rte 60 to Rte 1A	9,100	0.70	6370.0	35	0.02	3.580	0.188	2.660	0.415	1.065	0.223	3.138	0.489	1423.450	569.380	8004.032	1248.629
57	Bell Circle to Revere St	29,760	0.50	14880.0	40	0.02	3.580	0.181	6.003	0.936	1.065	0.229	7.532	1.175	1423.450	569.380	18704.428	2917.891
58	Bell Circle roundabout pass thru	22,260	0.07	1558.2	40	0.02	3.580	0.181	0.671	0.105	1.065	0.229	0.801	0.125	1423.450	569.380	1975.373	308.158
59	Bell Circle Rte 60 to Beach St W	19,670	0.04	786.8	35	0.02	3.580	0.188	0.369	0.058	1.065	0.223	0.400	0.062	1423.450	569.380	1004.797	156.748
60	Bell Circle Beach St W to 1A S	19,860	0.04	794.4	35	0.02	3.580	0.188	0.373	0.058	1.065	0.223	0.404	0.063	1423.450	569.380	1014.502	158.262
61	Bell Circle 1A	21,880	0.06	1312.8	35	0.02	3.580	0.188	0.592	0.092	1.065	0.223	0.660	0.103	1423.450	569.380	1666.998	260.052
62	Bell Circle 1A to Everett St	18,190	0.02	363.8	35	0.02	3.580	0.188	0.191	0.030	1.065	0.223	0.191	0.030	1423.450	569.380	472.525	73.714
63	Bell Circle Everett to Rte 60	18,440	0.02	368.8	35	0.02	3.580	0.188	0.193	0.030	1.065	0.223	0.193	0.030	1423.450	569.380	479.020	74.727
64	Beach St W	9,860	0.10	986.0	30	0.02	3.580	0.200	0.456	0.071	1.065	0.226	0.498	0.078	1423.450	569.380	1246.296	194.422
65	Everett St	2,280	0.10	228.0	30	0.02	3.580	0.200	0.106	0.016	1.065	0.226	0.115	0.018	1423.450	569.380	288.190	44.958
66	Rte 1A Bell Circle to Butler Circle	25,080	0.45	11286.0	35	0.02	3.580	0.188	4.733	0.738	1.065	0.223	5.565	0.868	1423.450	569.380	14188.892	2213.467
67	N. Shore Rd. S of Butler Circle	8,700	0.25	2175.0	35	0.02	3.580	0.188	0.921	0.144	1.065	0.223	1.075	0.168	1423.450	569.380	2737.806	427.098
68	Butler Circle N	400	0.04	16.0	35	0.02	3.580	0.188	0.008	0.001	1.065	0.223	0.008	0.001	1423.450	569.380	20.433	3.188
69	Butler Circle W	3,160	0.04	126.4	35	0.02	3.580	0.188	0.059	0.009	1.065	0.223	0.064	0.010	1423.450	569.380	161.421	25.182
70	Butler Circle S	12,690	0.04	507.6	35	0.02	3.580	0.188	0.238	0.037	1.065	0.223	0.258	0.040	1423.450	569.380	648.239	101.125
71	Wonderland Lot	170	0.10	17.0	30	0.02	3.580	0.200	0.008	0.001	1.065	0.226	0.009	0.001	1423.450	569.380	21.488	3.352
72	Bus Lane	200	0.02	4.0	30	0.02	3.580	0.200	0.002	0.000	1.065	0.226	0.002	0.000	1423.450	569.380	5.195	0.810

Caesars Resort at Suffolk Downs

Regional Mesoscale Emissions Analysis - Roadway Emissions
2022 Build

	Link	Daily Average Volumes	Miles Per Link	Miles Traveled	Vehicle Speed (mph)	Avg Idle Time (hr/veh)	Idle M6.2 VOC (g/hr)	M6.2 VOC (g/mile)	lbs/day	tons/year	Idle M6.2 NOX (g/hr)	M6.2 NOX (g/mile)	lbs/day	tons/year	Idle M6.2 CO2 (g/hr)	M6.2 CO2 (g/mile)	lbs/day	tons/year
73	**Rte 1A N of Butler Circle to Wonderland MBTA**	29,810	0.07	2086.7	30	0.02	3.580	0.200	0.985	0.154	1.065	0.226	1.059	0.165	1423.450	569.380	2645.367	412.677
74	**Rte 1A Wonderland MBTA to Revere St**	33,970	0.36	12229.2	35	0.02	3.580	0.188	5.143	0.802	1.065	0.223	6.034	0.941	1423.450	569.380	15380.616	2399.376
75	**Revere St E of Rte 1A**	9,950	0.16	1592.0	30	0.02	3.580	0.200	0.724	0.113	1.065	0.226	0.800	0.125	1423.450	569.380	2007.071	313.103
76	**1A/N. Shore Rd N of Revere St.**	32,890	0.50	16445.0	45	0.02	3.580	0.178	6.526	1.018	1.065	0.238	8.650	1.349	1423.450	569.380	20671.661	3224.779
77	**Revere Beach Blvd N of Eliot Circle**	9,910	0.50	4955.0	30	0.02	3.580	0.200	2.207	0.344	1.065	0.226	2.475	0.386	1423.450	569.380	6228.524	971.650
78	**Winthrop Pkwy S of Eliot Circle**	12,800	0.50	6400.0	30	0.02	3.580	0.200	2.850	0.445	1.065	0.226	3.197	0.499	1423.450	569.380	8044.915	1255.007
79	**State Rd Ocean Ave to Eliot Circle**	18,130	0.04	725.2	30	0.02	3.580	0.200	0.360	0.056	1.065	0.226	0.373	0.058	1423.450	569.380	926.129	144.476
80	**Ocean Ave N of State Rd**	12,400	0.18	2232.0	30	0.02	3.580	0.200	1.011	0.158	1.065	0.226	1.120	0.175	1423.450	569.380	2812.582	438.763
81	**Garfield Ave**	8,130	0.20	1626.0	30	0.02	3.580	0.200	0.735	0.115	1.065	0.226	0.815	0.127	1423.450	569.380	2048.164	319.514
82	**Webster Ave**	12,250	0.20	2450.0	30	0.02	3.580	0.200	1.107	0.173	1.065	0.226	1.229	0.192	1423.450	569.380	3086.101	481.432
83	**Rte 16 W of Garfield**	38,100	0.50	19050.0	45	0.02	3.580	0.178	7.559	1.179	1.065	0.238	10.020	1.563	1423.450	569.380	23946.193	3735.606
84	**Rte 16 Rte 1 S Ramp to Garfield/Webster**	43,400	0.16	6944.0	25	0.02	3.580	0.216	3.402	0.531	1.065	0.234	3.611	0.563	1423.450	569.380	8754.459	1365.696
85	**Rte 16 W to Rte 1 S OnRamp**	1,710	0.19	324.9	35	0.02	3.580	0.188	0.138	0.022	1.065	0.223	0.161	0.025	1423.450	569.380	409.329	63.855
86	**Rte 1 S to Rte 16 W Offramp**	9,730	0.22	2140.6	35	0.02	3.580	0.188	0.909	0.142	1.065	0.223	1.059	0.165	1423.450	569.380	2695.523	420.502
87	**Rte 1 N to Rte 16 E Offramp**	10,870	0.28	3043.6	35	0.02	3.580	0.188	1.285	0.201	1.065	0.223	1.503	0.235	1423.450	569.380	3830.029	597.485
88	**Rte 16 E to Rte 1 N Onramp**	6,640	0.24	1593.6	35	0.02	3.580	0.188	0.675	0.105	1.065	0.223	0.788	0.123	1423.450	569.380	2006.194	312.966
89	**Rte 16 W of Rte 1 Ramp to Ramp**	35,240	0.09	3171.6	45	0.02	3.580	0.178	1.322	0.206	1.065	0.238	1.687	0.263	1423.450	569.380	4011.948	625.864
90	**Rte 16 E of Rte 1 Ramp to Ramp**	31,210	0.13	4057.3	45	0.02	3.580	0.178	1.661	0.259	1.065	0.238	2.149	0.335	1423.450	569.380	5120.232	798.756
91	**Rte 16 Rte 1 to Winthrop Ave**	36,750	1.01	37117.5	45	0.02	3.580	0.178	14.646	2.285	1.065	0.238	19.500	3.042	1423.450	569.380	46624.690	7273.452
92	**Rte 16 Winthrop to Bell Circle**	13,290	0.30	3987.0	45	0.02	3.580	0.178	1.594	0.249	1.065	0.238	2.101	0.328	1423.450	569.380	5016.365	782.553
93	**Harris St**	1,960	0.16	313.6	30	0.02	3.580	0.200	0.143	0.022	1.065	0.226	0.158	0.025	1423.450	569.380	395.363	61.677
94	**Winthrop Ave W of Rte 16**	7,200	0.15	1080.0	30	0.02	3.580	0.200	0.492	0.077	1.065	0.226	0.543	0.085	1423.450	569.380	1361.973	212.468
95	**0**	0	0.00	0.0	0	0.02	3.580	0.000	0.000	0.000	1.065	0.000	0.000	0.000	1423.450	0.000	0.000	0.000
96	**Neptune Rd N of Saratoga**	11,720	0.02	234.4	30	0.02	3.580	0.200	0.129	0.020	1.065	0.226	0.124	0.019	1423.450	569.380	304.453	47.495
97	**Saratoga St E of Neptune**	8,270	0.07	578.9	30	0.02	3.580	0.200	0.273	0.043	1.065	0.226	0.294	0.046	1423.450	569.380	733.888	114.486
98	**Saratoga St W of Neptune**	2,870	0.06	172.2	30	0.02	3.580	0.200	0.082	0.013	1.065	0.226	0.088	0.014	1423.450	569.380	218.660	34.111
99	**Neptune Rd Saratoga to Bremen**	6,530	0.03	195.9	30	0.02	3.580	0.200	0.101	0.016	1.065	0.226	0.102	0.016	1423.450	569.380	251.601	39.250
100	**Bremen St N of Neptune**	1,580	0.05	79.0	30	0.02	3.580	0.200	0.038	0.006	1.065	0.226	0.040	0.006	1423.450	569.380	100.544	15.685
101	**Bremen St S of Neptune**	1,440	0.03	43.2	30	0.02	3.580	0.200	0.022	0.003	1.065	0.226	0.022	0.004	1423.450	569.380	55.483	8.655
102	**Neptune Rd Bremen to Bennington**	6,360	0.02	127.2	30	0.02	3.580	0.200	0.070	0.011	1.065	0.226	0.068	0.011	1423.450	569.380	165.215	25.774
103	**Bennington St W of Neptune Rd**	15,000	0.06	900.0	30	0.02	3.580	0.200	0.430	0.067	1.065	0.226	0.458	0.071	1423.450	569.380	1142.823	178.280
104	**Bennington E of Neptune Rd**	14,380	0.08	1150.4	35	0.02	3.580	0.188	0.508	0.079	1.065	0.223	0.575	0.090	1423.450	569.380	1456.603	227.230
105	**Ramp to 1A SB**	6,600	0.09	594.0	30	0.02	3.580	0.200	0.276	0.043	1.065	0.226	0.300	0.047	1423.450	569.380	751.386	117.216
106	**Ramp from 1A NB**	10,160	0.08	812.8	30	0.02	3.580	0.200	0.381	0.059	1.065	0.226	0.412	0.064	1423.450	569.380	1029.144	160.546
107	**1A Turnaround**	590	0.03	17.7	20	0.02	3.580	0.240	0.011	0.002	1.065	0.247	0.010	0.002	1423.450	569.380	22.733	3.546
108	**Vienna St**	7,710	0.07	539.7	30	0.02	3.580	0.200	0.255	0.040	1.065	0.226	0.274	0.043	1423.450	569.380	684.193	106.734
109	**Neptune Rd Bennington to Vienna**	7,310	0.04	292.4	30	0.02	3.580	0.200	0.145	0.023	1.065	0.226	0.150	0.023	1423.450	569.380	373.415	58.253
110	**Neptune Rd E of Vienna**	5,740	0.04	229.6	30	0.02	3.580	0.200	0.114	0.018	1.065	0.226	0.118	0.018	1423.450	569.380	293.215	45.741
111	**0**	0	0.00	0.0	0	0.02	3.580	0.000	0.000	0.000	1.065	0.000	0.000	0.000	1423.450	0.000	0.000	0.000
112	**New off ramp from Rte 1 SB to Rte 16 EB**	0	0.02	0.0	30	0.02	3.580	0.200	0.000	0.000	1.065	0.226	0.000	0.000	1423.450	569.380	0.000	0.000
113	**New on ramp from Rte 16 WB to Rte 1 NB**	0	0.03	0.0	30	0.02	3.580	0.200	0.000	0.000	1.065	0.226	0.000	0.000	1423.450	569.380	0.000	0.000
	Total	1817880.000	22.320	477004.900					198.557	30.975			242.392	37.813			600356.808	93655.662

Notes: Daily to annual factor (6 days/week * 52 weeks per year / 365 days per year) = 85%

Caesar's Resort at Suffolk Downs
Calculation of Microscale Modeling Emission Factors
Summary of MOBILE6 Output

Carbon Monoxide Only

Queues	Idle
Free Flow	30 mph
Right Turns	10 mph
Left Turns	15 mph

Winter	**2012**	**2022**	**Units**
Idle	50.215	45.893	g/hr
2.5 mph	20.086	18.357	g/mile
10 mph	10.834	10.310	g/mile
15 mph	9.736	9.364	g/mile
30 mph	8.682	8.468	g/mile

Note: Winter CO emission factors are higher than Summer and are conservatively used

Due to excessive size AERMOD, CAL3QHC, and MOBILE6.2 input and output files are available on digital media upon request.

Attachment I

Wetland Resource Area Delineation Summary Memo
(on-site)

Wetland Resource Area Delineation Summary Memo

Suffolk Downs Site

Revere & Boston, Massachusetts

January 8, 2013

OVERVIEW

The Suffolk Downs facility is located adjacent to Route 1A in Revere and East Boston, Massachusetts. The vast majority of the site is currently developed with a thoroughbred race track, ancillary facilities and structures, and paved parking lots. The site is bordered to the north by Revere Beach Parkway and residential developments; to the east by Washburn Avenue and a mix of residential and commercial developments; to the south by Waldemar Avenue and residential developments; and to the west by Route 1A and a large fuel storage facility with numerous above ground storage tanks.

On April 24, 25, and 26, and May 3, 2012, wetland and soil scientists from Epsilon Associates, Inc. ("Epsilon") delineated wetlands and other resource areas[1] within an approximately 200 acre study area at the Suffolk Downs facility. The purpose of the delineation effort was to define the extent of wetlands, resource areas and buffer zones regulated under the Massachusetts Wetlands Protection Act (MGL Ch. 131 § 40), Section 401/404 of the U.S. Clean Water Act (33 U.S.C. 1344) and local wetland ordinances in the Cities of Revere and Boston[2].

Refer to the figures provided in Attachment A for a depiction of existing conditions information.

WETLAND DELINEATION METHODOLOGY

The wetland delineation conducted by Epsilon was completed in accordance with the following regulations and guidance documents:

- U.S. Army Corps of Engineers "Wetland Delineation Manual" (1987) and the "Northcentral and Northeast Regional Supplement, Version 2.0" (2012);

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[1] "Resource Area", as used herein, means any of the areas specified in the Massachusetts Wetlands Protection Act regulations at 310 CMR 10.25 through 10.35 and 310 CMR 10.54 through 10.58. It is used synonymously with Area Subject to Protection Under M.G.L. c. 131, § 40, each one of which is enumerated in 310 CMR 10.02(1).

[2] The City of Boston does not have a Wetlands Protection Ordinance with the exception of a provision for local filing fees.

- Massachusetts Wetlands Protection Act and implementing regulations (310 CMR 10.00);
- Massachusetts Department of Environmental Protection ("MassDEP") wetland delineation guidance document entitled "Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act" (March 1995); and
- City of Revere Wetland Protection Ordinance (Title 16, Chapter 16.04).

The Corps of Engineers require the presence of three criteria for an area to be classified as a wetland (water of the U.S.)[3]: the presence of wetland hydrology, a predominance of hydrophytic vegetation (>50%), and the presence of hydric soils. The methodology prescribed by MassDEP under the Wetlands Protection Act for Bordering Vegetated Wetlands is similar although it requires the presence of only two criteria: a predominance of hydrophytic vegetation (≥ 50%) and the presence of hydrology (which can include hydric soils as per 310 CMR 10.55). The City of Revere local Ordinance requirements are consistent with the MassDEP criteria.

Intermittent and perennial stream delineations were based on the ordinary high water mark ("OHWM"), as defined by Corps of Engineers regulations and guidance documents. An OHWM is a line on the shore established by the fluctuations of water and indicated by physical characteristics, or by other appropriate means that consider the characteristics of the surrounding areas. See 33 CFR 328.3(e) and applicable Regulatory Guidance Letters. The OHWM identified by Epsilon is generally coincident with the upper boundary of Inland Bank as described under the Wetlands Protection Act regulations at 310 CMR 10.54 and the mean annual high water mark ("MAHW") for determining Riverfront Area under 310 CMR 10.58 and separate lines were determined not to be necessary.

The boundaries of wetlands were delineated in the field by tying brightly colored survey ribbons to woody vegetation or other relatively permanent vegetation. Where such vegetation was not available, wire flags were used. Colored ribbons and/or wire flagging were placed sufficiently close together to clearly identify wetland edges and to allow regulators, and work or survey crews to see adjacent flags from each other. Flags were labeled sequentially using numbers or alpha numeric identifiers.

In support of the proposed delineation, Epsilon evaluated and collected soil, hydrology, and vegetation data along transects across the wetland/upland interface and prepared corresponding Corps of Engineers wetland determination forms. This data is provided in Attachment B.

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[3] Wetlands means "those area that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas." 33 C.F.R. § 328.3(b). "Waters of the United States" is broadly defined in the federal regulations that implement the Clean Water Act. It includes tidal waters, rivers, streams, lakes, ponds and wetlands.

WETLANDS & OTHER RESOURCE AREAS

Table 1 on the following page presents a summary of the delineated wetlands and other resource areas and their corresponding jurisdictional status under the Wetlands Protection Act and Revere Wetlands Protection Ordinance. For the purposes of this evaluation it is reasonable to assume that all of the delineated vegetated wetlands and streams located within the study area are jurisdictional "waters of the U.S." as defined under Section 401 and 404 of the U.S. Clean Water Act. The wetland resource areas delineated by Epsilon are located in both Revere and Boston (the municipal boundary bisects the middle of the site). The boundaries of the delineated wetland resource areas and associated buffer zones are depicted on the existing conditions site plan prepared by Nitsch Engineering in Attachment D.

Sales Creek is depicted as a perennial stream on the applicable USGS quadrangle map (see Attachment A). According to 310 CMR 10.58(2)(a)1a, a river or stream shown as perennial on the current USGS or more recent map provided by MassDEP is perennial. Perennial streams (rivers) have a Riverfront Area. The Riverfront Area is the area of land between a river's mean annual high-water line measured horizontally outward from the river and a parallel line located 200 feet away, except that the parallel line is located: 25 feet away in Boston and 25 feet away in densely developed areas, as designated by the Secretary of the Executive Office of Energy and Environmental Affairs pursuant to 301 CMR 10.00 (see 310 CMR 10.58(2)(a)3). On March 12, 1999, Sales Creek and the surrounding environs on the project site were designated as a densely developed area by the Secretary; accordingly the Riverfront Area is also 25 feet in the City of Revere (see Attachment E). Riverfront Area does not have a buffer zone.

According to the applicable FEMA-FIRM maps 25025C0038G and 252025C0019G, a portion of the study area is located within a mapped 100-year floodplain, Zone AE, Base Elevation 9 feet NGVD (15.46 feet Boston City Base). The 100 year floodplain may be classified as Bordering Land Subject to Flooding ("BLSF") (310 CMR 10.57) or Land Subject to Coastal Storm Flowage ("LSCSF") (310 CMR 10.04) depending on site specific conditions and flooding characteristics. No distinction is made herein. Neither BLSF or LSCSF have a 100 foot buffer zone. See attached Figure 2, FEMA Flood Hazard Map.

Two man made stormwater detention/retention basins located in the City of Revere (referred to as Flag Series C and D on Table 1 below) have not been classified as jurisdictional wetland resource areas under the aforementioned regulations because they do not meet the criteria to be regulated as inland wetland resource areas including but not limited to "ponds" and "streams" (see 310 CMR 10.04) comprised of Inland Bank (310 CMR 10.54) and Land Under Water (310 CMR 10.56) or Isolated Land Subject to Flooding (310 CMR 10.57) and BVW (310 CMR 10.55). It is also Epsilon's opinion that the Corps would not likely regulate these areas as waters of the U.S.

The up gradient intermittent stream that flows into the jurisdictional pond located in the center of the race track oval in the City of Boston was also not classified as a jurisdictional wetland resource area per 310 CMR 10.04 (see definition of stream) or water of the U.S. because it appears to be excavated wholly in uplands.

Lastly, the portion of the study area that is associated with Sales Creek is located within the Rumney Marsh Area of Critical Environmental Concern ("ACEC").

See Table 1 on the following page for additional information.

Table 1 Summary of Jurisdictional Wetland Resource Areas under the Wetlands Protection Act and Revere Wetlands Ordinance

	Wetland Resource Areas Within Flag Series					
Wetland Flag Series	Inland Bank	Land Under Water	Bordering Vegetated Wetland	Isolated Land Subject to Flooding	Riverfront Area	Comments
A			•			Flag Series A delineates a detention basin that connects directly to Sales Creek (Series F/FF) via a culvert under Furlong Drive (thus making it a BVW). Series A and Flag Series B/BB are connected via a flood control gate running under an upland berm. This wetland series has a 100 foot buffer zone and is located in the City of Revere.
B/BB	•	•	•			Series B/BB delineates the edge of a linear BVW that borders an intermittent stream. The Inland Bank of the stream was not formally delineated because it exists down gradient of the BVW and is non-descript in certain stretches. This series is connected under Route 1A via a culvert. This wetland series has a 100 foot buffer zone and is located in the City of Revere and the City of Boston.
C	Non Jurisdictional Stormwater Basin					This non-jurisdictional stormwater basin is depicted as an open water body with no wetland flags shown on the enclosed existing conditions plan. It is dominated primarily by common reed *(Phragmites australis)*. The stormwater basin is located in the City of Revere.
D	Non Jurisdictional Stormwater Basin					This non-jurisdictional stormwater basin is depicted as an open water body with no wetland flags shown on the enclosed existing conditions plan. It is dominated primarily by common reed *(Phragmites australis)*. The stormwater basin is located in the City of Revere.
E			•			Flag Series E delineates a small pocket BVW/stormwater feature that is connected to Flag Series F/FF (Sales Creek) via three culverts. This wetland series has a 100 foot buffer zone and is located in the City of Revere.
F/FF	•	•	•		•	Flag Series F/F delineates BVW and the OHWM of Sales Creek (the lines are generally coincident). The 25 foot RFA extends from the OHWM. Inland Bank and LUW were not formally delineated but exist down gradient of the flag series. This wetland series has a 100 foot buffer zone from the BVW edge; the RFA does not have a buffer zone. It is located in the City of Revere.
G/GG			•			Flag Series G/GG delineates a pocket BVW/stormwater feature that is connected via a culvert to Flag Series F/FF. This wetland series has a 100 foot buffer zone and is located in the City of Revere.
H	•	•	•			Flag Series H/HH delineates a Bank and BVW that borders an intermittent stream (drainage ditch); these resource areas are generally coincident throughout. LUW was not formally delineated but it exists down gradient of the flag series. The higher elevation culvert inlet near Route 1A receives drainage from adjacent roads, as does the culvert outlet. Wetland Series H has a 100 foot buffer zone and is located in the City of Boston.
I/II	•	•			•	Flag Series I/II delineate Inland Bank and the OHWM of Sales Creek where it flows aboveground through the study area. The 25 foot RFA extends from the OHWM. This wetland series has a 100 foot buffer zone from the Bank; the RFA does not have a buffer zone. It is located in the City of Revere

	Wetland Resource Areas Within Flag Series					
Wetland Flag Series	Inland Bank	Land Under Water	Bordering Vegetated Wetland	Isolated Land Subject to Flooding	Riverfront Area	Comments
J/JJ	•	•			•	Flag Series J/JJ delineates Inland Bank and the OHWM of Sales Creek where it flows aboveground through the study area. The 25 foot RFA extends from the OHWM. This wetland series has a 100 foot buffer zone from the Bank; the RFA does not have a buffer zone. It is located in the City of Revere.
K/KK	•	•	•			Flag Series K/KK delineates BVW that borders an intermittent stream comprised of Inland Bank and LUW. Select portions of this series also delineate Sales Creek OHWM and its associated 25 foot RFA. This wetland series has a 100 foot buffer zone from the BVW edge; the RFA does not have a buffer zone. It is located in the City of Revere and the City of Boston.
L/LL	•	•	•			Flag Series L/LL delineates BVW that borders an intermittent stream comprised of Inland Bank and LUW. Select portions of this series also delineate Sales Creek OHWM and its associated 25 foot RFA. This wetland series has a 100 foot buffer zone from the BVW edge; the RFA does not have a buffer zone. It is located in the City of Revere.
Pond within Race Track Oval and Upgradient Drainage Ditch	•	•				The open water body located in the center of the race track oval appears to meet the definition of a pond as defined under 310 CMR 10.04.[1] The pond is comprised of Inland Bank and LUW; there is no BVW present. There is a 100 foot buffer zone that extends from the edge of the pond (it was not formally delineated in the field because its boundary is so well defined). The pond is located in the City of Boston. The man made drainage ditch located upgradient of the pond was not classified as a jurisdictional wetland resource area. According to 310 CMR 10.04, such a body of running water which does not flow throughout the year (i.e., which is intermittent) is a stream except for that portion upgradient of all bogs, swamps, wet meadows and marshes.

[1] According to 310 CMR 10.04, "pond" means any open body of fresh water with a surface area observed or recorded within the last ten years of at least 10,000 square feet. Ponds may be either naturally occurring or man-made by impoundment, excavation, or otherwise. Ponds shall contain standing water except for periods of extended drought. Periods of extended drought for purposes of 310 CMR 10.00 shall be those periods, in those specifically identified geographic locations, determined to be at the "Advisory" or more severe drought level by the Massachusetts Drought Management Task Force, as established by the Executive Office of Environmental Affairs and the Massachusetts Emergency Management Agency in 2001, in accordance with the Massachusetts Drought Management Plan (MDMP). Notwithstanding the above, the following man-made bodies of open water shall not be considered ponds: (a) basins or lagoons which are part of wastewater treatment plants; (b) swimming pools or other impervious man-made basins; and (c) individual gravel pits

ATTACHMENTS

Attachment A:

- USGS Locus Map (depicting Riverfront Area)
- FEMA Flood Hazard Map
- MassGIS Soils Map
- MassDEP Mapped Wetlands
- ACEC Map

Attachment B:

- U.S. Army Corps of Engineers wetland determination forms

Attachment C:

- Site Photos

Attachment D:

- Wetland Resource Areas Plan (prepared by Nitsch Engineering)

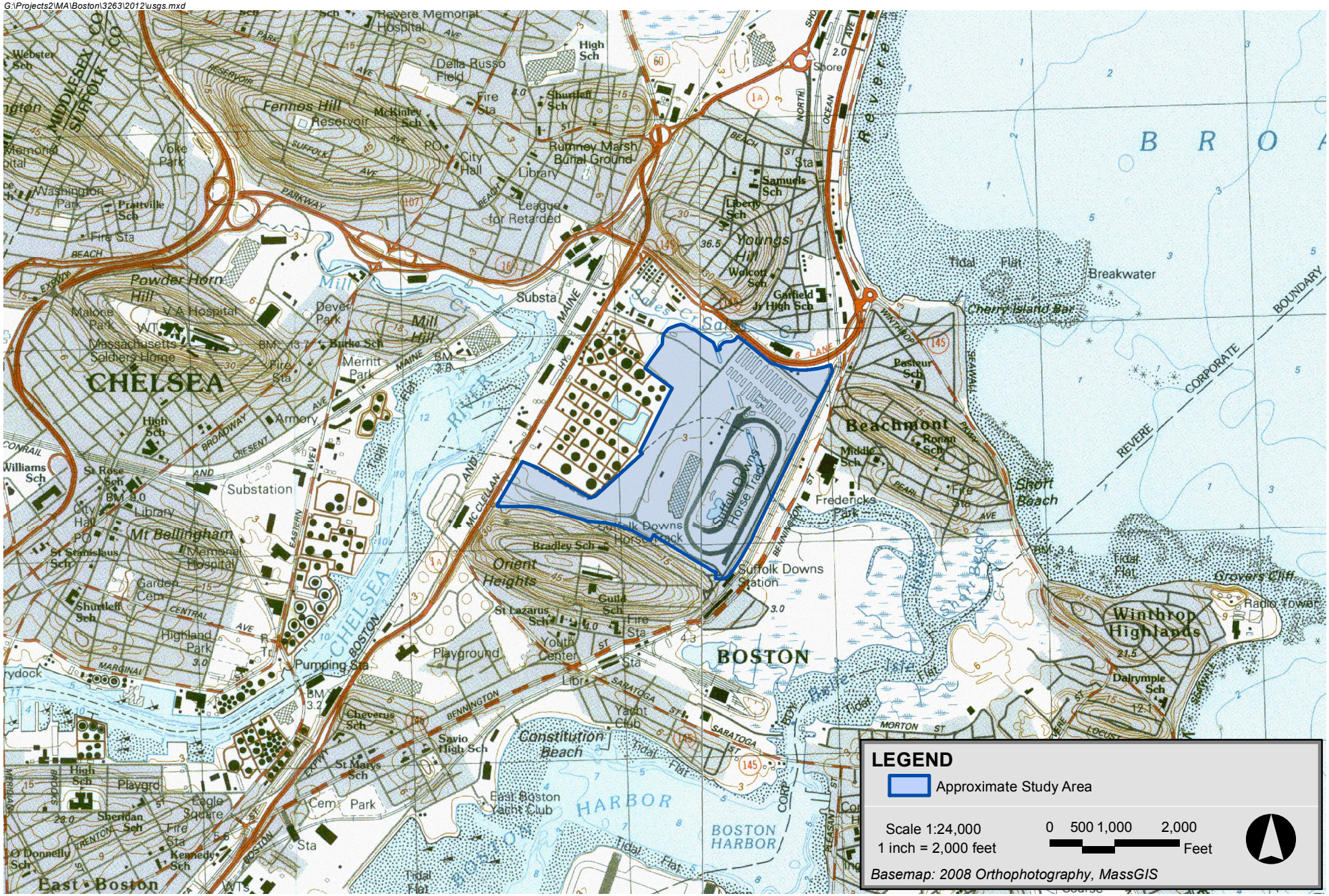
Attachment E:

- Densely Developed Area Determination for Riverfront Area

Attachment A

MassGIS Figures

G:\Projects2\MA\Boston\3263\2012\usgs.mxd

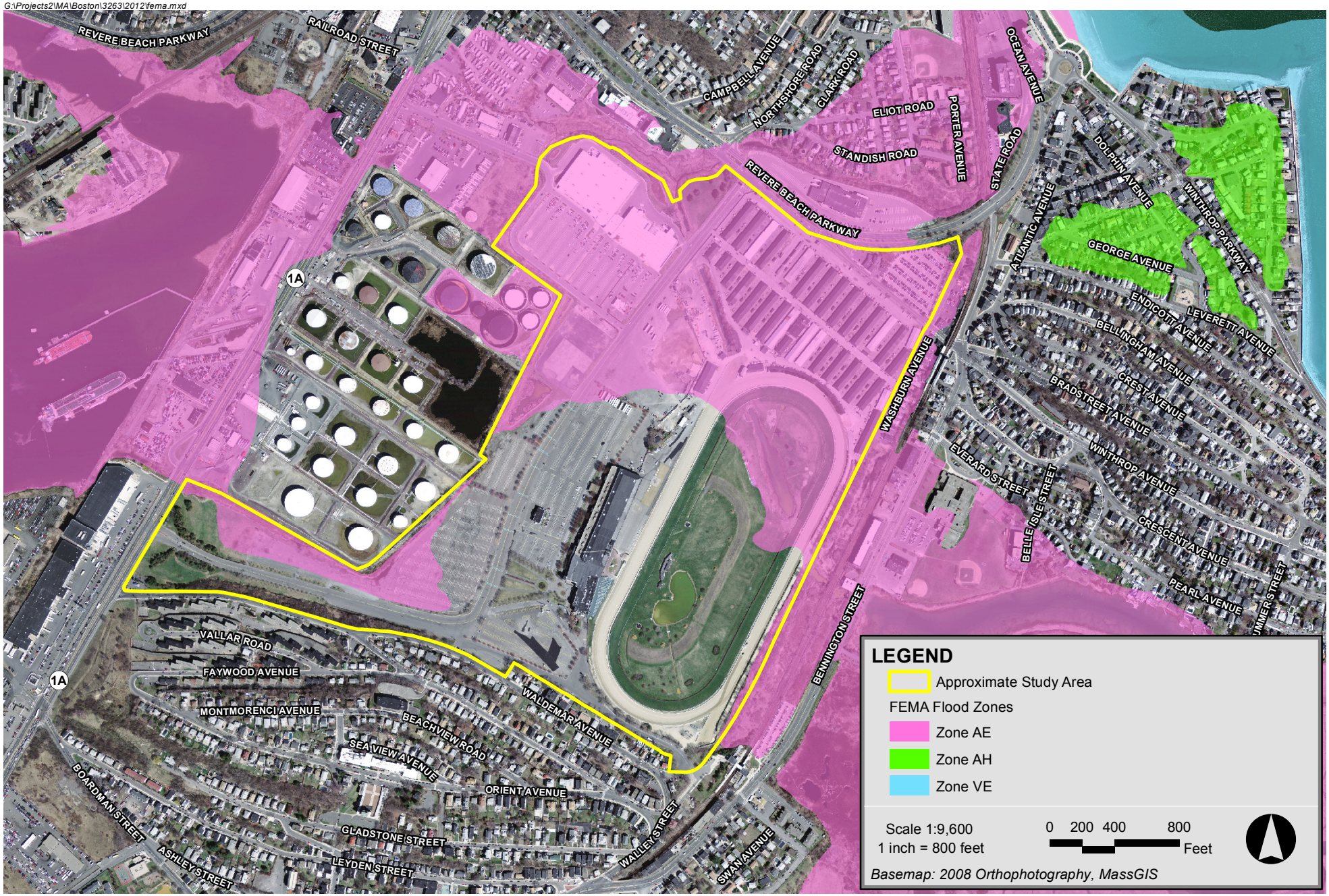


Suffolk Downs Boston/Revere, Massachusetts

Epsilon ASSOCIATES INC.

Figure 1
USGS Locus

G:\Projects2\MA\Boston\3263\2012\fema.mxd



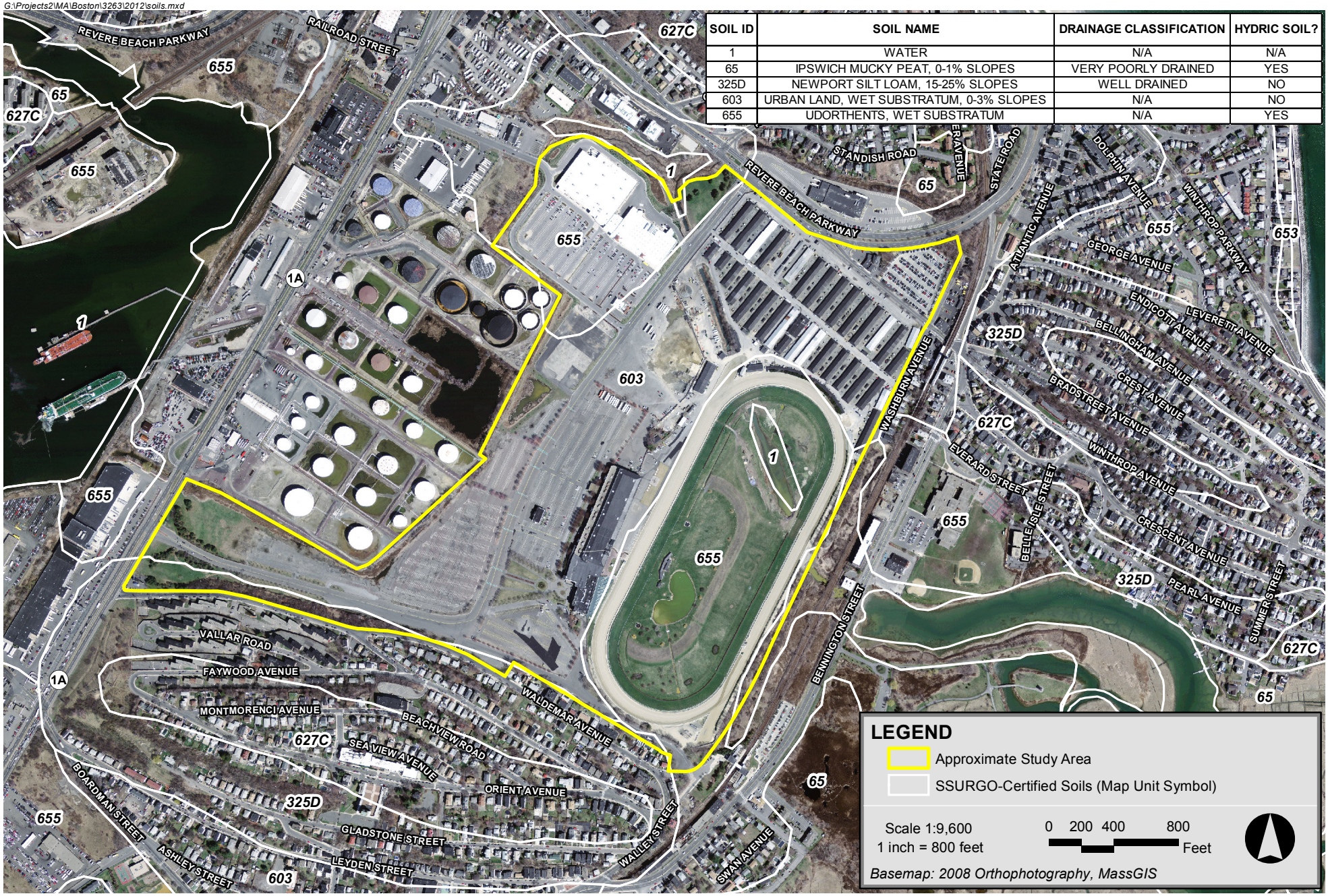
Suffolk Downs Boston/Revere, Massachusetts

Epsilon ASSOCIATES INC.

Figure 2

FEMA Flood Zones

G:\Projects2\MA\Boston\3263\2012\soils.mxd



SOIL ID	SOIL NAME	DRAINAGE CLASSIFICATION	HYDRIC SOIL?
1	WATER	N/A	N/A
65	IPSWICH MUCKY PEAT, 0-1% SLOPES	VERY POORLY DRAINED	YES
325D	NEWPORT SILT LOAM, 15-25% SLOPES	WELL DRAINED	NO
603	URBAN LAND, WET SUBSTRATUM, 0-3% SLOPES	N/A	NO
655	UDORTHENTS, WET SUBSTRATUM	N/A	YES

Suffolk Downs Boston/Revere, Massachusetts

Epsilon ASSOCIATES INC.

Figure 3
MassGIS Soils

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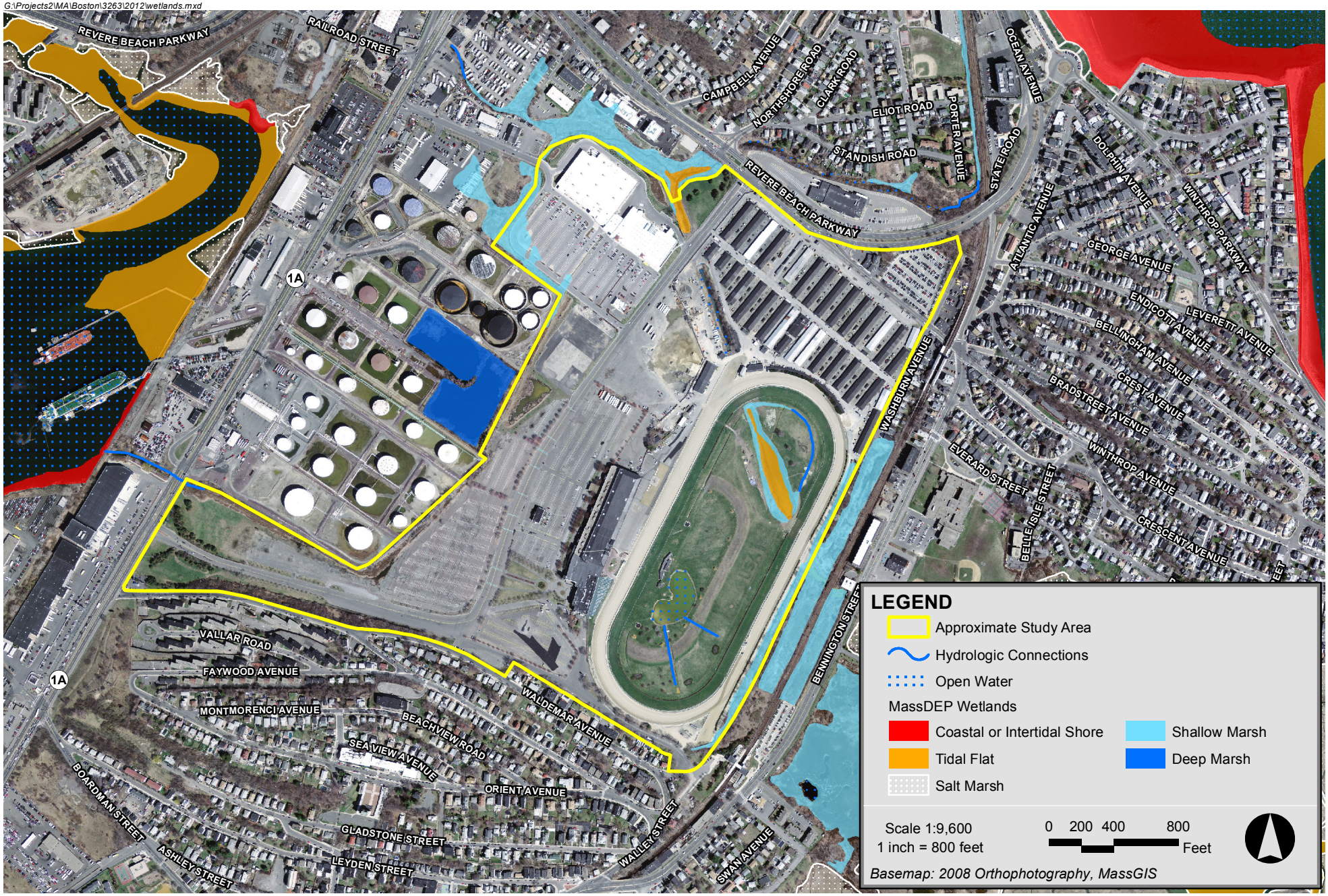
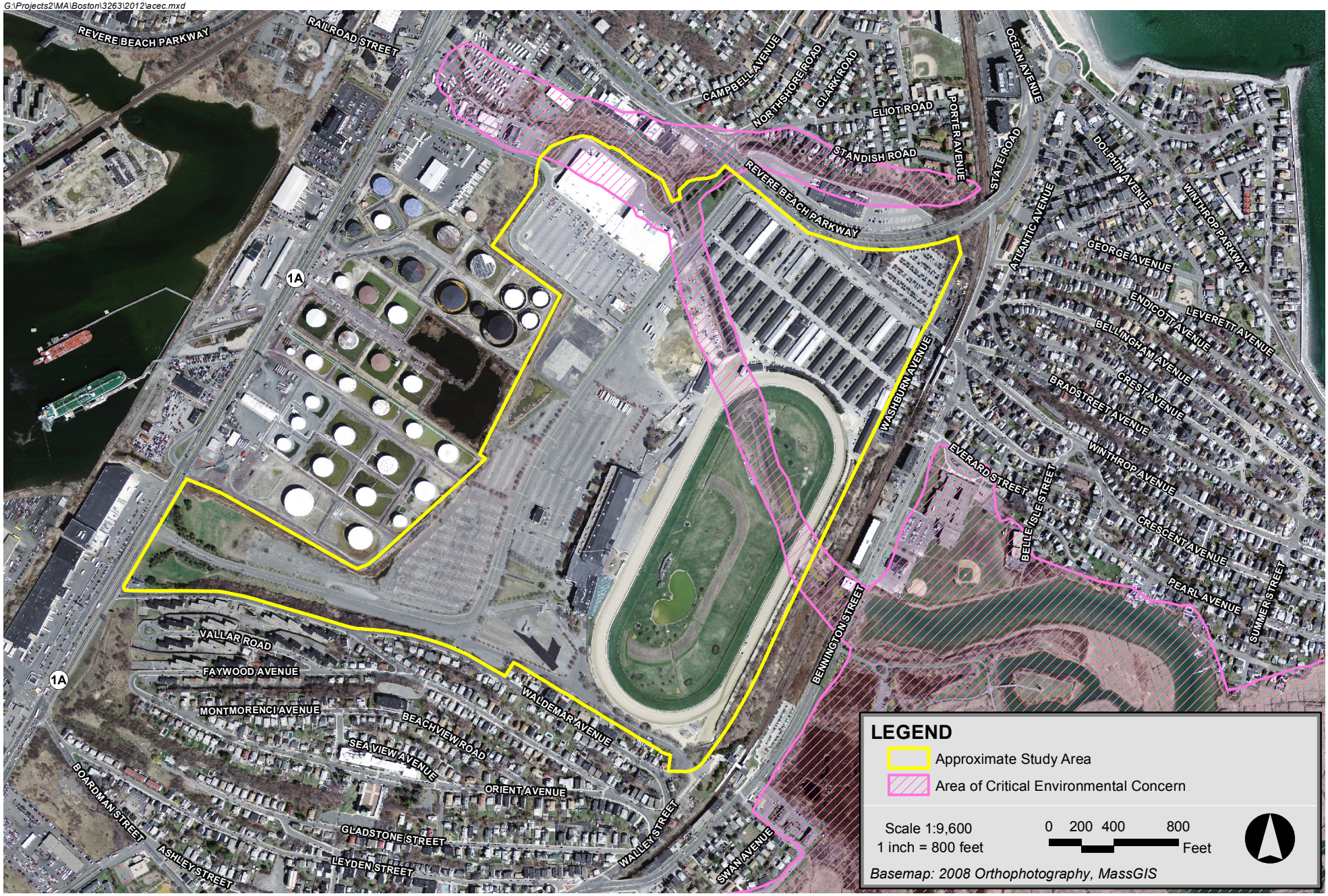


Suffolk Downs Boston/Revere, Massachusetts

Epsilon ASSOCIATES INC.

Figure 4
MassDEP Wetlands

G:\Projects2\MA\Boston\3263\2012\acec.mxd



Suffolk Downs Boston/Revere, Massachusetts

Epsilon ASSOCIATES INC.

Figure 5

Areas of Critical Environmental Concern

Attachment B

U.S. Army Corps of Engineers Wetland Determination Forms

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: SUFFOLK DOWNS City/County: BOSTON/SUFFOLK Sampling Date: 5-3-12

Applicant/Owner: SUFFOLK DOWNS State: MA Sampling Point: B/BBW

Investigator(s): J.FENNELL, A.ATWELL Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): FLOODPLAIN Local relief (concave, convex, none): CONVEX Slope (%): 1

Subregion (LRR or MLRA): R Lat: 42 23'41.06" N Long: 71 00'29.77"W Datum: WGS84

Soil Map Unit Name: URBANLANDS, WET SUBSTRATUM, 0-3% SLOPES NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X	No _____	
Wetland Hydrology Present?	Yes X	No _____	If yes, optional Wetland Site ID: B/BB

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes X	No _____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: B/BBW

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. NONE PRESENT			
2.			
3.			
4.			
5.			
6.			
7.			
	0 = Total Cover		

Sapling/Shrub Stratum (Plot size: 15')			
1. NONE PRESENT			
2.			
3.			
4.			
5.			
6.			
7.			
	0 = Total Cover		

Herb Stratum (Plot size: 5')			
1. JUNCUS EFFUSUS	30	Y	FACW
2. PHRAGMITES AUSTRALIS	20	Y	FACW
3. POA PRATENSIS	20	Y	FACU
4. CAREX STIPATA	5	N	OBL
5. LYTHRUM SALICARIA	5	N	OBL
6. EPILOBIUM COLORATUM	2	N	OBL
7.			
8.			
9.			
10.			
11.			
12.			
	102 = Total Cover		

Woody Vine Stratum (Plot size: 30')			
1. NONE PRESENT			
2.			
3.			
4.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

__ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

__ 3 - Prevalence Index is ≤3.0[1]

__ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: B/BBW

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/1	92	10YR 4/4	8	C	M	SANDY LOAM	
4-7	N 3/0	90	10Y 4/1	2	D	M	SANDY LOAM	
			7.5YR 4/6	8	C	M		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ASPHALT/FILL

Depth (inches): 7

Hydric Soil Present? Yes XX No ____

Remarks:

MADE THREE AUGER ATTEMPTS WITH SHALLOW REFUSAL.



Photo 1: View of COE wetland Plot B/BBW, facing north.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: SUFFOLK DOWNS City/County: BOSTON/SUFFOLK Sampling Date: 5-3-12

Applicant/Owner: SUFFOLK DOWNS State: MA Sampling Point: B/BBU

Investigator(s): J.FENNELL, A.ATWELL Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): FLOODPLAIN Local relief (concave, convex, none): CONCAVE Slope (%): 1

Subregion (LRR or MLRA): R Lat: 42 23'40.77"N Long: 71 00'29.77"W Datum: WGS84

Soil Map Unit Name: Urbanland, wet substratum, 0-3% slopes NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes _____	No X	

Remarks: (Explain alternative procedures here or in a separate report.)

ACTIVELY MOWED AREA WITH POORLY DEVELOPED SOIL AND BROKEN ASPHALT AND FILL SUBSTRATE.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: B/BBU

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. NONE PRESENT			
2.			
3.			
4.			
5.			
6.			
7.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1. NONE PRESENT			
2.			
3.			
4.			
5.			
6.			
7.			
	0 = Total Cover		
Herb Stratum (Plot size: 5')			
1. POA PRATENSIS	25	Y	FACU
2. TRIFOLIUM PRATENSE	25	Y	FACU
3. LYTHRUM SALICARIA	5	N	OBL
4. TARAXICUM OFFICINALE	5	N	FACU
5. CAREX SP.	5	N	NI
6. POA SP.	5	N	NI
7.			
8.			
9.			
10.			
11.			
12.			
	70 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: B/BBU

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 3/1	98	10YR 4/1	2	C	M	SANDY LOAM	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ASPHALT/FILL

Depth (inches): 3

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

MADE THREE AUGER ATTEMPTS WITH SHALLOW REFUSAL.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: SUFFOLK DOWNS City/County: REVERE/SUFFOLK Sampling Date: 5-3-12

Applicant/Owner: SUFFOLK DOWNS State: MA Sampling Point: F/FFW

Investigator(s): J.FENNELL, A.ATWELL Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): FLOODPLAIN Local relief (concave, convex, none): CONCAVE Slope (%): 3

Subregion (LRR or MLRA): R Lat: 42 24'01.84"N Long: 70 59'53.18"W Datum: WGS84

Soil Map Unit Name: UDORTHENTS, WET SUBSTRATUM NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** **Yes** X **No** _____
Hydric Soil Present?	Yes X	No _____	
Wetland Hydrology Present?	Yes X	No _____	If yes, optional Wetland Site ID: F/FF

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes X	No _____	Depth (inches): 8
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: F/FFW

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. NONE PRESENT			
2.			
3.			
4.			
5.			
6.			
7.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1. NONE PRESENT			
2.			
3.			
4.			
5.			
6.			
7.			
	0 = Total Cover		
Herb Stratum (Plot size: 5')			
1. PHRAGMITES AUSTRALIS	100	Y	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1. NONE PRESENT			
2.			
3.			
4.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

X 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: F/FFW

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	2.5YR 3/1	100					SILT LOAM	
2-10	2.5Y 4/1	70	10YR 4/6	30	C	M	SILT LOAM	
10-16	5Y 4/1	80	10YR 4/3	20	C	M	SILT LOAM	
16-20	N 5/0	100						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:



Photo 2: View of COE wetland data plot F/FFW facing northwest.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: SUFFOLK DOWNS City/County: REVERE/SUFFOLK Sampling Date: 5-3-12

Applicant/Owner: SUFFOLK DOWNS State: MA Sampling Point: F/FFU

Investigator(s): J.FENNELL, A.ATWELL Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): FLOODPLAIN Local relief (concave, convex, none): CONVEX Slope (%): 1

Subregion (LRR or MLRA): R Lat: 42 24'01.62"N Long: 70 59'53.05"W Datum: WGS84

Soil Map Unit Name: UDORTHENTS, WET SUBSTRATUM NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes _____	No X	

Remarks: (Explain alternative procedures here or in a separate report.)

MOWED AND LANDSCAPED AREA

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: F/FFU

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. TILIA AMERICANA	5	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	5	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1. AILANTHUS ALTISSIMA	2	Y	UPL
2.			
3.			
4.			
5.			
6.			
7.			
	2	= Total Cover	
Herb Stratum (Plot size: 5')			
1. POA PRATENSIS	80	Y	FACU
2. PLANTAGO MAJOR	8	N	FACU
3. TARAXICUM OFFICINALE	5	N	FACU
4. Lamium purpureum	2	N	UPL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	95	= Total Cover	
Woody Vine Stratum (Plot size: 30')			
1. PARTHENOCISSUS QUINQUEFOLIA	10	Y	FACU
2.			
3.			
4.			
	10	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: F/FFU

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-10	10YR 3/1	100					SANDY LOAM	
10-15	2.5 Y 4/2	100					SANDY LOAM	
15-20+	2.5 Y 3/1	100					SANDY LOAM	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: SUFFOLK DOWNS City/County: BOSTON/SUFFOLK Sampling Date: 5-3-12

Applicant/Owner: SUFFOLK DOWNS State: MA Sampling Point: H/HHW

Investigator(s): J.FENNELL, A.ATWELL Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): DITCH/SWALE Local relief (concave, convex, none): CONCAVE Slope (%): 3

Subregion (LRR or MLRA): R Lat: 42 23'36.75"N Long: 71 00'28.24"W Datum: WGS84

Soil Map Unit Name: URBANLAND, WET SUBSTRATUM, 0-3% SLOPES NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** **Yes** X **No** _____
Hydric Soil Present?	Yes X	No _____	
Wetland Hydrology Present?	Yes X	No _____	If yes, optional Wetland Site ID: H/HHW

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No _____	Depth (inches): 1
Water Table Present?	Yes X	No _____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: H/HHW

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. NONE PRESENT			
2.			
3.			
4.			
5.			
6.			
7.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1. MYRICA GALE	10	Y	OBL
2. FRANGULA ALNUS	10	Y	FAC
3. ROSA MULTIFLORA	5	Y	FACU
4.			
5.			
6.			
7.			
	25 = Total Cover		
Herb Stratum (Plot size: 5')			
1. PHRAGMITES AUSTRALIS	100	Y	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1. NONE PRESENT			
2.			
3.			
4.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: H/HHW

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 3/1	100					SILT LOAM	
3-16	10YR 5/1	55	10YR 4/4	40	C	M	SANDY LOAM	
			10YR 5/6	5	C	M		
16-20	5N 5/0	79	10YR 4/4	15	C	M	SANDY LOAM	
			10YG 6/0	6	D	M		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:



Photo 3: View of COE wetland data plot H/HHW, facing south.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: SUFFOLK DOWNS City/County: BOSTON/SUFFOLK Sampling Date: 5-3-12

Applicant/Owner: SUFFOLK DOWNS State: MA Sampling Point: H/HHU

Investigator(s): J.FENNELL, A.ATWELL Section, Township, Range: N/NA

Landform (hillslope, terrace, etc.): TERRACE Local relief (concave, convex, none): CONVEX Slope (%): 2

Subregion (LRR or MLRA): R Lat: 42 23'36.88" N Long: 71 00' 28.19" W Datum: WGS84

Soil Map Unit Name: URBANLAND, WET SUBSTRATUM 0-3% SLOPES NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

MOWED AND LANDSCAPED AREA

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: H/HHU

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. ACER PLATANOIDES	10	Y	UPL
2. JUNIPERUS VIRGINIANA	5	Y	FACU
3.			
4.			
5.			
6.			
7.			
	15	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15')			
1. ROSA MULTIFLORA	2	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	2	= Total Cover	

Herb Stratum (Plot size: 5')			
1. POA PRATENSIS	75	Y	FACU
2. TRIFOLIUM PRATENSE	5	N	FACU
3. ACHILLEA MILLEFOLIUM	5	N	FACU
4. PLANTAGO MAJOR	3	N	FACU
5. TARAXICUM OFFICINALE	3	N	FACU
6. OXALIS SP.	3	N	NI
7.			
8.			
9.			
10.			
11.			
12.			
	94	= Total Cover	

Woody Vine Stratum (Plot size: 30')			
1. NONE PRESENT			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: H/HHU

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 3/2	100					SANDY LOAM	
3-6	10YR 4/2	100					SANDY LOAM	
6-7	10YR 5/3	90	10YR 4/4	10	C	M	SANDY LOAM	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: COMPACTED FILL

Depth (inches): 7

Hydric Soil Present? Yes _____ No X

Remarks:

MADE THREE AUGER ATTEMPTS WITH SHALLOW REFUSAL.

Attachment C

Site Photos



Photo 1: View of Flag Series C from Flag C-1, facing southwest.



Photo 2: View of Flag Series B from Flag B-64, facing north.



Photo 3: View of Series F/FF (Sales Creek) from Flag FF-16, facing northwest.



Photo 4: View of Series J/JJ (Sales Creek, facing southeast. Area is inside race track.



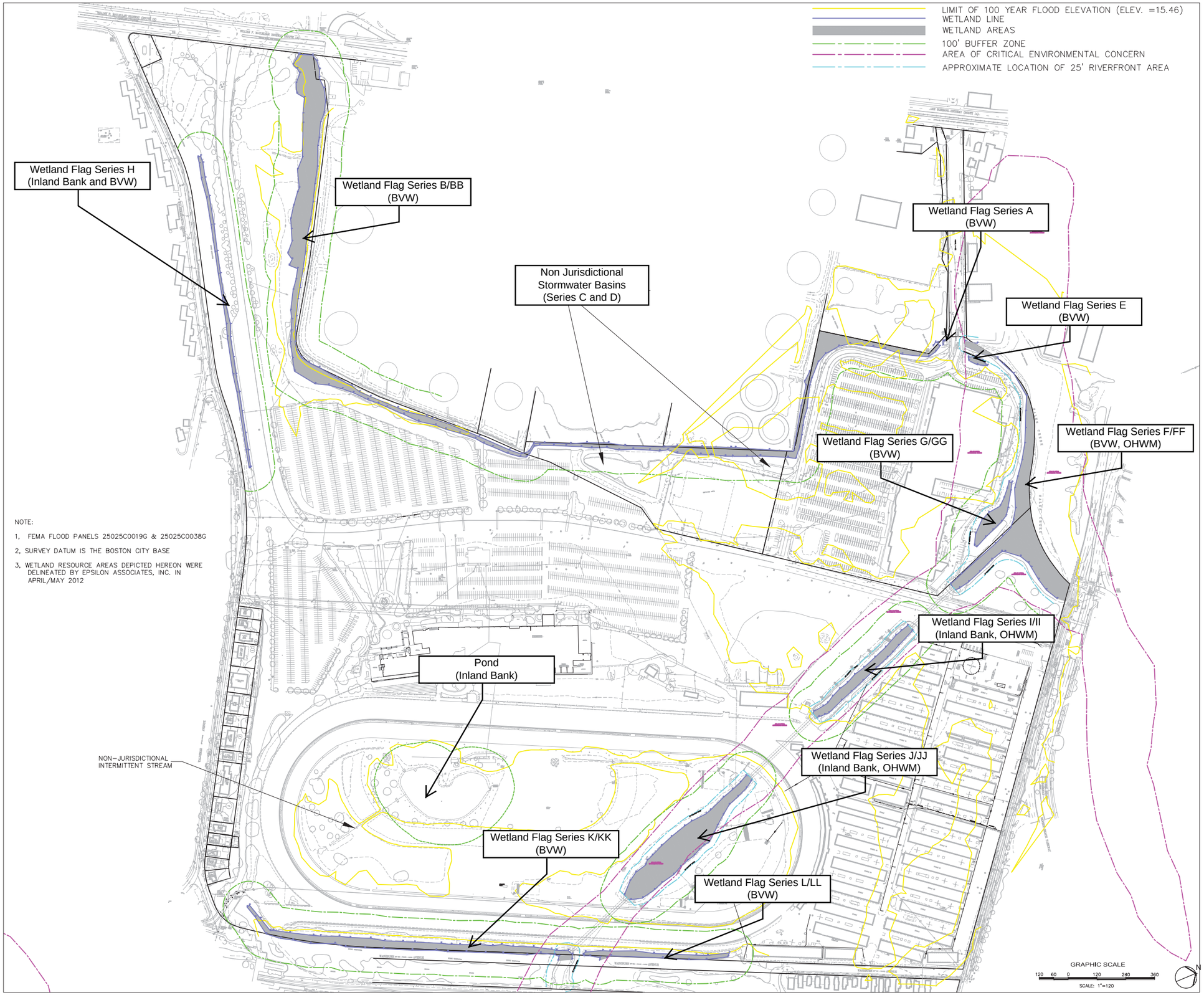
Photo 5: View of Flag Series H/HH facing east from Flag H-5.



Photo 6: View of Series L/LL from flag L-8, facing north.

Attachment D

Wetland Resource Area Plan



NOTE:

1, FEMA FLOOD PANELS 25025C0019G & 25025C0038G

2, SURVEY DATUM IS THE BOSTON CITY BASE

3, WETLAND RESOURCE AREAS DEPICTED HEREON WERE DELINEATED BY EPSILON ASSOCIATES, INC. IN APRIL/MAY 2012

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ELKUS | MANFREDI
ARCHITECTS

[address] 300 A STREET
BOSTON MASSACHUSETTS 02210
[tel] 617-426-1300

The Resort at Suffolk Downs
Boston, Massachusetts

Nitsch Engineering

PROJECT NUMBER: 9180.2

DATE: JUNE 13, 2012

REVISIONS:

SCALE: AS NOTED

DRAWING NAME:
WETLAND RESOURCE AREA PLAN

DRAWING NUMBER:
CLRS1

PRELIMINARY AND PROPRIETARY
NOT FOR CONSTRUCTION

Attachment E

Densely Developed Riverfront Area Determination

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
100 Cambridge Street, Boston, MA 02202

ARGEO PAUL CELLUCCI
GOVERNOR

JANE SWIFT
LIEUTENANT GOVERNOR

BOB DURAND
SECRETARY

Tel. (617) 727-9800
Fax (617) 727-2754
http://www.magnet.state.ma.us/envir

March 12, 1999

APPROVAL OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS
OF A
DESIGNATION OF A DENSELY DEVELOPED AREA

PROJECT NAME	:Sales Creek Densely Developed Area
PROPONENT MUNICIPALITY	:Revere
PROJECT WATERSHED	:North Coastal
DATE NOTICED IN MONITOR	:February 10, 1999

Pursuant to the Massachusetts Wetlands Protection Act (M.G.L. c. 131 s. 40 as amended by St. 1996 c. 258) and M.G.L. c. 21A s. 2, and the regulations governing the designation of Densely Developed Areas (310 C.M.R. 10.00), I hereby approve the designation of a Densely Developed Area (DDA) in the municipality of Revere, as described below.

The DDA comprises an area of Revere bounded generally on the west by Lee Burbank Highway, on the north by Revere Beach Parkway and Standish Road, on the east by Bennington Street, and on the south by Diner Road (a private way through Suffolk Downs). In particular, the approved DDA boundary runs as follows: from the conjunction of the northwesterly bank of Sales Creek and Lee Burbank Highway (Route 1A), and running along the northerly bank of Sales Creek to the fork in Sales Creek, thence along the northerly bank of the north fork and under Revere Beach Parkway, thence north of Revere Beach Parkway and south of Standish Road until the conjunction of the north branch of Sales Creek and Bennington Road south of Standish Road; and from the conjunction of the southwesterly bank of Sales Creek and Lee Burbank Highway along the southerly bank of Sales Creek to the fork in Sales Creek, thence along the south fork of Sales Creek, under Tomasello Road, and under the Suffolk Downs Race Track along the

Printed on Recycled Stock, 20% Post Consumer Waste.

Revere DDA Approval March 12, 1999

Revere/Boston corporate boundary, to its conjunction with Bennington Road.

I find that the petition submitted by the City of Revere meets the designation standards found at 310 C.M.R. 10.05. The total area proposed to be designated as densely developed is slightly more than 50 acres. According to the petition, approximately 31 acres of that area are in industrial and commercial use, and 20 acres are in residential use. The whole of the area is within the 200 foot riverfront area. With several isolated exceptions, the area is utilized intensively by commercial, industrial, and residential uses or by underutilized but disturbed land. Most of the underdeveloped land is composed of fill, much of it covered by invasive, nuisance vegetation.

The DDA petition area is a well conceived proposal in keeping with the letter and spirit of the DDA regulations. The DDA petition resulted in several comment letters to me in favor of the petition, and several letters raising concerns about the petition and offering solutions to problems that could follow the DDA designation. Specifically, I refer the City of Revere to the comment letters from the Department of Environmental Management, the Office of Coastal Zone Management, and the Metropolitan Area Planning Council for guidance on how the City and future developers can repair existing damage to Sales Creek and avoid or mitigate potential future impacts. I anticipate that the designation of the DDA will serve to focus new development in an already disturbed and densely developed area, where density of development makes environmentally more sustainable transportation options (such as transit or vanpooling) more feasible.

In accordance with the DDA regulations, the designation described above takes effect immediately.

March 12, 1999
Date

Bob Durand

Revere DDA Approval March 12, 1999

Comments received :

1/25/99	State Senator Robert E. Travaglini and State Representatives Robert A. DeLeo, Emmanuel G. Serra, and Kathi-Anne Reinstein
2/22/99	Riverways Program
3/2/99	Office of Coastal Zone Management
3/2/99	Stephanie DeSisto, Revere Neighborhood Association
3/3/99	Adele J. Toro
3/3/99	Metropolitan Area Planning Council
3/4/99	Department of Environmental Management

BD/LER/ler

Attachment J

MHC Form A

FORM A - AREA

Assessor's Sheets	USGS Quad	Area Letter	Form Numbers in Area
BOS - 102524000 REV – 4-80-14B	Boston North and Lynn		209

MASSACHUSETTS HISTORICAL COMMISSION
MASSACHUSETTS ARCHIVES BUILDING
220 MORRISSEY BOULEVARD
BOSTON, MASSACHUSETTS 02125

Photograph



Town/City: Boston and Revere

Place *(neighborhood or village):* East Boston

Name of Area: Suffolk Downs

Present Use: Horse Racing

Construction Dates or Period: 1935, 1953, 1962-65, 1991

Overall Condition: Fair to Good

Major Intrusions and Alterations: Major window modifications, 1962-1965 and 1991 major additions and renovations

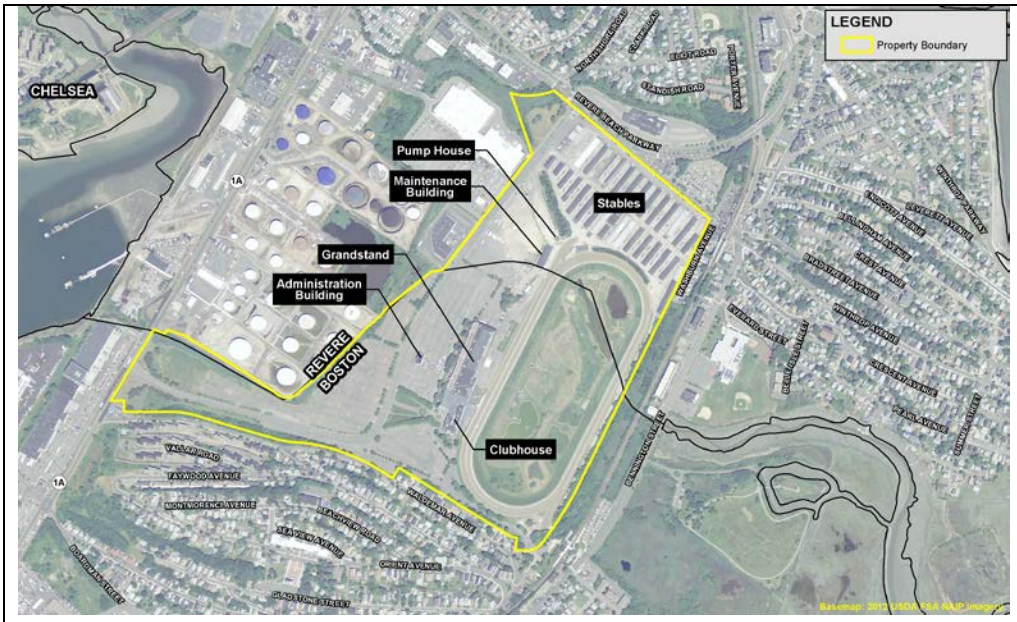
Acreage: 161 acres

Recorded by: Taya Dixon

Organization: Epsilon Associates, Inc.

Date *(month/year):* July 2013

Locus Map



☒ *see continuation sheet*

☐ Recommended for listing in the National Register of Historic Places.
If checked, you must attach a completed National Register Criteria Statement form.

Use as much space as necessary to complete the following entries, allowing text to flow onto additional continuation sheets.

ARCHITECTURAL DESCRIPTION

Describe architectural, structural and landscape features and evaluate in terms of other areas within the community.

Suffolk Downs is situated on 161 acres of land in the East Boston neighborhood of Boston and within the City of Revere. The race track facility is bounded on the east by the MBTA subway line which includes the Suffolk Downs train station at the property's southeast corner. Tomasello Way and an oil tank facility form the western boundary of the site. The property is bounded to the north by Revere Beach Parkway and Winthrop Avenue and to the south by Waldemar Avenue and residential properties. The Suffolk Downs property encompasses the racetrack, connected clubhouse and grandstand, administration building, barns, and ancillary support buildings.

Surface parking is situated on the western side of the site on both sides of Tomasello Way. Now referred to as the office building, the two-story steel frame concrete clad former administration building is situated on the east side of Tomasello Way. Surrounded by surface parking, the administration building is nine-bays long (east and west elevations) and five-bays wide (north and south elevations). The first floor of the east elevation projects out one bay off the façade, and a central projecting rectangular bay extends out of the center of the second floor of the west elevation. All window openings within the building have been completely or partially infilled with concrete block and largely contain one-over-one double hung sash. The building exhibits significant areas of spalled concrete and deteriorated paint. The flat roof of the building collapsed during a heavy rainstorm in late 2012 and is now vacant, with considerable water damage.

The north side of the site contains approximately 30 wood frame barns, several sheds and ancillary buildings, and jockey quarters. The barns are aligned in two rows of parallel buildings separated by a central lane running east west. The barn area is separated from the surface parking by a drainage ditch to the southeast carrying Sales Creek from Chelsea Creek to the Belle Isle Marsh. The barn area is separated from the racetrack by a curved barn structure (date unknown). Most of the barns are long, one-story wood frame structures clad in wide horizontal clapboard siding with single leaf board and batten doors at each stall. The roofs of the barns extend past the walls creating covered walkway along each side of the building. A one-story wood frame maintenance building (date unknown) is situated between the barns and the grandstand just west of the race track. A small, one-story concrete sewer pump station is located just north of the grandstand.

The one-mile long oval race track is located on the east side of the site. The dirt track is bounded by a wood rail fence and the infield is primarily covered in grass. A grass track is situated immediately inside the dirt track and is defined on both sides by a wood rail fence. A portion of the former half-mile harness racing track (1962) is still visible in the infield. Also located in the infield is a portion of Sales Creek, a pond, and the tote board which faces the grandstand. Several trees and shrubs are also located throughout the infield.

Near the center of the property is the connected clubhouse and grandstand. Originally two separate structures, the buildings were connected in 1962 through an expansion of the grandstand. The smaller clubhouse is at the south end of the complex while the grandstand and its later addition is situated at the north end. Although somewhat altered from its original design, the landscaped entrance court on the west side of the clubhouse remains. The area is now laid out with pedestrian walkways and grassy areas bounded with trees and shrubs.

Constructed in 1935, the clubhouse was designed in the Art Deco style. The present day west elevation is a reconstruction of the original elevation following removal of the 1962 International Style addition. The east side of the building reflects its original design from 1935, its 1953 modifications, and the 1962 International Style renovation. The east elevation is accessed from a wide, elevated landing set atop several concrete steps. The original clubhouse section (south end) contains a southern bay with punched window openings at the second and third stories, and a tower with a single bay of punched window openings adjacent to a three-bay wide façade to the north. Wide expanses of doors at the first floor and windows at the second and third levels are separated by wide concrete clad piers. To the north is a slightly recessed, three-story bay with wide rectangular window openings. The elevation then steps forward one bay with the south elevation being a solid concrete wall and the east elevation defined by a ground level entrance and two levels of windows above. All windows are aluminum sash designed to appear as steel sash similar in character to what was present in 1935. The south elevation of the clubhouse is utilitarian in design containing a return bay of punched window openings on the west side. The elevation is then set forward one return bay (solid concrete wall), and contains three levels of completely or partially infilled window openings. At the elevation's eastern end, the glass enclosed viewing platforms at the second and third floor stories are visible. The east elevation contains three stories of tall windows separated by vertical steel mullions. The windows are set atop long ribbons of concrete wall at the second and third stories. The flat roof is accentuated by a narrow ribbon of concrete. The interior is predominately finished with modern furred out walls, drop ceilings, and carpeting.

The existing grandstand building was constructed in two building campaigns: 1935 and 1962. The building retains architectural elements of both building periods. The ca.1962 walking ring remains on the east side of the building situated between the grandstand and the race track. The west is a long solid concrete elevation with three elevated entrances accessed by Art Deco-style rounded staircases. A former first-story entrance has been infilled with vertical board siding at each staircase, and each second story entrance door is situated atop a monumental staircase and beneath a canvas awning. A one-story concrete entrance pavilion projects off the west elevation between two sets of stairs at the north end of the elevation. The one-story, flat roofed addition contains large storefront windows and doors on all elevations. At the southern end of the elevation is a slightly pitched concrete and steel enclosed walkway that begins at the corner tower and extends to just south of the southernmost entrance stairs. Due to the sloping floor of the grandstands, the solid concrete rear (west) wall of the grandstands projects above the roof of the main block. The south elevation of the grandstand has been faced with a three-story Art Deco façade similar in character and proportion to the west elevation of the adjoining clubhouse. The north elevation features the return bay of glazing set atop a solid concrete base. The east elevation of the grandstand exhibits the structural steel I-beams at regular intervals along the elevation. The first floor contains aluminum and glass storefront systems at the north and central sections and recessed wood and glass walls at the southern end. The entire upper seating area has large windows that operate via a vertical lift system. A rooftop addition is situated on the roof overlooking the finish line. The one-story section has a

continuous row of ribbon windows and two upper level penthouses. The first floor of the grandstand features exposed concrete columns and the underside the grandstand seating. The grandstand seating area has modern finishes with exposed roof and exterior steel framing overlooking the track.

HISTORICAL NARRATIVE

Explain historical development of the area. Discuss how this relates to the historical development of the community.

Historical Development of Suffolk Downs

Situated in the cities of Boston and Revere, Suffolk Downs is constructed upon former marshland. Located immediately northeast of the former Breeds Island (also referred to as Breeds Hill and Orient Heights), the filled land was bounded on the northwest by the Boston and Maine Railroad and to the southeast by the Boston, Revere Beach and Lynn Railroad, both of which connected the then island of East Boston with Revere and Chelsea in the late nineteenth century. The Belle Isle Inlet and other small channels crossed the site in a generally east-west direction. The inlet connected Chelsea Creek to the west and Sales Creek to the north with Boston Harbor to the east. In ca. 1890, the Boston Land Company filled the former marsh to prepare the area for development, which had already begun on Breeds Island. When the land was filled, culverts and a drainage ditch were constructed within the site to carry water from Sales Creek through the site in a southeast direction to Belle Isle Inlet. Although streets were planned for the filled land, no development took place, and in 1911 the land was sold to the East Boston Company. Residential development commenced around the filled land, and in 1935 construction of the Suffolk Downs Race Track was undertaken by the Eastern Racing Commission.

Horse racing was a popular sport and pastime in America at the turn of the twentieth century. In the Boston area, horse racing, including harness racing, was taking place in neighborhoods around the City on race tracks from Franklin Field in Roxbury to the banks of the Charles River in Allston. Thoroughbred racing began in America in the 1868 with the creation of the American Stud Book that profiled all thoroughbreds born in America. By 1890 there were 314 tracks operating in the United States. In 1894, the American Jockey Club was formed. Most states banned gambling on horses due to illegal bookmaking practices until 1908 when pari-mutuel betting was introduced. The betting system pooled all wagers, removed the taxes and house take, and paid off winnings based on odds calculated among all winning bets. The newly sanctioned system allowed for the creation of Suffolk Downs.

In 1934, the Commonwealth of Massachusetts created the State Racing Commission which legalized pari-mutuel wagering. That same year, Charles F. Adams commissioned engineer Mark Linenthal to design a race track for the East Boston site. The contracting firm of A.G. Tomasello & Son won the $2 million construction contract and completed the job in about three months. Mark Linenthal (1886-1976) was born in Boston, MA. He completed his studies in civil engineering at the Graduate School of Applied Science at Harvard University. Linenthal was a member of the Boston Society of Civil Engineers, and by 1917, he was married to his wife Anna, had two children, and was working as an engineer with the firm of Monks and Johnson in Boston. In 1919, Linenthal was in a partnership of Gascoigne & Linenthal on Tremont Street in Boston. Eventually, he entered into his own practice and was responsible for not only the design of Suffolk Downs but also Narragansett Park, a horseracing track in Pawtucket, Rhode Island, the Roosevelt Raceway in Westbury, Long

Island, New York, the renovation of Salem, New Hampshire's horseracing track known as Rockingham Park, the greyhound racing track Raynham Park in Raynham, MA, and the baseball park McCoy Stadium in Pawtucket, RI designed with Thomas Harding. The Constitution Wharf – Quincy Mark Cold Storage Building in Boston's North End and the Garment Center Building on Kneeland Street in Boston are also attributed to Linenthal.

The original Suffolk Downs included the one-mile long race track, two-story judges' stand, grandstand, clubhouse, administration building, horse paddock, an equipment shed, sewer pump house, approximately 30 horse barns, and a jockey building. The judges' stand, clubhouse, grandstand and administration buildings were all steel frame and concrete structures designed in the Art Deco style while the paddock and barns were utilitarian, wood frame structures. The equipment shed and sewer pump house were both concrete and wood frame buildings. The grounds included a ceremonial circular driveway in front of the clubhouse, a parade ring between the paddock and the grandstand, three rows of trees planted in the grassed forecourt of the grandstand, and extensive parking areas to the north and south of the grandstand and clubhouse.

In 1939, the small free-standing steel frame photo-finish booth situated on the roof of the grandstand was fully enclosed in a new concrete penthouse. In that same year, the judges' stand, located at the edge of the track near the south end of the grandstand, received a new roof, but by 1942, the stand was demolished. In 1945, a new 14x14-foot reviewing stand was added to the roof. These modifications were all designed by Mark Linenthal. The next major renovation to the facility was in 1953. Following plans prepared by A.R. Barnes, the former open air third level of the clubhouse overlooking the track was enclosed. The roof of the main block of the building was extended over the outside deck to create a new indoor kitchen, dining room, and betting area.

Between 1962 and 1965, a major transformation of the facility was undertaken following plans developed by Linenthal & Becker, a later Linenthal partnership. A substantial addition was constructed between the clubhouse and grandstand. The International Style addition added two-stories to the front façade of the clubhouse, enclosed the former walkway between the clubhouse and the grandstand, and connected the new clubhouse addition to the grandstand via a long sloping enclosed walkway. A clubhouse addition featured a four-bay monumental entrance defined by a four-vaulted canopy. The entrances were defined by large expanses of glass. The first story, which appeared as two stories from the exterior due its double height, contained punched window openings within the brick façade while the second floor was accentuated by a continuous row of ribbon windows. The concrete sloping walkway to the grandstand extended from the new entryway addition across the former open walkway to the grandstand. Enclosed in glazed panels, the walkway connected the first floor of the new clubhouse addition with the second floor of the grandstand.

On the east side of the clubhouse, the first and second floor concrete decks were enclosed with ribbon windows and doors during the 1962-1965 renovation. The grandstand was expanded to enclose the former walkway between the two buildings, and the entire grandstand enclosed in movable glass walls. The steel and glass walls operated vertically and could be opened and closed with a mechanical lift system. The original paddock building was removed at this time. A 14-stall paddock was constructed below the grandstand and a walking ring was created on the track side of the grandstand. A new half-mile harness racing oval was constructed inside the original track. The forecourt at west elevation was paved for parking.

A number of interior renovations occurred in the ensuing years including the installation of an escalator between the first and second floors of the grandstand in 1965, and the demolition of the box seats in the grandstand to provide more open seats in 1969. In 1972, the administration building underwent an interior renovation. In 1982, a fire destroyed one of the barns, and several were re-sided and renovated. In 1991, the 1962 clubhouse addition was removed and the original west elevation was restored following plans by architect Olsen Lewis. The infill between the clubhouse and the grandstand was retained, and a new south elevation and corner tower were constructed in the same Art Deco architectural character as the original clubhouse building. A portion of the sloped walkway was retained and connected the new corner tower to the second floor of the grandstand. While the west elevation of the clubhouse was restored, the grandstand seating area was renovated, new bathrooms and flooring installed and the interior and exterior of the building was repainted. In 1993, a new broadcast signal center was also added on the interior of the grandstand. Since the 1990s, little alteration to Suffolk Downs has been undertaken. In late 2012, the roof of the administration building collapsed. As a result, the building has suffered severe structural and water damage and is vacant. The building has been condemned and is scheduled to be demolished.

Ownership and Operations of Suffolk Downs

The original owner and developer of Suffolk Downs was Charles F. Adams who was also the founder and president of the Boston Bruins, the city's professional ice hockey team. The track opened on July 10, 1935 to a crowd of 35,000. In its first day of wagering, Suffolk Downs took in $425,546. The first Massachusetts Handicap was run at Suffolk Downs on October 16, 1935. Known as the "MassCap," the race is limited to thoroughbred horses, ages three years and up. In 1936, Suffolk Downs installed photography equipment to capture images of the finish line. In that same year, Seabiscuit wins a race at Suffolk Downs and is seen for the first time by future trainer Tom Smith. Seabiscuit returns a year later, trained by Smith and ridden by jockey Johnny "Red" Pollard, to win the 1937 MassCap and a purse of $50,000, propelling him to national stardom.

Racing at Suffolk Downs continued during World War II. Due to gas rationing, the track was groomed by draft horses pulling the plows during the War. In 1945, the operation of the track was entrusted to Aldred Investment Trust under its president Allen Wilson. Despite bringing in its highest average attendance between 1945 and 1947, Suffolk Downs was sold at public auction in May of 1946, and was purchased by importer and judge John C. Pappas for $3,600,000.

During the 1950s, other events in addition to horse racing were programmed for the track including several boxing matches set up on the east side of the grandstands. In 1959, harness racing was introduced on the one-mile track. In 1962, a smaller half-mile track was created inside the original track for this purpose. The 1960s renovation added 100,000 square feet to the clubhouse and grandstand at a cost of $1,500,000. In 1964, New York businessman David Harber purchased John Pappas' 300,000 shares of stock for $2.9 million. Although Harber was now the owner of Suffolk Downs, Pappas remained the track's director. In 1966, the Beatles made their final appearance in Boston to a crowd of over 25,000 at Suffolk Downs.

In 1968, Realty Equities Corporation, a firm that purchased mainly hotel and theater chains, acquired Suffolk Downs for $12 million and made Bill Veeck, a former owner of several major league baseball teams, as the president and chief operating officer. Under Veeck's leadership, chariot races and livestock giveaways were added to the yearly roster. Unfortunately, during the 1970s, horse racing fell out of fashion. Many tracks around the country were closing. In an attempt to improve attendance, tracks, including Suffolk Downs, introduced a new wagering system of perfectas and trifectas, which allowed betting on first, second, and third place finishes. Just three years after taking ownership, Realty Equities Corporation sold Suffolk Downs to James F. Edwards, the president of National Raceways, Inc.

The track quickly changed hands again and in 1972 was owned by Ogden Recreation, Inc., a subsidiary of the New York-based Ogden Corporation. Placed under the direction of William F. Connell, Suffolk Downs expanded its racing to 150 days and eventually to 200 days per year. In 1986, Belle Isle Limited purchased the track for $21 million. The managing partner was Edward "Buddy" LeRoux, a former owner of the Boston Red Sox, but the track closed after declining revenues in 1989. It reopened in 1992 after Sterling Suffolk Racecourse LLC, led by Chairman James B. Moseley and President John L. Hall II, leased the property from Belle Isle Limited for $3.5 million per year. During this period, the $5 million demolition and renovation of the clubhouse was undertaken. In 1995, the MassCap was reinstituted, resulting in successive appearances by two of the greatest horses in racing history, Cigar in 1995 and '96 and Skip Away in 1997 and '98.

In 1997, Sterling Suffolk Racecourse LLC purchased the track from Belle Isle Limited. Although the track was advertised for development for other uses, it remained in operation and hosted a variety of non-horse racing events. During the late 1990s and 2000s, Suffolk Downs hosted a number of music concerts, the Phantom Gourmet's Hot Dog Safari, and Cirque du Soleil. In 2007, after a two-year hiatus, the MassCap returned to Suffolk Downs to its largest crowd, 19,191, since 1996. Today, Suffolk Downs continues its horse racing activities.

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East Elevation of Administration Building (Spring 2013)



West Elevation of Administration Building (Summer 2012)



West Elevation of Clubhouse



East Elevation of Clubhouse (left) and Grandstand (right)



West Elevation of Grandstand



East Elevation of Grandstand



Interior of Grandstand (1962 infill in foreground)



Typical Stable



View Northeast of Racetrack

Attachment K

Pedestrian Wind Consultation Report

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THE RESORT AT SUFFOLK DOWNS

Boston, MA

Draft Report

Pedestrian Wind Consultation

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Appendix A: Drawing List for Model Construction

1. INTRODUCTION

A pedestrian wind study was conducted on the proposed Resort at Suffolk Downs project located in Boston, Massachusetts. The objective of the study was to assess the effect of the proposed development on local conditions in pedestrian areas around the study site and provide recommendations for minimizing adverse effects.

The study involved wind simulations on a 1:400 scale model of the proposed building and surroundings. These simulations were then conducted in RWDI's boundary-layer wind tunnel at Guelph, Ontario, for the purpose of quantifying local wind speed conditions and comparing to appropriate criteria for gauging wind comfort in pedestrian areas. A list of the drawings used for the construction of the model can be found in Appendix A. The criteria recommended by the Boston Redevelopment Authority (BRA) were used in this study. The present report describes the methods and presents the results of the wind tunnel simulations.

2. OVERVIEW

Major buildings, especially those that protrude above their surroundings, often cause increased local wind speeds at the pedestrian level. Typically, wind speeds increase with elevation above the ground surface, and taller buildings intercept these faster winds and deflect them down to the pedestrian level. The funneling of wind through gaps between buildings and the acceleration of wind around corners of buildings may also cause increases in wind speed. Conversely, if a building is surrounded by others of equivalent height, it may be protected from the prevailing upper-level winds, resulting in no significant changes to the local pedestrian-level wind environment. The most effective way to assess potential pedestrian-level wind impacts around a proposed new building is to conduct scale model tests in a wind tunnel.

The consideration of wind in planning outdoor activity areas is important since high winds in an area tend to deter pedestrian use. For example, winds should be light or relatively light in areas where people would be sitting, such as outdoor cafes or playgrounds. For bus stops and other locations where people would be standing, somewhat higher winds can be tolerated. For frequently used sidewalks, where people are primarily walking, stronger winds are acceptable. For infrequently used areas, the wind comfort criteria can be relaxed even further. The actual effects of wind can range from pedestrian inconvenience, due to the blowing of dust and other loose material in a moderate breeze, to severe difficulty with walking due to the wind forces on the pedestrian.

3. METHODOLOGY

Information concerning the site and surroundings was derived from: site photographs; information on surrounding buildings and terrain; site plans and elevations of the proposed development provided by the design team. The following configurations were simulated:

No Build Configuration: includes all existing surrounding buildings;

Build Configuration: includes the proposed Resort at Suffolk Downs and all existing surroundings.

As shown in Figures 1a and 1b, the wind tunnel model included the proposed development and all relevant surrounding buildings and topography within a 1600 ft radius of the study site. The mean speed profile and turbulence of the natural wind approaching the modelled area were also simulated in RWDI's boundary layer wind tunnel. The scale model was equipped with 82 specially designed wind speed sensors that were connected to the wind tunnel's data acquisition system to record the mean and fluctuating components of wind speed at a full-scale height of 5 feet above grade in pedestrian areas throughout the study site. Wind speeds were measured for 36 wind directions, in 10 degree increments, starting from true north. The measurements at each sensor location were recorded in the form of ratios of local mean and gust speeds to the reference wind speed in the free stream above the model. The results were then combined with long-term meteorological data, recorded during the years 1982 to 2011 at Boston's Logan International Airport, in order to predict full scale wind conditions. The analysis was performed separately for each of the four seasons and for the entire year.

Figures 2a, 2b and 2c present "wind roses", summarizing the annual and seasonal wind climates in the Boston area, based on the data from the Logan International Airport. The left side wind rose in Figure 2a, for example summarizes the spring (March, April, and May) wind data. In general, the prevailing winds at this time of year are from the west-northwest, northwest, west, southwest and east. On an annual basis (Figure 2c) the most common wind directions are those between southwest and northwest.

This study involved state-of-the-art measurement and analysis techniques to predict wind conditions at the study site. Nevertheless, some uncertainty remains in predicting wind comfort, and this must be kept in mind. For example, the sensation of comfort among individuals can be quite variable. Variations in age, individual health, clothing, and other human factors can change a particular response of an individual. The comfort limits used in this report represent an average for the total population. Also, unforeseen changes in the project area, such as the construction or removal of buildings, can affect the conditions experienced at the site. Finally, the prediction of wind speeds is necessarily a statistical procedure. The wind speeds reported are for the frequency of occurrence stated (one percent of the time). Higher wind speeds will occur but on a less frequent basis.

4. PEDESTRIAN WIND COMFORT CRITERIA

The BRA has adopted two standards for assessing the relative wind comfort of pedestrians. First, the BRA wind design guidance criterion states that an effective gust velocity (hourly mean wind speed +1.5 times the root-mean-square wind speed) of 31 mph should not be exceeded more than one percent of the time. The second set of criteria used by the BRA to determine the acceptability of specific locations is

based on the work of Melbourne[1]. This set of criteria is used to determine the relative level of pedestrian wind comfort for activities such as sitting, standing, or walking. The criteria are expressed in terms of benchmarks for the 1-hour mean wind speed exceeded 1% of the time (i.e., the 99-percentile mean wind speed). They are as follows:

Table 1: BRA Mean Wind Criteria*

Dangerous	> 27 mph
Uncomfortable for Walking	> 19 and ≤ 27 mph
Comfortable for Walking	> 15 and ≤ 19 mph
Comfortable for Standing	> 12 and ≤ 15 mph
Comfortable for Sitting	< 12 mph

* Applicable to the hourly mean wind speed exceeded one percent of the time.

The wind climate found in a typical downtown location in Boston is generally comfortable for the pedestrian use of sidewalks and thoroughfares and meets the BRA effective gust velocity criterion of 31 mph. However, without any mitigation measures, this wind climate is likely to be frequently uncomfortable for more passive activities such as sitting.

5. TEST RESULTS

Table 1 presents the mean and effective gust wind speeds for each season as well as annually. Figures 3a through 4b graphically depict the wind comfort conditions at each wind measurement location based on the annual winds. Typically the summer and fall winds tend to be more comfortable than the annual winds while the winter and spring winds are less comfortable than the annual winds. The following summary of pedestrian wind comfort is based on the annual winds for each configuration tested.

The majority of the existing site was confirmed to have acceptable conditions with respect to pedestrian safety with the exception of one area to the south of the existing casino and grandstand structure. These unsafe wind conditions will be effectively mitigated with the addition of the proposed development.

5.1 No Build Configuration

5.1.1 Existing Casino Area (Sensors 21-24, 43-54 and 68-75)

A trend of increasing wind speeds to the west of the grandstand is evident in Figure 3a. This trend is evidence of the sheltering effect of the existing grandstand structure. The area adjacent to the grandstand is appropriate for sitting (Sensors 24, 45, 47, 50 and 53). Further west from the grandstand conditions are appropriate for standing (Sensors 44 and 51). Still further back, towards the existing parking areas, conditions are appropriate for walking (Sensors 21-23, 43, 46, 48, 49, 52 and 54).

[1] Melbourne, W.H., 1978, "Criteria for Environmental Wind Conditions", Journal of Industrial Aerodynamics, 3 (1978) 241 - 249.

Along the horse track some shelter is provided by the casino to the west, thus conditions appropriate for walking exist (Sensors 71, 73, 75 and 76). However, to the north of the casino, which is less sheltered from the prevailing easterly and westerly winds, conditions are currently uncomfortable (Sensors 68 and 69).

5.1.2 Other Areas (Sensors 1 – 20, 25-42, 55-67, 76 and 77)

A wind comfort categorization of walking is considered appropriate for sidewalks. The sidewalks along Tomasello Drive and within the existing residential area to the southwest of the existing casino site are predominantly comfortable for walking. One segment of Tomasello Drive to the west of the casino currently experiences uncomfortable wind conditions due to the exposure to the prevailing westerly winds (Sensors 40, 57-59 and 63).

As shown in Figure 3a, the proposed casino area was found to be mainly uncomfortable with the eastern portion being comfortable only for walking (Sensors 1, 2, 4 and 6).

Elevated wind conditions, suitable for walking at best, are currently observed for much of the site to the north and south of the existing casino due to the exposed nature of the site (Sensors 13, 14, 16-20, 41, 42, 55, 56, 59-62 and 65-69).

5.2 Build Configuration

5.2.1 Casino Entrance and Water Feature Area (Locations 1 through 11)

The shelter provided by the proposed casino is expected to significantly improve the wind conditions over the site, with many of the previously uncomfortable wind conditions predicted to be comfortable for walking or better. The highly sheltered entrance area to the casino is predicted to be comfortable for sitting (Sensors 1-3, 5 and 6). The areas adjacent to the entrance are expected to be comfortable for standing (Sensors 4, 7 and 11), which is appropriate for the pedestrian traffic in these areas. The water feature to the west of the casino is located in an area where walking conditions are expected. If a fountain is to be placed in the water feature the potential for fountain dispersion and its impact on pedestrians should be considered.

5.2.2 North and South Plazas (Locations 21 through 24, 43 through 54)

As shown in Figure 3b, the north and south plaza areas will be suitable for walking or better annually, with the majority of locations suitable for standing or sitting. The north and south extents of the plaza will have conditions appropriate for standing (Sensors 21, 22, 46 and 50-54). The increased sheltering in the central plaza areas will result in conditions appropriate for sitting, which corresponds well with the planned park benches and cafes in these areas (Sensors 43 and 47-49). Slightly increased wind conditions will occur in the narrow section between the north and south plazas as a result of wind channeling between the adjacent structures. However, conditions appropriate for walking are anticipated which is appropriate for the pedestrian usage of this area (Sensors 24, 44 and 45).

5.2.3 Other Onsite Areas (Locations 12 – 20, 34, 35, 41, 42, 55, 56, 59-62, 65-82)

The majority of other onsite areas near buildings, including secondary building entrances, will have conditions appropriate for the intended pedestrian usages. However, two areas are expected to remain uncomfortable for walking. These include the area to the south of the existing casino, which currently exhibits unsafe wind conditions (Location 20) and on the top of the proposed parking garage (Locations 80 and 81). While the area around sensor 20 remains uncomfortable, the conditions are expected to be improved from the conditions currently experienced in this area. It should also be noted that this area currently does not pass the criteria used to assess pedestrian safety. The proposed development will effectively mitigate these unsafe conditions. There is dense landscaping in the area, which should be retained or enhanced for wind reduction. Sensors 80 and 81 are on the top of the proposed garage. If frequent pedestrian use is anticipated, porous windscreens placed around the perimeter of the upper parking lot would reduce pedestrian discomfort at these locations.

5.2.4 Offsite Areas (Locations 25 through 33, 36-40, 57, 58, 63, 64)

The construction of the proposed casino and surrounding facilities is expected to reduce the speed of wind in most immediate surrounding areas. Further, it is not expected that the addition of the proposed development will have a significant negative effect in any of the surrounding areas. The most notable improvement is anticipated along Tomasello Drive just southeast of the shopping plaza (Sensors 57, 58 and 63). Wind speeds at Location 26 increases by 1 mph on an annual basis with the proposed development in place, resulting in uncomfortable wind conditions. The existing dense trees along the road, which were not modeled in the wind tunnel tests, would reduce the wind activity in this area to a comfortable level. The other areas will remain in the same wind comfort category.

6. APPLICABILITY OF RESULTS

The results presented in this report pertain to the model of the proposed Resort at Suffolk Downs development constructed using the architectural design drawings listed in Appendix A. Should there be any design changes that deviate from this list of drawings, the results presented may change. Therefore, if changes in the design are made, it is recommended that RWDI be contacted and requested to review their potential effects on wind conditions.

TABLES

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
1	A	Spring	19		Walking	26		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	18		Walking	25		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	19		Walking	26		Acceptable
	B	Spring	7	-63%	Sitting	13	-50%	Acceptable
		Summer	6	-60%	Sitting	11	-48%	Acceptable
		Fall	7	-61%	Sitting	12	-52%	Acceptable
		Winter	8	-62%	Sitting	13	-54%	Acceptable
		Annual	7	-63%	Sitting	12	-54%	Acceptable
2	A	Spring	20		Uncomfortable	26		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	19		Walking	26		Acceptable
	B	Spring	7	-65%	Sitting	11	-58%	Acceptable
		Summer	6	-60%	Sitting	10	-52%	Acceptable
		Fall	7	-63%	Sitting	11	-56%	Acceptable
		Winter	8	-62%	Sitting	12	-57%	Acceptable
		Annual	7	-63%	Sitting	11	-58%	Acceptable
3	A	Spring	21		Uncomfortable	27		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	20		Uncomfortable	26		Acceptable
	B	Spring	10	-52%	Sitting	15	-44%	Acceptable
		Summer	8	-50%	Sitting	12	-43%	Acceptable
		Fall	9	-53%	Sitting	14	-44%	Acceptable
		Winter	10	-52%	Sitting	16	-43%	Acceptable
		Annual	9	-55%	Sitting	15	-42%	Acceptable
4	A	Spring	20		Uncomfortable	27		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	19		Walking	26		Acceptable
	B	Spring	13	-35%	Standing	22	-19%	Acceptable
		Summer	10	-33%	Sitting	17	-19%	Acceptable
		Fall	12	-37%	Sitting	21	-16%	Acceptable
		Winter	14	-33%	Standing	24	-14%	Acceptable
		Annual	13	-32%	Standing	22	-15%	Acceptable
5	A	Spring	22		Uncomfortable	29		Acceptable
		Summer	17		Walking	22		Acceptable
		Fall	20		Uncomfortable	27		Acceptable
		Winter	22		Uncomfortable	30		Acceptable
		Annual	21		Uncomfortable	28		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
	B	Spring	11	-50%	Sitting	18	-38%	Acceptable
		Summer	9	-47%	Sitting	15	-32%	Acceptable
		Fall	11	-45%	Sitting	18	-33%	Acceptable
		Winter	12	-45%	Sitting	19	-37%	Acceptable
		Annual	11	-48%	Sitting	18	-36%	Acceptable
6	A	Spring	20		Uncomfortable	27		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	25		Acceptable
		Winter	20		Uncomfortable	28		Acceptable
		Annual	19		Walking	26		Acceptable
	B	Spring	10	-50%	Sitting	17	-37%	Acceptable
		Summer	8	-47%	Sitting	14	-30%	Acceptable
		Fall	10	-44%	Sitting	16	-36%	Acceptable
		Winter	11	-45%	Sitting	17	-39%	Acceptable
		Annual	10	-47%	Sitting	16	-38%	Acceptable
7	A	Spring	21		Uncomfortable	27		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	21		Uncomfortable	29		Acceptable
		Annual	20		Uncomfortable	26		Acceptable
	B	Spring	13	-38%	Standing	20	-26%	Acceptable
		Summer	10	-38%	Sitting	16	-24%	Acceptable
		Fall	12	-37%	Sitting	19	-24%	Acceptable
		Winter	14	-33%	Standing	22	-24%	Acceptable
		Annual	13	-35%	Standing	20	-23%	Acceptable
8	A	Spring	20		Uncomfortable	27		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	20		Uncomfortable	26		Acceptable
	B	Spring	18		Walking	25		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	17	-11%	Walking	24		Acceptable
		Winter	19		Walking	27		Acceptable
		Annual	18		Walking	25		Acceptable
9	A	Spring	20		Uncomfortable	27		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	20		Uncomfortable	26		Acceptable
	B	Spring	17	-15%	Walking	23	-15%	Acceptable
		Summer	14	-12%	Standing	19		Acceptable
		Fall	16	-16%	Walking	22	-12%	Acceptable
		Winter	18	-14%	Walking	25	-11%	Acceptable
		Annual	17	-15%	Walking	23	-12%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
10	A	Spring	21		Uncomfortable	27		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	19		Walking	26		Acceptable
		Winter	22		Uncomfortable	29		Acceptable
		Annual	20		Uncomfortable	27		Acceptable
	B	Spring	17	-19%	Walking	24	-11%	Acceptable
		Summer	14	-12%	Standing	19		Acceptable
		Fall	16	-16%	Walking	23	-12%	Acceptable
		Winter	18	-18%	Walking	26	-10%	Acceptable
		Annual	17	-15%	Walking	24	-11%	Acceptable
11	A	Spring	20		Uncomfortable	27		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	20		Uncomfortable	26		Acceptable
	B	Spring	14	-30%	Standing	22	-19%	Acceptable
		Summer	12	-25%	Sitting	18	-14%	Acceptable
		Fall	13	-32%	Standing	21	-16%	Acceptable
		Winter	14	-33%	Standing	23	-18%	Acceptable
		Annual	13	-35%	Standing	22	-15%	Acceptable
12	A	Spring	19		Walking	26		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	19		Walking	25		Acceptable
	B	Spring	16	-16%	Walking	25		Acceptable
		Summer	14		Standing	21		Acceptable
		Fall	15	-17%	Standing	24		Acceptable
		Winter	17	-15%	Walking	26		Acceptable
		Annual	16	-16%	Walking	24		Acceptable
13	A	Spring	20		Uncomfortable	26		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	22		Uncomfortable	28		Acceptable
		Annual	20		Uncomfortable	26		Acceptable
	B	Spring	18		Walking	26		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	17	-11%	Walking	25		Acceptable
		Winter	19	-14%	Walking	28		Acceptable
		Annual	17	-15%	Walking	25		Acceptable
14	A	Spring	21		Uncomfortable	27		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	19		Walking	26		Acceptable
		Winter	22		Uncomfortable	29		Acceptable
		Annual	20		Uncomfortable	27		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
	B	Spring	14	-33%	Standing	23	-15%	Acceptable
		Summer	12	-25%	Sitting	20		Acceptable
		Fall	14	-26%	Standing	22	-15%	Acceptable
		Winter	15	-32%	Standing	24	-17%	Acceptable
		Annual	14	-30%	Standing	22	-19%	Acceptable
15	A	Spring	20		Uncomfortable	26		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	25		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	19		Walking	25		Acceptable
	B	Spring	11	-45%	Sitting	19	-27%	Acceptable
		Summer	9	-40%	Sitting	16	-20%	Acceptable
		Fall	11	-39%	Sitting	18	-28%	Acceptable
		Winter	12	-43%	Sitting	20	-29%	Acceptable
		Annual	11	-42%	Sitting	19	-24%	Acceptable
16	A	Spring	20		Uncomfortable	27		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	20		Uncomfortable	26		Acceptable
	B	Spring	16	-20%	Walking	25		Acceptable
		Summer	13	-19%	Standing	20		Acceptable
		Fall	15	-21%	Standing	24		Acceptable
		Winter	17	-19%	Walking	27		Acceptable
		Annual	16	-20%	Walking	25		Acceptable
17	A	Spring	20		Uncomfortable	26		Acceptable
		Summer	16		Walking	20		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	22		Uncomfortable	28		Acceptable
		Annual	20		Uncomfortable	26		Acceptable
	B	Spring	18		Walking	25		Acceptable
		Summer	14	-12%	Standing	20		Acceptable
		Fall	17	-11%	Walking	24		Acceptable
		Winter	19	-14%	Walking	27		Acceptable
		Annual	17	-15%	Walking	25		Acceptable
18	A	Spring	21		Uncomfortable	26		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	22		Uncomfortable	28		Acceptable
		Annual	20		Uncomfortable	26		Acceptable
	B	Spring	19		Walking	26		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	20		Uncomfortable	28		Acceptable
		Annual	18		Walking	25		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
19	A	Spring	22		Uncomfortable	28		Acceptable
		Summer	17		Walking	22		Acceptable
		Fall	21		Uncomfortable	26		Acceptable
		Winter	23		Uncomfortable	30		Acceptable
		Annual	21		Uncomfortable	28		Acceptable
	B	Spring	20		Uncomfortable	28		Acceptable
		Summer	15	-12%	Standing	21		Acceptable
		Fall	18	-14%	Walking	26		Acceptable
		Winter	20	-13%	Uncomfortable	30		Acceptable
		Annual	19		Walking	27		Acceptable
20	A	Spring	24		Uncomfortable	32		Unacceptable
		Summer	19		Walking	25		Acceptable
		Fall	23		Uncomfortable	30		Acceptable
		Winter	27		Uncomfortable	35		Unacceptable
		Annual	24		Uncomfortable	32		Unacceptable
	B	Spring	20	-17%	Uncomfortable	31		Acceptable
		Summer	16	-16%	Walking	24		Acceptable
		Fall	19	-17%	Walking	29		Acceptable
		Winter	22	-19%	Uncomfortable	34		Unacceptable
		Annual	20	-17%	Uncomfortable	31		Acceptable
21	A	Spring	18		Walking	24		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	18		Walking	24		Acceptable
	B	Spring	14	-22%	Standing	23		Acceptable
		Summer	11	-21%	Sitting	17	-11%	Acceptable
		Fall	13	-24%	Standing	21		Acceptable
		Winter	15	-21%	Standing	25		Acceptable
		Annual	14	-22%	Standing	22		Acceptable
22	A	Spring	17		Walking	24		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	17		Walking	23		Acceptable
	B	Spring	13	-24%	Standing	22		Acceptable
		Summer	11	-21%	Sitting	17	-11%	Acceptable
		Fall	13	-19%	Standing	21		Acceptable
		Winter	15	-17%	Standing	24		Acceptable
		Annual	13	-24%	Standing	22		Acceptable
23	A	Spring	17		Walking	24		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	17		Walking	23		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
	B	Spring	12	-29%	Sitting	19	-21%	Acceptable
		Summer	10	-23%	Sitting	17	-11%	Acceptable
		Fall	12	-25%	Sitting	19	-17%	Acceptable
		Winter	13	-28%	Standing	20	-20%	Acceptable
		Annual	12	-29%	Sitting	19	-17%	Acceptable
24	A	Spring	13		Standing	19		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	19		Acceptable
		Annual	12		Sitting	18		Acceptable
	B	Spring	16	23%	Walking	25	32%	Acceptable
		Summer	13	30%	Standing	20	33%	Acceptable
		Fall	15	25%	Standing	24	33%	Acceptable
		Winter	18	38%	Walking	28	47%	Acceptable
		Annual	16	33%	Walking	25	39%	Acceptable
25	A	Spring	20		Uncomfortable	26		Acceptable
		Summer	16		Walking	20		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	22		Uncomfortable	28		Acceptable
		Annual	20		Uncomfortable	26		Acceptable
	B	Spring	18		Walking	25		Acceptable
		Summer	14	-12%	Standing	19		Acceptable
		Fall	17	-11%	Walking	23		Acceptable
		Winter	19	-14%	Walking	27		Acceptable
		Annual	18		Walking	24		Acceptable
26	A	Spring	19		Walking	25		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	21		Uncomfortable	27		Acceptable
		Annual	19		Walking	25		Acceptable
	B	Spring	20		Uncomfortable	27		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	22		Uncomfortable	29		Acceptable
		Annual	20		Uncomfortable	26		Acceptable
27	A	Spring	17		Walking	24		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	16		Walking	24		Acceptable
		Annual	15		Standing	22		Acceptable
	B	Spring	15	-12%	Standing	23		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	14		Standing	21		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	14		Standing	21		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
28	A	Spring	14		Standing	22		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	14		Standing	21		Acceptable
	B	Spring	14		Standing	22		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	14		Standing	22		Acceptable
		Annual	13		Standing	20		Acceptable
29	A	Spring	19		Walking	27		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	17		Walking	25		Acceptable
		Winter	19		Walking	27		Acceptable
		Annual	18		Walking	26		Acceptable
	B	Spring	16	-16%	Walking	24	-11%	Acceptable
		Summer	12	-14%	Sitting	18		Acceptable
		Fall	14	-18%	Standing	22	-12%	Acceptable
		Winter	16	-16%	Walking	25		Acceptable
		Annual	15	-17%	Standing	23	-12%	Acceptable
30	A	Spring	15		Standing	21		Acceptable
		Summer	12		Sitting	16		Acceptable
		Fall	14		Standing	20		Acceptable
		Winter	16		Walking	22		Acceptable
		Annual	15		Standing	20		Acceptable
	B	Spring	16		Walking	22		Acceptable
		Summer	13		Standing	17		Acceptable
		Fall	15		Standing	21		Acceptable
		Winter	17		Walking	24		Acceptable
		Annual	16		Walking	22		Acceptable
31	A	Spring	18		Walking	24		Acceptable
		Summer	14		Standing	18		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	17		Walking	23		Acceptable
	B	Spring	17		Walking	24		Acceptable
		Summer	13		Standing	18		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	16		Walking	23		Acceptable
32	A	Spring	18		Walking	24		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	17		Walking	23		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
	B	Spring	17		Walking	24		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	16		Walking	23		Acceptable
33	A	Spring	20		Uncomfortable	26		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	21		Uncomfortable	27		Acceptable
		Annual	19		Walking	25		Acceptable
	B	Spring	18		Walking	25		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	18		Walking	24		Acceptable
34	A	Spring	21		Uncomfortable	27		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	20		Uncomfortable	26		Acceptable
	B	Spring	18	-14%	Walking	25		Acceptable
		Summer	14	-12%	Standing	20		Acceptable
		Fall	17	-11%	Walking	23		Acceptable
		Winter	19		Walking	27		Acceptable
		Annual	18		Walking	24		Acceptable
35	A	Spring	19		Walking	26		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	21		Uncomfortable	27		Acceptable
		Annual	19		Walking	25		Acceptable
	B	Spring	18		Walking	24		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	18		Walking	24		Acceptable
36	A	Spring	20		Uncomfortable	26		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	25		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	19		Walking	25		Acceptable
	B	Spring	16	-20%	Walking	23	-12%	Acceptable
		Summer	13	-13%	Standing	18		Acceptable
		Fall	15	-17%	Standing	22	-12%	Acceptable
		Winter	17	-15%	Walking	24	-11%	Acceptable
		Annual	15	-21%	Standing	22	-12%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
37	A	Spring	20		Uncomfortable	27		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	19		Walking	26		Acceptable
	B	Spring	17	-15%	Walking	25		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	17	-11%	Walking	24		Acceptable
		Winter	18	-14%	Walking	26		Acceptable
		Annual	17	-11%	Walking	24		Acceptable
38	A	Spring	20		Uncomfortable	27		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	19		Walking	25		Acceptable
	B	Spring	18		Walking	25		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	17	-11%	Walking	24		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	17	-11%	Walking	24		Acceptable
39	A	Spring	19		Walking	26		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	18		Walking	25		Acceptable
	B	Spring	16	-16%	Walking	23	-12%	Acceptable
		Summer	13	-13%	Standing	19		Acceptable
		Fall	15	-17%	Standing	22		Acceptable
		Winter	16	-16%	Walking	24		Acceptable
		Annual	15	-17%	Standing	22	-12%	Acceptable
40	A	Spring	21		Uncomfortable	27		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	19		Walking	26		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	20		Uncomfortable	26		Acceptable
	B	Spring	15	-29%	Standing	23	-15%	Acceptable
		Summer	13	-19%	Standing	19		Acceptable
		Fall	15	-21%	Standing	21	-19%	Acceptable
		Winter	16	-24%	Walking	23	-18%	Acceptable
		Annual	15	-25%	Standing	22	-15%	Acceptable
41	A	Spring	20		Uncomfortable	27		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	19		Walking	26		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
	B	Spring	16	-20%	Walking	23	-15%	Acceptable
		Summer	13	-13%	Standing	18	-14%	Acceptable
		Fall	16	-16%	Walking	22	-12%	Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	16	-16%	Walking	23	-12%	Acceptable
42	A	Spring	19		Walking	25		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	18		Walking	24		Acceptable
	B	Spring	11	-42%	Sitting	17	-32%	Acceptable
		Summer	9	-36%	Sitting	14	-26%	Acceptable
		Fall	10	-41%	Sitting	16	-30%	Acceptable
		Winter	11	-42%	Sitting	18	-31%	Acceptable
		Annual	10	-44%	Sitting	16	-33%	Acceptable
43	A	Spring	20		Uncomfortable	26		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	25		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	18		Walking	25		Acceptable
	B	Spring	10	-50%	Sitting	17	-35%	Acceptable
		Summer	9	-40%	Sitting	15	-25%	Acceptable
		Fall	10	-44%	Sitting	17	-32%	Acceptable
		Winter	11	-42%	Sitting	19	-27%	Acceptable
		Annual	10	-44%	Sitting	17	-32%	Acceptable
44	A	Spring	15		Standing	21		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	14		Standing	19		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	14		Standing	20		Acceptable
	B	Spring	20	33%	Uncomfortable	29	38%	Acceptable
		Summer	15	36%	Standing	22	38%	Acceptable
		Fall	18	29%	Walking	27	42%	Acceptable
		Winter	20	43%	Uncomfortable	29	38%	Acceptable
		Annual	19	36%	Walking	27	35%	Acceptable
45	A	Spring	9		Sitting	14		Acceptable
		Summer	8		Sitting	12		Acceptable
		Fall	9		Sitting	14		Acceptable
		Winter	10		Sitting	16		Acceptable
		Annual	9		Sitting	14		Acceptable
	B	Spring	19	111%	Walking	27	93%	Acceptable
		Summer	17	112%	Walking	23	92%	Acceptable
		Fall	17	89%	Walking	25	79%	Acceptable
		Winter	19	90%	Walking	27	69%	Acceptable
		Annual	18	100%	Walking	25	79%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
46	A	Spring	19		Walking	25		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	17		Walking	23		Acceptable
	B	Spring	14	-26%	Standing	22	-12%	Acceptable
		Summer	12	-14%	Sitting	18		Acceptable
		Fall	13	-24%	Standing	20	-13%	Acceptable
		Winter	14	-22%	Standing	22	-12%	Acceptable
		Annual	13	-24%	Standing	21		Acceptable
47	A	Spring	10		Sitting	14		Acceptable
		Summer	7		Sitting	11		Acceptable
		Fall	9		Sitting	13		Acceptable
		Winter	9		Sitting	15		Acceptable
		Annual	9		Sitting	14		Acceptable
	B	Spring	12	20%	Sitting	20	43%	Acceptable
		Summer	10	43%	Sitting	15	36%	Acceptable
		Fall	11	22%	Sitting	19	46%	Acceptable
		Winter	13	44%	Standing	21	40%	Acceptable
		Annual	12	33%	Sitting	19	36%	Acceptable
48	A	Spring	17		Walking	23		Acceptable
		Summer	13		Standing	18		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	17		Walking	23		Acceptable
		Annual	16		Walking	22		Acceptable
	B	Spring	13	-24%	Standing	19	-17%	Acceptable
		Summer	10	-23%	Sitting	15	-17%	Acceptable
		Fall	12	-25%	Sitting	18	-18%	Acceptable
		Winter	12	-29%	Sitting	19	-17%	Acceptable
		Annual	12	-25%	Sitting	18	-18%	Acceptable
49	A	Spring	19		Walking	25		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	17		Walking	24		Acceptable
	B	Spring	12	-37%	Sitting	18	-28%	Acceptable
		Summer	10	-29%	Sitting	14	-26%	Acceptable
		Fall	11	-35%	Sitting	17	-26%	Acceptable
		Winter	12	-33%	Sitting	18	-28%	Acceptable
		Annual	12	-29%	Sitting	17	-29%	Acceptable
50	A	Spring	13		Standing	19		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	18		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
	B	Spring	14		Standing	21	11%	Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	13		Standing	20	11%	Acceptable
		Winter	15	15%	Standing	22		Acceptable
		Annual	14	17%	Standing	21	17%	Acceptable
51	A	Spring	14		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	15		Standing	21		Acceptable
		Annual	14		Standing	20		Acceptable
	B	Spring	15		Standing	20		Acceptable
		Summer	11		Sitting	15		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	14		Standing	20		Acceptable
		Annual	13		Standing	19		Acceptable
52	A	Spring	18		Walking	25		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	17		Walking	24		Acceptable
	B	Spring	14	-22%	Standing	20	-20%	Acceptable
		Summer	11	-21%	Sitting	16	-20%	Acceptable
		Fall	13	-24%	Standing	19	-21%	Acceptable
		Winter	14	-22%	Standing	20	-20%	Acceptable
		Annual	13	-24%	Standing	19	-21%	Acceptable
53	A	Spring	12		Sitting	19		Acceptable
		Summer	9		Sitting	15		Acceptable
		Fall	11		Sitting	18		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	18		Acceptable
	B	Spring	14	17%	Standing	21	11%	Acceptable
		Summer	11	22%	Sitting	16		Acceptable
		Fall	13	18%	Standing	19		Acceptable
		Winter	15	15%	Standing	22		Acceptable
		Annual	14	17%	Standing	20	11%	Acceptable
54	A	Spring	19		Walking	26		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	18		Walking	24		Acceptable
	B	Spring	16	-16%	Walking	22	-15%	Acceptable
		Summer	13	-13%	Standing	17	-15%	Acceptable
		Fall	15	-17%	Standing	21	-12%	Acceptable
		Winter	16	-11%	Walking	23	-12%	Acceptable
		Annual	15	-17%	Standing	21	-12%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
55	A	Spring	21		Uncomfortable	28		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	20		Uncomfortable	26		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	20		Uncomfortable	27		Acceptable
	B	Spring	14	-33%	Standing	21	-25%	Acceptable
		Summer	11	-31%	Sitting	16	-24%	Acceptable
		Fall	13	-35%	Standing	19	-27%	Acceptable
		Winter	15	-29%	Standing	22	-21%	Acceptable
		Annual	14	-30%	Standing	20	-26%	Acceptable
56	A	Spring	21		Uncomfortable	28		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	19		Walking	26		Acceptable
		Winter	21		Uncomfortable	29		Acceptable
		Annual	20		Uncomfortable	27		Acceptable
	B	Spring	16	-24%	Walking	24	-14%	Acceptable
		Summer	13	-19%	Standing	19	-14%	Acceptable
		Fall	15	-21%	Standing	23	-12%	Acceptable
		Winter	18	-14%	Walking	26	-10%	Acceptable
		Annual	16	-20%	Walking	24	-11%	Acceptable
57	A	Spring	21		Uncomfortable	28		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	19		Walking	26		Acceptable
		Winter	21		Uncomfortable	29		Acceptable
		Annual	20		Uncomfortable	27		Acceptable
	B	Spring	20		Uncomfortable	26		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	19		Walking	26		Acceptable
58	A	Spring	21		Uncomfortable	28		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	20		Uncomfortable	27		Acceptable
		Winter	22		Uncomfortable	29		Acceptable
		Annual	20		Uncomfortable	27		Acceptable
	B	Spring	20		Uncomfortable	26		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	19		Walking	26		Acceptable
59	A	Spring	22		Uncomfortable	29		Acceptable
		Summer	17		Walking	22		Acceptable
		Fall	21		Uncomfortable	27		Acceptable
		Winter	22		Uncomfortable	29		Acceptable
		Annual	21		Uncomfortable	27		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
	B	Spring	20		Uncomfortable	27		Acceptable
		Summer	15	-12%	Standing	20		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	19		Walking	26		Acceptable
60	A	Spring	22		Uncomfortable	28		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	20		Uncomfortable	26		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	20		Uncomfortable	26		Acceptable
	B	Spring	17	-23%	Walking	23	-18%	Acceptable
		Summer	13	-19%	Standing	17	-19%	Acceptable
		Fall	16	-20%	Walking	21	-19%	Acceptable
		Winter	17	-19%	Walking	24	-14%	Acceptable
		Annual	16	-20%	Walking	22	-15%	Acceptable
61	A	Spring	22		Uncomfortable	28		Acceptable
		Summer	17		Walking	22		Acceptable
		Fall	20		Uncomfortable	26		Acceptable
		Winter	22		Uncomfortable	29		Acceptable
		Annual	21		Uncomfortable	27		Acceptable
	B	Spring	18	-18%	Walking	25	-11%	Acceptable
		Summer	13	-24%	Standing	19	-14%	Acceptable
		Fall	17	-15%	Walking	23	-12%	Acceptable
		Winter	19	-14%	Walking	25	-14%	Acceptable
		Annual	17	-19%	Walking	24	-11%	Acceptable
62	A	Spring	21		Uncomfortable	28		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	20		Uncomfortable	27		Acceptable
		Winter	22		Uncomfortable	29		Acceptable
		Annual	21		Uncomfortable	27		Acceptable
	B	Spring	20		Uncomfortable	27		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	19		Walking	26		Acceptable
63	A	Spring	21		Uncomfortable	28		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	20		Uncomfortable	27		Acceptable
		Winter	22		Uncomfortable	29		Acceptable
		Annual	20		Uncomfortable	27		Acceptable
	B	Spring	20		Uncomfortable	27		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	19		Walking	26		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
64	A	Spring	20		Uncomfortable	26		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	19		Walking	25		Acceptable
	B	Spring	19		Walking	25		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	18		Walking	24		Acceptable
65	A	Spring	21		Uncomfortable	27		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	20		Uncomfortable	26		Acceptable
		Winter	22		Uncomfortable	29		Acceptable
		Annual	20		Uncomfortable	27		Acceptable
	B	Spring	19		Walking	25		Acceptable
		Summer	14	-12%	Standing	19		Acceptable
		Fall	17	-15%	Walking	23	-12%	Acceptable
		Winter	17	-23%	Walking	24	-17%	Acceptable
		Annual	17	-15%	Walking	23	-15%	Acceptable
66	A	Spring	21		Uncomfortable	27		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	20		Uncomfortable	25		Acceptable
		Winter	22		Uncomfortable	28		Acceptable
		Annual	20		Uncomfortable	26		Acceptable
	B	Spring	14	-33%	Standing	21	-22%	Acceptable
		Summer	11	-31%	Sitting	16	-24%	Acceptable
		Fall	13	-35%	Standing	19	-24%	Acceptable
		Winter	13	-41%	Standing	20	-29%	Acceptable
		Annual	13	-35%	Standing	19	-27%	Acceptable
67	A	Spring	20		Uncomfortable	26		Acceptable
		Summer	16		Walking	20		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	22		Uncomfortable	28		Acceptable
		Annual	20		Uncomfortable	26		Acceptable
	B	Spring	14	-30%	Standing	20	-23%	Acceptable
		Summer	11	-31%	Sitting	15	-25%	Acceptable
		Fall	13	-32%	Standing	19	-24%	Acceptable
		Winter	14	-36%	Standing	21	-25%	Acceptable
		Annual	13	-35%	Standing	19	-27%	Acceptable
68	A	Spring	21		Uncomfortable	28		Acceptable
		Summer	17		Walking	22		Acceptable
		Fall	20		Uncomfortable	26		Acceptable
		Winter	22		Uncomfortable	29		Acceptable
		Annual	21		Uncomfortable	27		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
	B	Spring	20		Uncomfortable	27		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	20		Uncomfortable	28		Acceptable
		Annual	19		Walking	26		Acceptable
69	A	Spring	21		Uncomfortable	26		Acceptable
		Summer	17		Walking	21		Acceptable
		Fall	20		Uncomfortable	25		Acceptable
		Winter	22		Uncomfortable	27		Acceptable
		Annual	21		Uncomfortable	25		Acceptable
	B	Spring	18	-14%	Walking	25		Acceptable
		Summer	15	-12%	Standing	20		Acceptable
		Fall	17	-15%	Walking	23		Acceptable
		Winter	19	-14%	Walking	25		Acceptable
		Annual	18	-14%	Walking	24		Acceptable
70	A	Spring	16		Walking	22		Acceptable
		Summer	13		Standing	17		Acceptable
		Fall	15		Standing	20		Acceptable
		Winter	16		Walking	22		Acceptable
		Annual	15		Standing	21		Acceptable
	B	Spring	14	-12%	Standing	20		Acceptable
		Summer	11	-15%	Sitting	16		Acceptable
		Fall	13	-13%	Standing	19		Acceptable
		Winter	14	-12%	Standing	20		Acceptable
		Annual	13	-13%	Standing	19		Acceptable
71	A	Spring	19		Walking	25		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	18		Walking	24		Acceptable
	B	Spring	18		Walking	24		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	18		Walking	24		Acceptable
		Annual	17		Walking	23		Acceptable
72	A	Spring	16		Walking	23		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	15		Standing	21		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	15		Standing	21		Acceptable
	B	Spring	16		Walking	22		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	14		Standing	21		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	14		Standing	20		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
73	A	Spring	18		Walking	23		Acceptable
		Summer	13		Standing	18		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	17		Walking	24		Acceptable
		Annual	16		Walking	22		Acceptable
	B	Spring	DATA NOT AVAILABLE					
		Summer	DATA NOT AVAILABLE					
		Fall	DATA NOT AVAILABLE					
		Winter	DATA NOT AVAILABLE					
		Annual	DATA NOT AVAILABLE					
74	A	Spring	16		Walking	22		Acceptable
		Summer	12		Sitting	16		Acceptable
		Fall	15		Standing	20		Acceptable
		Winter	15		Standing	21		Acceptable
		Annual	15		Standing	20		Acceptable
	B	Spring	16		Walking	21		Acceptable
		Summer	12		Sitting	15		Acceptable
		Fall	15		Standing	19		Acceptable
		Winter	15		Standing	21		Acceptable
		Annual	15		Standing	19		Acceptable
75	A	Spring	20		Uncomfortable	27		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	18		Walking	25		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	19		Walking	25		Acceptable
	B	Spring	19		Walking	26		Acceptable
		Summer	15		Standing	22		Acceptable
		Fall	18		Walking	25		Acceptable
		Winter	19		Walking	27		Acceptable
		Annual	18		Walking	25		Acceptable
76	A	Spring	19		Walking	25		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	19		Walking	25		Acceptable
		Annual	18		Walking	24		Acceptable
	B	Spring	19		Walking	25		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	18		Walking	24		Acceptable
77	A	Spring	DATA NOT AVAILABLE					
		Summer	DATA NOT AVAILABLE					
		Fall	DATA NOT AVAILABLE					
		Winter	DATA NOT AVAILABLE					
		Annual	DATA NOT AVAILABLE					

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
	B	Spring	16		Walking	26		Acceptable
		Summer	13		Standing	20		Acceptable
		Fall	15		Standing	24		Acceptable
		Winter	18		Walking	28		Acceptable
		Annual	16		Walking	25		Acceptable
78	A	Spring	DATA NOT AVAILABLE					
		Summer	DATA NOT AVAILABLE					
		Fall	DATA NOT AVAILABLE					
		Winter	DATA NOT AVAILABLE					
		Annual	DATA NOT AVAILABLE					
	B	Spring	11		Sitting	18		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	11		Sitting	17		Acceptable
		Winter	12		Sitting	19		Acceptable
		Annual	11		Sitting	17		Acceptable
79	A	Spring	DATA NOT AVAILABLE					
		Summer	DATA NOT AVAILABLE					
		Fall	DATA NOT AVAILABLE					
		Winter	DATA NOT AVAILABLE					
		Annual	DATA NOT AVAILABLE					
	B	Spring	16		Walking	24		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	17		Walking	25		Acceptable
		Annual	16		Walking	23		Acceptable
80	A	Spring	DATA NOT AVAILABLE					
		Summer	DATA NOT AVAILABLE					
		Fall	DATA NOT AVAILABLE					
		Winter	DATA NOT AVAILABLE					
		Annual	DATA NOT AVAILABLE					
	B	Spring	21		Uncomfortable	29		Acceptable
		Summer	17		Walking	24		Acceptable
		Fall	20		Uncomfortable	28		Acceptable
		Winter	22		Uncomfortable	31		Acceptable
		Annual	21		Uncomfortable	28		Acceptable
81	A	Spring	DATA NOT AVAILABLE					
		Summer	DATA NOT AVAILABLE					
		Fall	DATA NOT AVAILABLE					
		Winter	DATA NOT AVAILABLE					
		Annual	DATA NOT AVAILABLE					
	B	Spring	22		Uncomfortable	30		Acceptable
		Summer	17		Walking	24		Acceptable
		Fall	21		Uncomfortable	28		Acceptable
		Winter	23		Uncomfortable	32		Acceptable
		Annual	21		Uncomfortable	30		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
82	A	Spring	DATA NOT AVAILABLE					
		Summer	DATA NOT AVAILABLE					
		Fall	DATA NOT AVAILABLE					
		Winter	DATA NOT AVAILABLE					
		Annual	DATA NOT AVAILABLE					
	B	Spring	18		Walking	24		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	17		Walking	24		Acceptable
		Annual	16		Walking	23		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

FIGURES



Wind Tunnel Study Model
No Build Configuration

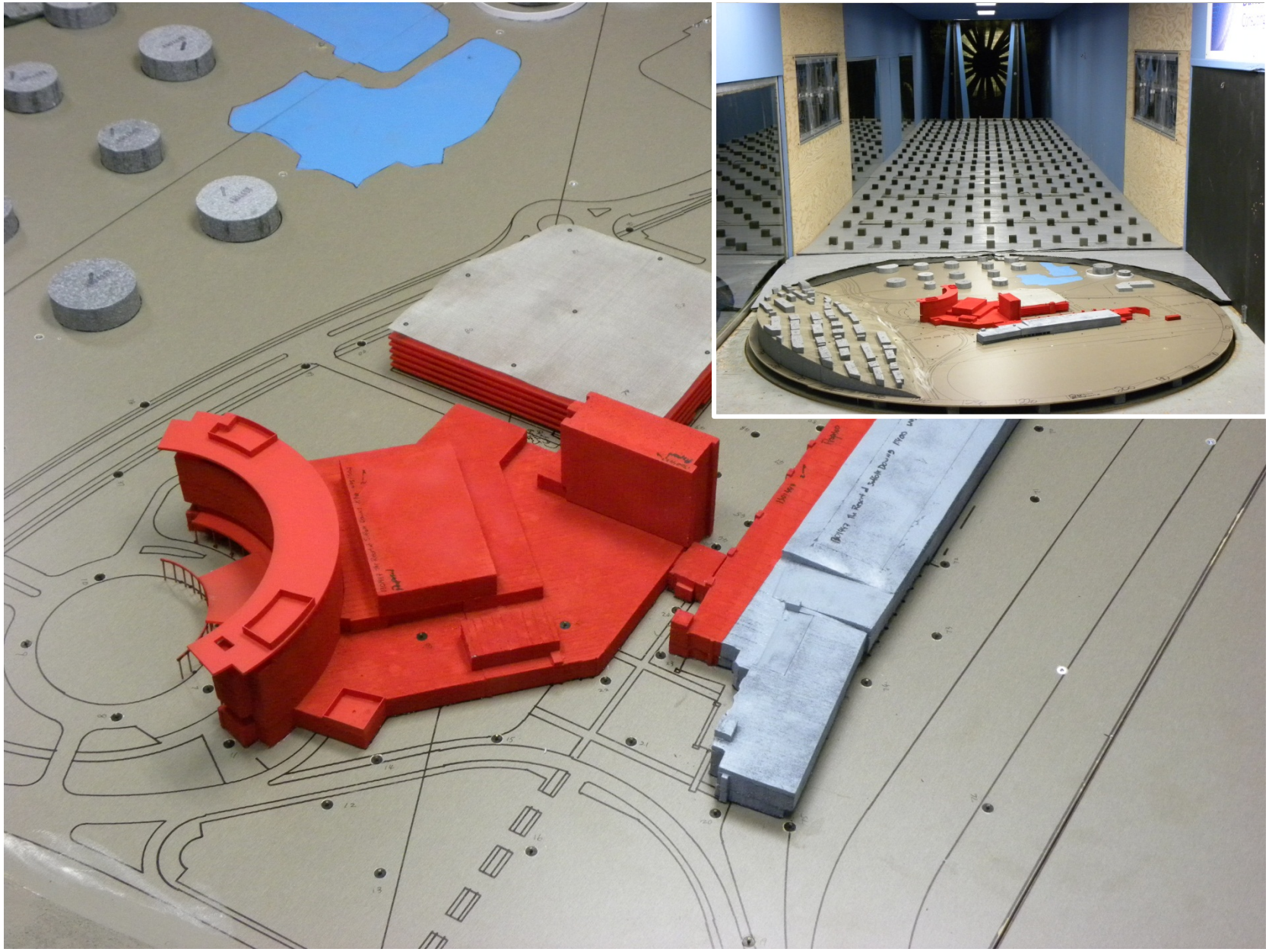
The Resort at Suffolk Downs - Boston, Massachusetts

Project #1301447

Figure: 1a

Date: July 4, 2013

RWDI



Wind Tunnel Study Model
Build Configuration

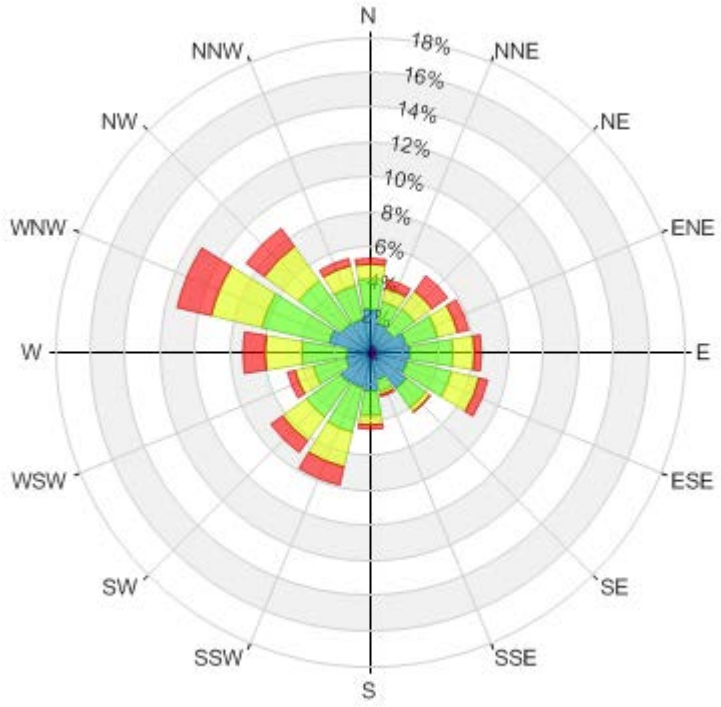
The Resort at Suffolk Downs - Boston, Massachusetts

Project #1301447

Figure: 1b

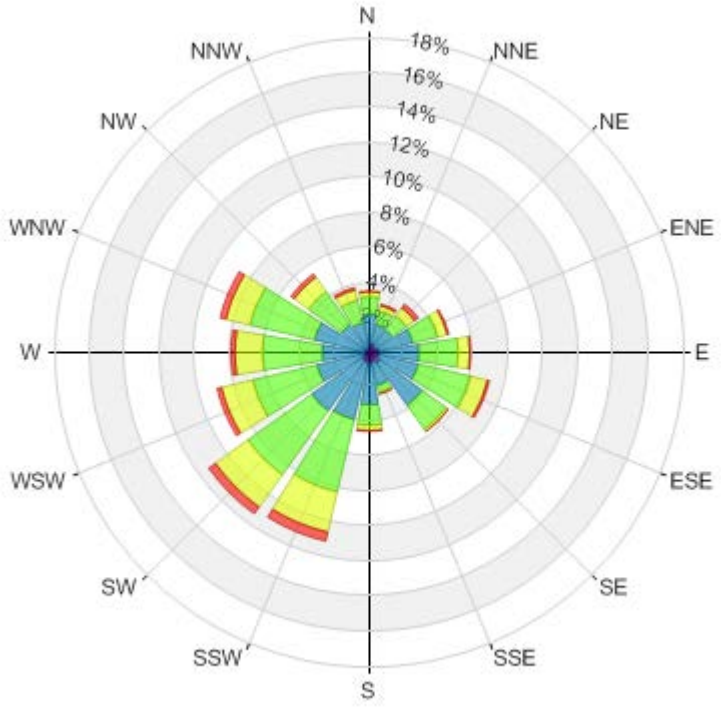
Date: July 4, 2013

RWDI



Spring Winds
(March - May)

(mph)	Probability (%) Spring	Summer
Calm	1.4	1.5
1-5	5.8	8.3
6-10	26.9	36.1
11-15	33.4	36.2
16-20	21.3	14.9
>20	11.2	2.9



Summer Winds
(June - August)

Directional Distribution (%) of Winds (Blowing From)
Boston Logan International Airport (1982 - 2011)

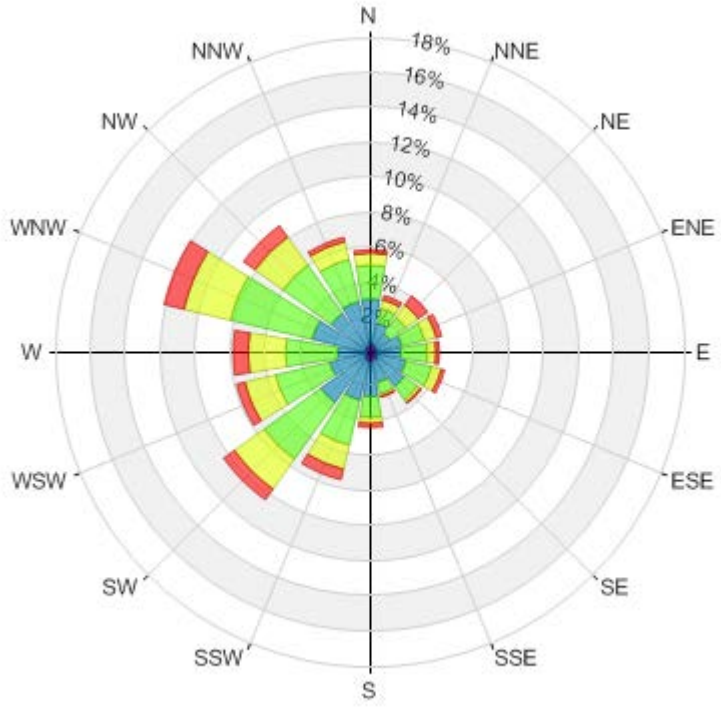
The Resort at Suffolk Downs – Boston, Massachusetts

Project #1301447

Figure No: 2a

Date: 7/16/2013

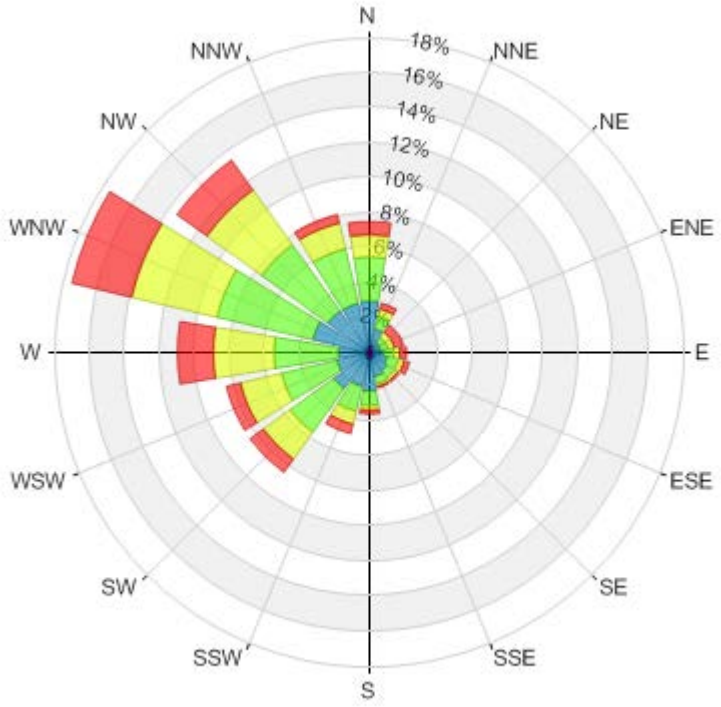
RWDI



Fall Winds
(September - November)



(mph)	Probability (%) Fall	Winter
Calm	1.6	1.2
1-5	7.0	5.3
6-10	32.0	25.1
11-15	34.6	32.1
16-20	17.6	22.6
>20	7.2	13.7



Winter Winds
(December - February)

Directional Distribution (%) of Winds (Blowing From)
Boston Logan International Airport (1982 - 2011)

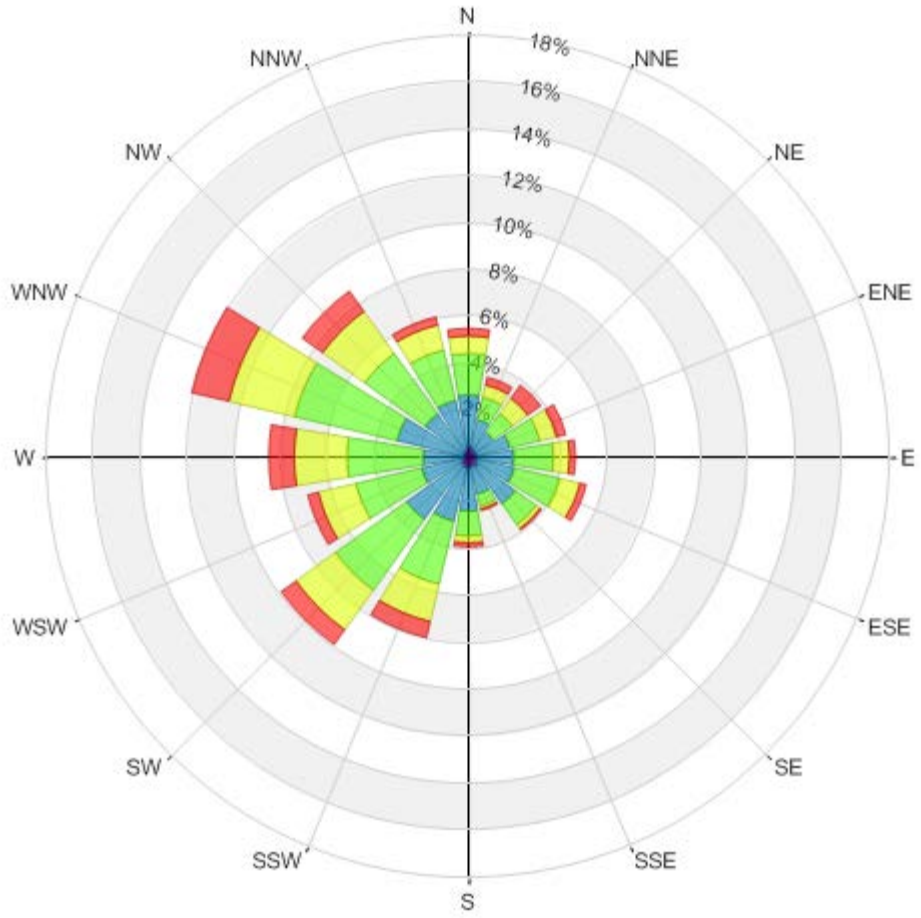
The Resort at Suffolk Downs – Boston, Massachusetts

Project #1301447

Figure No: 2b

Date: 7/16/2013

RWDI



Annual Winds

(mph)	Probability (%)
Calm	1.8
1-5	6.3
6-10	30.4
11-15	34.0
16-20	18.8
>20	8.7

Directional Distribution (%) of Winds (Blowing From)
Boston Logan International Airport (1982 - 2011)

The Resort at Suffolk Downs – Boston, Massachusetts Project #1301447

Figure No: 2c

Date: 7/16/2013

RWDI



Pedestrian Wind Conditions - Mean Speed -No Build
Annual (January to December, 1:00 to 24:00)

True North

The Resort At Suffolk Downs - Boston, Massachusetts

Project #1301447

Drawn by:	SMR	Figure:	3a
Approx. Scale:			1"=200'
Date Revised:			July 3, 2013

RWDI



Pedestrian Wind Conditions - Mean Speed -Build

Annual (January to December, 1:00 to 24:00)

The Resort At Suffolk Downs - Boston, Massachusetts

Project #1301447

True North

Drawn by: SMR	Figure: 3b
Approx. Scale:	1"=200'
Date Revised:	July 3, 2013

RWDI

TOMASELLO DRIVE

GRANDSTAND

LEGEND:

EFFECTIVE GUST CATEGORIES:

Acceptable

Unacceptable

SENSOR LOCATION:

Grade Level

Podium Level

0 100 200ft

Pedestrian Wind Conditions - Effective Gust -No Build

Annual (January to December, 1:00 to 24:00)

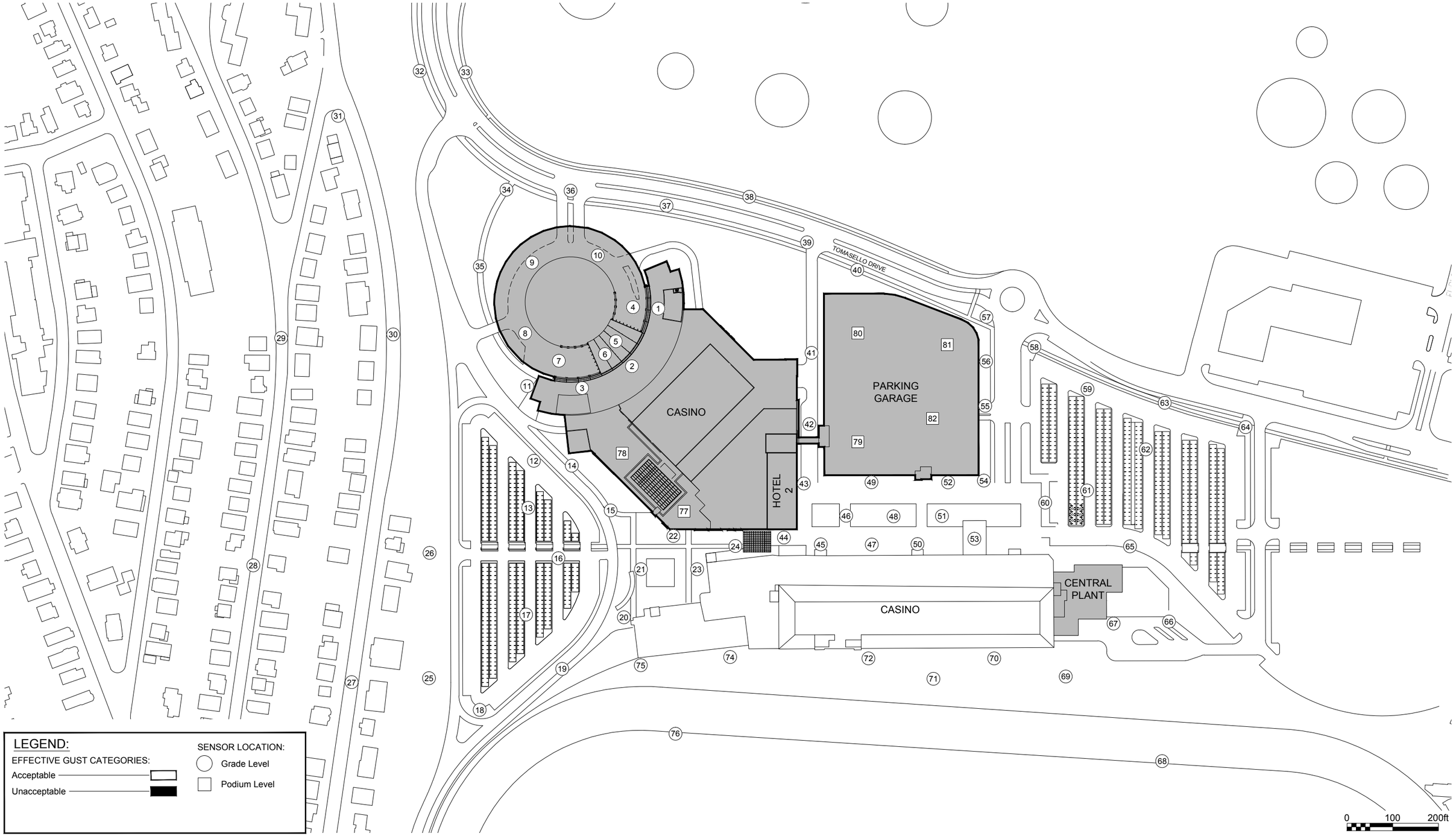
True North

The Resort At Suffolk Downs - Boston, Massachusetts

Project #1301447

Drawn by:	SMR	Figure:	4a
Approx. Scale:			1"=200'
Date Revised:			July 3, 2013

RWDI



Pedestrian Wind Conditions - Effective Gust -Build
Annual (January to December, 1:00 to 24:00)

The Resort At Suffolk Downs - Boston, Massachusetts

True North

Project #1301447

Drawn by:	SMR	Figure:	4b
Approx. Scale:			1"=200'
Date Revised:			July 3, 2013

RWDI

APPENDIX A

APPENDIX A: DRAWING LIST FOR MODEL CONSTRUCTION

The drawings and information listed below were received from Elkus Manfredi Architects and were used to construct the scale model of the proposed Resort at Suffolk Downs. Should there be any design changes that deviate from this list of drawings, the results may change. Therefore, if changes in the design are made, it is recommended that RWDI be contacted and requested to review their potential effects on wind conditions.

Description	File Name	File Type	Date Received (dd/mm/yyyy)
3D Model	Suffolk Downs Site Plan DWG Conversion	.skp	10/06/2013
Sensor Layout	PreliminarySensorPlan3	.pdf	18/06/2013
Site Document	13_0313_RWDI Package	.pdf	14/03/2013
Site Document	Daylight Analysis Plan	.dwg	14/05/2013
Revised Sensor Layout	Fig3&4	.dwg	03/07/2013

Attachment L

Draft Construction Management Plan

ATTACHMENT L DRAFT CONSTRUCTION MANAGEMENT PLAN

This draft Construction Management Plan (CMP) addresses construction sequencing, staging plans, material deliveries, and specific mitigation measures intended to avoid and minimize impacts from the Project. As Project design progresses, protection measures will be added and modified as appropriate. A CMP will be submitted to the Boston Transportation Department for approval prior to commencement of construction, and the Developer's general contractor will be bound by the operational parameters described herein.

For on-site construction, the Developer and construction team will coordinate CMPs with the cities of Boston and Revere and applicable state agencies and authorities, as appropriate.

1. Construction Methodology

This section describes the construction schedule and the methods that will be used for staging, site access, public safety, and erosion and sediment control.

1.1 Construction Activity Schedule

Project construction is expected to take up to 60 months. Weekend, extended hours and 2nd/3rd shift activities will require an off-hours permit jointly issued by the Inspectional Services Department and Boston Transportation Department (BTD), and will be performed in a manner that will minimize impacts as may be necessary to meet permitting restrictions. The general contractor will also need to perform some activities, such as materials unloading, during off hours; deliveries of large construction equipment (e.g., cranes, excavation equipment) will be scheduled to avoid and/or minimize impacts to vehicular, pedestrian traffic and noise generated from the site.

Within the site, activities such as excavation, pile driving, and steel erection will also be prohibited during these hours. Every two weeks, the contractor will publish an updated schedule of upcoming work and will disseminate the schedule to affected parties in local neighborhoods. In addition, the general contractor will publish monthly schedule updates describing progress as well as projected activity for the next month. This information will be available on a Project website which will allow neighbors real-time access to the most up-to-date construction information.

1.2 Construction Staging and Truck Deliveries

The proposed staging plan is designed to isolate construction activities while providing safe access for pedestrians and automobiles during normal daily activities as well as emergencies. All adjacent streets will remain open to the public during construction.

Construction storage and staging will remain within the fenced construction fence enclosure. This boundary will be enclosed with a six-foot-high chain link fence with privacy screening. Plans illustrating construction phasing and staging on the Project site will be provided to and subject to review and approval by BTD prior to the commencement of any Work on the Property.

All construction delivery trucks will enter the site from Route 1A at Tomasello Drive, and will not be allowed to park or idle on neighborhood streets. Major deliveries such as steel or large pieces of mechanical equipment will be staged on-site. Specific language regarding staging locations and the prohibition of staging materials in neighborhood streets will be called out in all subcontracts. While it is not anticipated that any off-site staging or marshalling areas will be used, the locations of any and all staging and marshalling areas will be forwarded to the BTD and the City of Revere for review and approval. Truck wheel wash stations will be located and used at all site exits to ensure that soil materials are not tracked onto roadways from the site. During all site work activities, construction laborers will maintain adjacent streets and sidewalks to prevent accumulation of dirt and dust. Mechanical sweeping, and at the City's sole discretion, vacuum sweeping, will be used continuously during the excavation, foundation, and site work phases of the project to maintain adjacent roadways.

1.3 Perimeter Protection and Public Safety

Proper signage will direct pedestrians, vehicles and bicyclists safely around the site and construction activities.

The general contractor will work to minimize impacts to both pedestrian, bicycle and vehicular flow. Specific configurations of staging and pedestrian access around the site will vary depending on the phase of work being performed (see attached construction phasing plans). These configurations will ensure safe egress to and from the existing racetrack facilities during operation. As pedestrian, bicycle and vehicular access changes with the progression of construction, all changes will be submitted to BTD and the City of Revere for their review and approval prior to implementation. Fire department access as well as access to the fire hose connection will be continuously maintained at all times as shown in the attached construction phasing plans.

In general, secured fencing will isolate construction areas from pedestrian traffic within the site. Police details will be provided as needed to facilitate traffic flow both on and off the project site. In addition, sidewalk areas and walkways near construction activities will be protected, well marked, and lighted to ensure pedestrian safety. The general contractor will provide sufficient temporary site lighting to ensure the safety of all pedestrians accessing the site until permanent street lighting is installed. Construction safety procedures will be designed to meet all OSHA safety standards for specific site construction activities.

All subcontractors will be required to wear appropriate personal protective equipment, and each subcontractor will implement and manage its own Safety and Health Program for the project. These programs will be reviewed by the general contractor's field staff and safety department, which will also monitor compliance. This program will ensure that subcontractors' employees, subcontractors, and suppliers, regardless of tier, know and understand the complete safety and health requirements of the project.

Snow removal and ice treatment will occur in a timely manner and will be provided on the surrounding City sidewalks. Trash removal and debris cleanup will be performed on a continuous basis throughout the entire construction process. Construction-period way finding and directional signage will be provided and updated as necessary during construction.

1.4 Erosion Control, Dewatering and Mitigation

The Developer will prepare a Stormwater Pollution Prevention Plan (SWPPP) and submit a Notice of Intent to the U.S. EPA for coverage under EPA's NPDES Construction General Permit (CGP). The SWPPP will detail methods for preventing soil erosion and pollution of downstream receiving waters due to stormwater runoff from construction zones, and will be a "living" document to be revised as construction phasing dictates. The SWPPP will include both structural and non-structural BMPs to be used during construction, and will require site inspections in accordance with the CGP during all periods when ground surfaces remain un-stabilized. Locations for materials stockpiles, construction staging, construction trailers, and equipment storage will be identified.

Construction-period erosion and sediment controls will include the non-structural and structural BMPs described below. These controls will be designed, installed, and maintained in accordance with the SWPPP as well as the following documents:

- "Storm Water Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices" (EPA 832-R92-005, Sept. 1992);
- "Storm Water Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices – Summary Guidance" (EPA 833-R92-001, Oct. 1992);
- Massachusetts Stormwater Management Policy Handbook (Volume I) and Technical Handbook (Volume II) issued by the Massachusetts Department of Environmental Protection, March 1997; and
- Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas, A Guide for Planners, Designers and Municipal Officials, March 1997.

Stormwater management for the post-construction, operational phase of the Resort is described in Section 9.3.2.

Non-Structural Controls

One of the most important methods of preventing soil erosion and sedimentation associated with stormwater runoff is to minimize the amount and duration of non-stabilized surfaces. Maintaining an efficient construction sequence that minimizes the size of disturbed areas reduces the exposure of non-stabilized surfaces to the erosive effects of stormwater. As with the SWPPP, the CMP will require contractors to minimize areas of disturbance. The thoughtful siting of storage and stockpile areas away from downstream receptors will also help prevent sedimentation from stormwater runoff.

On-site storage of hazardous materials or toxic chemicals will be limited to what is absolutely necessary. Where necessary, these materials will be stored off the ground and in enclosed or covered structures to prevent contact with stormwater runoff.

Daily street sweeping (or more frequent street sweeping as needed) of construction areas and surrounding streets and sidewalks will be required throughout construction to control fugitive dust emissions and to remove sediments tracked off site where they could otherwise by washed into surface waters, wetland resource areas, or the municipal stormwater management system, on a schedule approved by BTD. Permanent stabilization of exposed surfaces will be required within seven days of the completion of work in any given area. In instances when it may not possible to permanently stabilize exposed soils within seven days of work completion, or when soils will be exposed for 14 days or longer without work occurring, temporary stabilization of surfaces will be required. This temporary stabilization will be achieved by seeding with quickly-germinating grasses or the use of erosion control blankets.

Structural Practices

In addition to the non-structural controls discussed above, many construction-period structural BMPs will be required to prevent pollution from stormwater runoff. Appropriate perimeter controls such as silt socks, straw wattles, and compost berms will be installed to filter and slow stormwater runoff as it leaves the construction site. To prevent the import of invasive species and weed seeds, hay bales will not be used for erosion and sedimentation control in the Project. In accordance with the SWPPP, these perimeter controls will be inspected every seven days. Sediment build-up behind perimeter controls will be removed when it reaches one-half the height of the controls, and controls will be repaired or replaced as needed.

To prevent the tracking of sediments beyond the construction site, stabilized construction exits of crushed stone will be installed. All construction traffic will be directed over these exits when leaving the site to remove soils from vehicle tires. Construction exits will be inspected weekly in accordance with the SWPPP, and will be repaired or replaced as necessary when sediment builds up on the surface or crushed stone is displaced. Appropriately-sized concrete truck wash-out basins will be installed in locations to prevent

contact with stormwater runoff. These basins will be cleaned as needed, and concrete materials will be disposed of in accordance with applicable local, state, and federal regulations.

New and existing inlets to stormwater management systems will be protected against sediment inflow. Catch basins will be fitted with filter inserts or will be surrounding by silt socks or other materials to filter incoming stormwater. The stormwater management systems will be constructed starting at the downstream end, and no flows will be directed to permanent stormwater BMPs prior to their completion and upstream surface stabilization.

Where larger site disturbances are necessary to accommodate particular construction activities, various measures will be implemented to prevent sediment-laden runoff from leaving the Project site. Where long, exposed slopes are required, temporary check dams will be constructed to reduce runoff velocities and promote less erosive sheet flow. These check dams may be earthen berms, straw wattles, compost berms, or other appropriate systems of slowing runoff velocities and promoting sediment removal. Temporary sediment basins will be constructed where necessary to allow sediments to drop out of suspension prior to discharge and promote construction-period infiltration to groundwater. Disturbed surfaces will be temporarily graded towards these basins, or temporary diversion swales will be built to direct flows to these basins. Basin outlets will be constructed to promote low-velocity sheet flow and will be directed towards existing vegetated areas for further treatment.

2. Construction Air Quality

Construction operations at the site, including earthwork, will generate dust. All demolition and construction work will be performed in accordance with applicable sections of the MassDEP Air Pollution Control Regulations at 310 CMR 7.02 and 310 CMR 7.09. Specific air quality mitigation measures will be as follows:

- Use of appropriately designed construction entrances and wheel wash facilities at all construction exists by all vehicles that would otherwise track mud or dirt onto public roadways to prevent off-site migration of soils;
- Mechanical street sweeping, and at the City's sole discretion, vacuum sweeping, of construction areas and surrounding streets and sidewalks;
- Encapsulation of demolition sites as necessary where hazardous materials such as asbestos or lead paint are identified;
- Removal of demolition and construction waste in covered or enclosed trailers;
- Wetting of exposed soils and stockpiles to prevent dust generation;
- Minimizing stockpiling of materials on site;

- Turning off construction equipment when not in use, complying with all idling limitations in applicable law and regulations and minimizing idling times;
- Minimizing the storage of demolition and construction wastes on site; and
- Minimizing the duration that soils are left exposed.

Many of these measures are intended to minimize potential impacts associated with construction activities that may generate fugitive dust, which will result in localized increases in airborne particulate levels. Fugitive dust emissions from construction activities will depend on such factors as the properties of the emitting surfaces (e.g., moisture content and volume of spoils), meteorological variables, and construction practices employed.

Although fugitive dust may be generated during demolition and construction activities, the distance to off-site receptors makes it unlikely that the migration of dust will cause off-site impacts. Nonetheless, the contractor will implement dust control measures during active demolition and construction that will primarily consist of using wetting agents regularly to control and suppress dust that may come from the structure being demolished or the construction materials. The contractor will comply with the National Emission Standards for Hazardous Pollutants (NESHAP) throughout renovation, demolition, and construction activities. The proposed redevelopment also includes on-site processing and reuse of brick and concrete, which will involve use of an on-site crusher. Appropriate notifications 30 days prior to any crushing will be performed, including notifying local officials and MassDEP in accordance with 310 CMR 16.05(3)(e)6. At no time shall fugitive dust be allowed to migrate beyond the immediate work zone. Dust mitigation during processing will include the use of water sprayers.

Site preparations involving construction haul roads, soil stockpiles, and vehicles exiting the Project site have the greatest potential to create fugitive dust. Soil excavation does not typically generate dust, however, due to the natural moisture content of subsurface soils. As necessary, haul roads will be routinely misted to suppress dust generation. Soil stockpiles can either be covered or vegetated, depending on how long the stockpile will remain. Dust from construction traffic exiting the Project site onto public roads will be controlled with the use of wheel wash stations and vehicle tracking pads, which remove soil from the tires of construction vehicles. Paved construction entrances will also be routinely swept by street sweepers to remove accumulated soils. At no time will visible soils be permitted on public streets that could result in fugitive dust issues.

In addition, the Developer acknowledges the importance of emission controls and will require contractors to comply with MassDEP's Diesel Retrofit Program and the use of ultra low sulfur diesel in off-road engines. The Diesel Retrofit Program, formerly called the Clear Air Construction Initiative of the Clean Construction Equipment Initiative, originated as an

air quality mitigation measure for the Central Artery/Tunnel Project. The program was designed to encourage users of diesel construction equipment to install exhaust emission controls such as oxidation catalysts or particulate filters on their diesel engines.

Construction vehicles will be required to comply with all applicable laws and regulations regarding engine idling, and shall minimize any such idling. The approved construction contractor(s) will be required to use equipment fitted with diesel oxidation catalysts (DOC) or diesel particulate filters (DPF) to reduce emissions. DOCs can reduce fine PM by 25 percent, toxic carbon monoxide by 60 percent and smog-forming volatile organic compounds by 60 percent. DPFs can reduce fine PM by 85 percent or more, as well as smaller reductions in carbon monoxide and VOCs.

A construction air quality dust and emissions mitigation plan will be developed before construction begins and enforceable measures will be executed in the construction contracts.

Indoor air quality will be evaluated and tested by the Project environmental consultant, as appropriate, in buildings that are to remain or be renovated. The need for protective measures such as vapor barriers will be determined during final design. The potential for methane migration (from organic deposits) will be assessed by the Project environmental consultant during final design.

3. Construction Period Noise

Predicted sound levels from construction within the proposed Project site are not anticipated to cause a significant noise impact and are expected to meet the relevant City of Boston daytime construction noise criteria at all noise-sensitive locations.

Construction will require the use of equipment that will be heard off-site, but background ambient noise conditions in the area, including urban activities and traffic, will lessen the impacts from construction noise. In addition, the Developer is committed to mitigate noise impacts related to the construction activities. A noise analysis performed for the Project to quantify the expected noise level associated with different construction activities and has been provided to BTD and the City of Revere.

The proposed construction process has been designed around site constraints, and the exact pieces of equipment will be finalized after subcontractor selection is complete.

Every reasonable effort will be made to minimize the noise impact of construction activities. Mitigation measures will be as follows:

- Scheduling work during daytime hours. If extended hours, weekend or $2^{nd}/3^{rd}$ shift work is proposed, it will be coordinated with BTD and the City of Revere. During any such extended hours, weekend or $2^{nd}/3^{rd}$ shift work, all back up alarms on vehicles shall be disengaged and manual traffic controls will be used.

- Using appropriate mufflers on all equipment and providing ongoing maintenance of intake and exhaust mufflers.
- Maintaining muffler enclosures on continuously operating equipment, such as air compressors and welding generators.
- Replacing specific construction operations by less noisy ones where feasible and practical.
- Selecting the quietest practicable equipment (e.g., electric instead of diesel-powered equipment).
- Selecting equipment operations to keep average noise levels low, to synchronize the noisiest activities with times of highest ambient noise levels, and to maintain relatively uniform noise levels.
- Turning off idle equipment.
- Securing any decking on roadways so that there is no rattling when traffic passes over.
- Using vehicles and equipment with either ambient-sensitive or manually adjustable back-up alarms.
- The proper sizing of impact equipment such as hoe rams, pile drivers and jackhammers and powering only to the degree needed to perform the work.
- The installation of noise suppression enclosures on hoe rams.
- The placement of stationary noise producing equipment such as pumps and generators as far away as possible from residential and sensitive receptor locations.
- Keeping engine housing panels on all equipment closed; and when not in use, shutting off equipment.

4. Construction Schedule

The Project will be constructed in one continuous phase. Staging plans will be provided to BTD for review and approval prior to the commencement of any Work on the Property. The precise details of such staging will be set forth in the final CMP as approved for the Project but in all events shall require that all construction staging will be sequenced such that all construction staging and construction worker parking will be provided on the Property.

5. Construction Traffic Impacts

The number of workers required during construction will vary by period of construction and level of activity. Because the workforce will arrive prior to peak traffic periods, these trips are not expected to impact traffic conditions. In addition, the general contractor will encourage jobsite personnel to utilize public transportation such as by providing personnel with subsidized MBTA passes or shuttle services. Personal vehicles will be allowed to park within designated areas at the Project construction site at no cost, and no construction or personal vehicle parking will be allowed in adjacent neighborhoods. The general contractor shall develop a parking plan for BTD's review and approval, which shall include the general contractor's plans and protocols for enforcing the prohibition on construction personnel parking personal vehicles on streets in the adjacent neighborhood. Terms and conditions to maximize protection of the neighborhoods related to workforce parking will be written into each subcontract and reviewed with each worker during a mandatory orientation. Terms and conditions encouraging public transportation use will be included in each subcontract.

Truck traffic will vary throughout the construction period, depending on the activities being performed. It is expected that truck traffic will average 15-20 trucks daily spread evenly throughout the day.

Specific truck routes will be identified and described to BTD and the City of Revere, and will be clearly delineated on site logistics drawings, for BTD and the City of Revere's review and approval. Construction contracts will include clauses restricting truck travel to BTD- and Revere-approved routes. Unless a specific exception is approved by BTD and the City of Revere, the Developer shall require all construction vehicles to access the Project site from Route 1A at Tomasello Drive. Wheel wash stations and anti-tracking stone pads, which will be at least 50 feet long and consist of a four-inch-thick layer of crushed stone placed over a non-woven filter fabric, will be placed at each access point to the work area. Wheel wash stations will remain in place until the completion of construction and anti-tracking stone pads will remain in place until the work area is paved or otherwise stabilized.

Off-site traffic improvements will require close coordination with the cities of Boston and Revere as well as certain state agencies. The general contractor will develop a construction-period traffic management plan for review and approval by the cities and state. Signage, traffic cones, drums, and other traffic control measures will be employed during construction to provide positive guidance for traffic near the work zone.

6. Dewatering and Groundwater

Should dewatering become necessary during demolition, installation of utilities, or construction of building foundations, appropriate BMPs will be implemented to prevent pollution of downstream receptors. Temporary construction dewatering will likely be

required locally for various excavations, and intermittent pumping will be used as needed to allow for construction in-the-dry. Effluent generated during temporary construction dewatering will be infiltrated into the ground where possible. Groundwater testing will be conducted during dewatering operations as appropriate to determine the type and degree of contamination present and to evaluate and implement appropriate measures to manage groundwater associated with Project excavation and construction, including use of a fractionation tank(s) and adherence to the requirements of temporary construction dewatering permits, as appropriate.

7. Material Handling

The Project includes the demolition of existing buildings, paved driveways, parking lots, sidewalks, and various utilities that will generate large volumes of waste products. Based on available information, a portion of the demolition waste includes hazardous materials such as asbestos, minor amounts of materials containing low levels of polychlorinated biphenyls (PCBs), and lead paint. In addition, due to the scale of the Project, a large amount of general construction waste is also expected. The sections below detail how hazardous and non-hazardous solid wastes will be handled during demolition and construction. The Developer is targeting a 75% reduction in construction debris.

7.1 Solid Waste and Recycling

Proposed construction, demolition, and remediation activities will generate solid waste, including certain regulated building waste streams (e.g., asbestos-containing materials, PCBs, and oil/hazardous materials). The general contractor will take an active role in the processing and recycling of construction waste. The disposal contract will include specific requirements to ensure that procedures allow for the necessary segregation, reprocessing, reuse, and recycling of materials. For those materials that cannot be recycled, solid waste will be transported in covered trucks to an approved solid waste facility per MassDEP Regulations for Solid Waste Facilities, 310 CMR 16.00. Brick, concrete, gypsum wallboard, wood and metal will be segregated from other construction debris for recycling, with the other debris to be disposed of as non-banned construction waste in accordance with waste facility management regulations at 310 CMR 19.017.

Demolition of the administration building, electrical building, and portions of the existing grandstand and link buildings will generate asphalt, brick and concrete (ABC) debris. ABC that is not coated, impregnated, or otherwise treated will be crushed and reused on site without MassDEP pre-approval, provided that MassDEP and the municipalities are notified in advance. However, for ABC that is painted, coated, impregnated, or otherwise treated, the contractor will submit a Beneficial Use Determination (BUD) Application to MassDEP for approval before those materials are crushed and reused on site. The application will be supported by documentation demonstrating that the material will be beneficially used on site and that use of the material will not result in a significant risk to health or the environment and will not increase the overall level of contamination at the site.

7.2 Hazardous Waste

Releases of oil or hazardous material to the environment are managed under the MCP (M.G.L. Chapter 21E and 310 CMR 40.0000) under the supervision of an LSP. The Project includes demolition and reconstruction as part of site redevelopment. [*Customary background information regarding Project environmental matters to be addressed in final CMP*].

An LSP has been engaged by Developer to provide environmental consulting services during Project design and construction. If contamination is identified in pre-construction sampling or during construction, an LSP will provide services consistent with the MCP as required for regulatory compliance and close-out. The Project environmental consultant will ensure that the Project conforms to MCP regulatory requirements for construction of buildings in contaminated areas, and that all required submittals will be provided to MassDEP.

The presence of PCBs in the caulking of buildings constructed between 1950 and 1980 has recently become public knowledge. There are minor amounts of PCB-containing materials on the Project site, specifically the caulking used to seal some of the windows. PCB-containing material is also common in items such as florescent light fixtures. A building assessment of the existing buildings has been completed quantifying the demolition debris that requires special disposal conditions. Non-hazardous waste landfills in Massachusetts landfills are permitted to accept PCB-containing materials where concentrations are less than 2 mg/kg; such disposal does not require approval from the EPA.

The site is also regulated under asbestos abatement regulations (310 CMR 4.00), and asbestos-containing materials are known to exist on the Project site. Asbestos is classified as a "special waste" under MassDEP solid waste regulations, and asbestos and asbestos-containing material require special handling and transporting methods set out in MassDEP regulations. Asbestos-containing material surveys and abatement plans will be developed for each building prior to demolition. Asbestos can only be disposed of in landfills that have been approved to accept asbestos-containing waste materials. Any entity or individual engaged at the site for asbestos abatement or containment shall be licensed and certified under 453 CMR 6.00.

The Project involves the demolition of existing buildings, paved driveways, parking lots, sidewalks, and various utilities including portions of existing water mains and sewer mains. Based on available information, a portion of the demolition waste will include hazardous materials such as asbestos and lead-based paint. These materials are classified as "special waste" under MassDEP solid waste regulations. Accordingly, asbestos, asbestos-containing material, and materials with lead-based paint will be segregated and Project operations will proceed in accordance with the required special handling and transporting methods set out in MassDEP regulations.

Based on a February 14, 2007 Phase I/Phase II Environmental Site Assessment report completed by GEI Consultants, an on-site inspection for asbestos-containing building materials and lead-based paint was conducted by Smith & Wessel of Merrimac, Massachusetts in select buildings on the Project site. Materials that tested positive for asbestos included floor tile and paper, wall and ceiling panels, insulation, window glazing compound, and door caulking. It is unclear whether the existing grandstand roof contains asbestos. It is also noted that some painted surfaces contain lead-based paint.

Surveys and abatement plans related to asbestos-containing material, PCB-containing material, and lead-based paint will be required for each building prior to demolition. Asbestos, PCBs, and lead-based paint will be disposed of in accordance with MassDEP regulations at landfills that have been approved to accept these materials. Any entity or individual engaged at the site for asbestos, lead-based paint, or PCB abatement or containment shall be licensed and certified under 453 CMR 6.00.

Construction operations at the site, including earthwork, will generate dust. As required on construction projects, the Contract Documents will specify the requirements for dust control and include the site-specific Contractor Health & Safety Plans to protect worker safety. If required, dust will be suppressed by spraying the site with water, and air quality will be measured with dust monitors.

Based on existing information, one active UST exists on site. The existing UST is a 7,000-gallon partitioned gasoline and fuel oil tank located near the northwest corner of the existing building. During construction, the existing UST will be removed and a new UST will be installed near the proposed new maintenance building. The Project LSP will ensure that tank removal and closeout is completed in accordance with the MCP and requirements for the city of Revere. In addition, previously unknown USTs encountered during construction will be managed similarly, as needed.

8. Draft Spill Response Plan

Small quantities of hazardous materials or chemicals may be utilized on site, including petroleum/fuel products. Any such materials will be handled and stored in accordance with all applicable regulatory requirements. In the event of an unplanned release of petroleum/fuel products or other contaminants, the general contractor and its subcontractors will utilize the following procedures:

1. Notify Fire Department and contracted spill response contractor;
2. Notify the U.S. Army Corps of Engineers;
3. Mobile excavating equipment will come to the spill/release area and if necessary, create berms, dig channels or cover effected area with soil to reduce spreading or migration;

4. The general contractor will maintain a spill kit on site containing absorbent materials that will be positioned near fueling areas and utilized in the event of spill or release;

5. The general contractor and its subcontractors will reduce the probability of an unplanned spill or release by having fuels delivered by truck to a designated fueling area rather than bulk storage and/or tanks of petroleum/fuel products or other contaminants;

6. Fire extinguishers will be positioned adjacent to fueling areas;

7. No hot work, smoking or potential ignition sources will be allowed in the fueling areas;

8. Personnel involved with fueling or handling of any contaminant will be equipped with communication devices to sound an alarm in the event of spill or unplanned release;

9. Only authorized personnel will be allowed in the spill release area; and

10. The general contractor and its subcontractors will provide assistance as necessary to the qualified spill response contractor and fire department.

9. Geotechnical Impacts and Monitoring

Excavation will be required for the deep foundations (precast piles and/or steel piles), drilled elements such as micropiles, and PIFs proposed in the Project design. Means and methods for installing the deep foundation system will consider potential impacts to abutting facilities that will remain within the property limits (e.g., the grandstand). It is not expected that vibrations will approach thresholds that could potentially impact existing facilities; nonetheless, vibration monitoring will be conducted during pile driving activities. In addition, the Project team will conduct a full existing conditions survey of existing structures prior to commencement of construction, with follow-up on completion.

10. Rodent Control

To control rodent infestation, the City enforces requirements established under the Massachusetts State Sanitary Code, Chapter 11, 105 CMR 410.550 and the State Building Code, Section 108.6. Policy Number 87-4 (City of Boston), which require the extermination of rodents for issuance of permits for demolition, excavation, foundation and basement rehabilitation.

A rodent control program will be developed for the Project prior to commencement of construction and submitted to the City for its review and approval. The program will include performing extermination and control procedures on a bi-weekly basis and placing tamper-resistant bait boxes around the site perimeter.

11. Utilities

New infrastructure for sewer, drainage, domestic water, fire protection water, telephone, gas, and electric services will be tied into existing infrastructure. Specific traffic management plans will be developed for the work required to perform these tie-ins. Connections to the existing services will be coordinated with the proper utilities and their respective contractors, as necessary. All shutdowns will be arranged with affected parties and proper notice will be given prior to any shutdowns. Any and all work requiring a BTD Permit will be approved in writing by the general contractor at the time of permit application. The written approval of the general contractor will be presented to BTD by the contractor performing the work at the time of application of permit to BTD.

12. Damage to Public Property

The Contractor will be responsible for repairing any damage to public streets, public sidewalks, or other public property resulting from its construction activities.

13. Emergency Contacts

A 24-hour emergency contact list will be distributed to all parties involved in the Project. This list shall contain at least three (3) representatives for the Contractor. A 24-hour complaint hotline telephone number shall be provided and will be visibly posted on Project site signage subject to the approval of BTD, including on a Project sign visible from Route 1A. This hotline shall be staffed appropriately to ensure that a caller is allowed to speak to a person as opposed to leaving a message. Logs of all complaints and how/when the complaints were resolved will be kept on-site.

Attachment M

Circulation List

ATTACHMENT M CIRCULATION LIST

Executive Office of Energy and Environmental Affairs
Attn: MEPA Office
100 Cambridge Street, 9th Floor
Boston, MA 02114

Massachusetts Department of Environmental Protection
Commissioner's Office
Attn: MEPA Coordinator
One Winter Street
Boston, MA 02108

Massachusetts Department of Environmental Protection
Northeastern Regional Office
Attn: MEPA Coordinator
205B Lowell Street
Wilmington, MA 01887

Massachusetts Department of Environmental Protection
Attn: Air Quality Department
One Winter Street
Boston, MA 02108

Massachusetts Department of Transportation – Highway Division
Attn: Environmental Reviewer
Public/Private Development Unit
10 Park Plaza
Boston, MA 02116

Massachusetts Department of Transportation – Highway Division, District #4
Attn: Environmental Reviewer
519 Appleton Street
Arlington, MA 02476

Massachusetts Department of Transportation – Highway Division, District #6
Attn: Environmental Reviewer
185 Kneeland Street
Boston, MA 02111

Massachusetts Historical Commission
Attn: Environmental Reviewer
The MA Archives Building
220 Morrissey Boulevard
Boston, MA 02125

Massachusetts Office of Coastal Zone Management
Attn: MEPA Coordinator
251 Causeway Street, Suite 800
Boston, MA 02114

Massachusetts Division of Marine Fisheries
Attn: MEPA Coordinator
251 Causeway Street, Suite 400
Boston, MA 02114

Massachusetts Department of Conservation and Recreation
251 Causeway Street
Boston, MA 02114

Massachusetts Department of Energy Resources
100 Cambridge Street, Suite 1020
Boston, MA 02114

Massachusetts Water Resources Authority
Attn: MEPA Coordinator
100 First Avenue
Charlestown Navy Yard
Boston, MA 02129

Massachusetts Bay Transportation Authority
Attn: MEPA Coordinator
10 Park Plaza, 6th Floor
Boston, MA 02216-3966

Massport
Attn: Craig Leiner, Deputy Director
Economic and Planning Department
One Harborside Place, Suite 200S
East Boston, MA 02128-2909

Metropolitan Area Planning Council
60 Temple Place, 6th Floor
Boston, MA 02111

Commonwealth of Massachusetts
The General Court
Attn: State Senator Anthony Petruccelli
State House
Boston, MA 02133

Commonwealth of Massachusetts
The General Court
Attn: State Senator Jennifer L. Flanagan
State House
Boston, MA 02133

Commonwealth of Massachusetts
The General Court
Attn: State Representative Carlo Basile
State House
Boston, MA 02133

Commonwealth of Massachusetts
House of Representatives
Attn: State Representative Kathi-Anne Reinstein
State House
Boston, MA 02133

Boston City Councilor Salvatore LaMattina
1 City Hall Square, Suite 550
Boston, MA 02201-2043

Boston City Council
1 City Hall Square, Suite 550
Boston, MA 02201-2043

Boston Redevelopment Authority
1 City Hall Square
Boston, MA 02201

Boston Conservation Commission
1 City Hall Square, Room 805
Boston, MA 02201

Boston Public Health Commission
1010 Massachusetts Avenue, 2nd Floor
Boston, MA 02118

Boston Public Library
700 Boylston Street
Boston, MA 02116

Boston Public Library – East Boston Branch
276 Meridian Street
East Boston, MA 02128

Boston Transportation Department
One City Hall Plaza, Room 721
Boston, MA 02201

Boston Water and Sewer Commission
980 Harrison Avenue
Boston, MA 02119

City of Boston – Environmental and Energy Services
1 City Hall Square, Suite 603
Boston, MA 02201

City of Boston Law Department
Attn: Elizabeth Dello Russo
1 City Hall Square, Room 615
Boston, MA 02201

Daniel Rizzo, Mayor of Revere
City Hall Revere
281 Broadway
Revere, MA 02151

City of Revere – Department of Planning and Community Development
281 Broadway
Revere, MA 02151

Revere Public Library
179 Beach Street
Revere, MA 02151

City of Malden
Attn: Mayor Christenson, Malden
200 Pleasant Street, Room 627
Malden, MA 02148

Host Community Advisory Committee
1 City Hall Square, Room 615
Boston, MA 02201

Bike to the Sea, Inc
83 Jacob Street
Malden, MA 02148

Boston Harbor Islands Alliance
408 Atlantic Avenue, Suite 228
Boston, MA 02110

Building and Construction Trades Council
of the Metropolitan District
12 A Everdean Street, Suite 2
Dorchester, MA 02122

Carpenters Local Union 218
35 Salem Street
Medford, MA 02155

Clean Water Action Massachusetts
262 Washington Street, #601
Boston, MA 02108

East Boston Chamber of Commerce
175 McClellan Highway (Rt. 1A), Suite 1
East Boston, MA 03128

First Bristol Corporation
10 North Main Street, P.O. Box 2516
Fall River, MA 02722

Friends of Belle Isle Marsh
P.O. Box 575
East Boston, MA 02128

Greater Boston Labor Council, AFL-CIO
6 Beacon Street, Suite 910
Boston, MA 02108

Laborers' Local 22
35 Highland Avenue
Malden, MA 02148

Local 103 of Greater Boston
256 Freeport Street
Dorchester, MA 02122

Mass Audubon
Six Beacon Street, Suite 1025
Boston, MA 02108

Massachusetts AFL-CIO
389 Main Street
Malden, MA 02148

Massachusetts Thoroughbred Breeders
Association
340 Marshall Road
Fitchburg, MA 01420

Mystic River Watershed Association
20 Academy Street, Suite 306
Arlington, MA 02476

New England Horsemen's Benevolent
and Protective Association, Inc.
P.O. Box 388
Revere, MA 02151

New England Regional Council of
Carpenters
13 Branch Street, #215
Methuen, MA 01844

No Eastie Casino
c/o Jessica Curtis Schnittjer
742 Saratoga Street
Boston, MA 02128

Painters and Allied Trades District
Council #35
25 Colgate Road, Suite 204
Roslindale, MA 02131

Plumbers & Gasfitters Local 12 Boston
1240 Massachusetts Avenue
Boston, MA 02125

Revere Chamber of Commerce
108 Beach Street
Revere, MA 02151

Saugus River Watershed Council
P.O. Box 1092
Saugus, MA 01906

Sheet Metal Workers' International
Association Local Union No. 17
1157 Adams Street, 2nd Floor
Dorchester, MA 02124

Teamsters Local Union No. 25
544 Main Street
Boston, MA 02129

The Boston Harbor Association
374 Congress Street, Suite 307
Boston, MA 02210

United Auto Workers
111 South Road
Farmington, Connecticut 06032

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45 School Street
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124 Mount Auburn Street, 3rd Floor
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NE Council of Carpenters
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750 Dorchester Avenue, 3rd Floor
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