Expanded Project Notification Form

Submitted Pursuant to Article 80 of the Boston Zoning Code

PARCEL K

Northern Avenue
South Boston, Massachusetts



Submitted to:
Boston Redevelopment Authority
One City Hall Square
Boston, Massachusetts 02201

Submitted by:
Parcel K LLC
800 Technology Center Drive
Stoughton, Massachusetts 02072

Prepared by:
Epsilon Associates, Inc.

December 16, 2013

Epsilon
ASSOCIATES INC.

Expanded Project Notification Form

Submitted Pursuant to Article 80 of the Boston Zoning Code

PARCEL K

NORTHERN AVENUE

SOUTH BOSTON, MA

Submitted to:

BOSTON REDEVELOPMENT AUTHORITY
One City Hall Square
Boston, MA 02201

Submitted by:

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GZA GeoEnvironmental, Inc.
Rowan, Williams, Davies & Irwin, Inc.
Bay Colony Group, Inc.

December 16, 2013

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Section 1.0

General Information and Project Description

1.0 GENERAL INFORMATION AND PROJECT DESCRIPTION

1.1 Introduction

Parcel K LLC (the Proponent) is proposing to develop a vibrant, mixed-use Project on "Parcel K," located at the corner of Northern Avenue and Congress Street in Boston's Innovation District. This exciting new waterfront development will be anchored by 304 modern apartment residences, a 247 room boutique hotel, incubator office space for emerging entrepreneurs, and a mix of restaurants and retail shops, all situated across the street from the excitement of Liberty Wharf and the Bank of America Pavilion. The synergy of the Project's complementary uses, publicly accessible urban open space, interactive and pedestrian friendly streetscapes along with 180 degree panoramic water views, will enhance this emerging and dynamic urban neighborhood as envisioned in the Northern Avenue Development Plan and previous plans for the area.

Parcel K is one of several parcels that comprise the 30 acre Massachusetts Port Authority (Massport) Commonwealth Flats Development Area (CFDA). The Project's apartments and business incubator space will create much needed housing and office space for the rapidly growing Innovation District. The hotel will support the businesses of the nearby Boston Marine Industrial Park, the emerging businesses of the Innovation District, and the World Trade Center and the Boston Convention & Exhibition Center, both of which are within walking distance to the Project. The mix of restaurants and retail shops associated with the Project will offer additional diversity of experience and add to the vitality of this new urban neighborhood.

As designed, the 304-unit residential apartment building offers one of the closest waterfront rental housing locations in Boston, as well as a broad spectrum of unit choices for varying demographics, including one- and two-bedroom units, studios, and micro-units. Meanwhile, the 247-room, boutique hotel is oriented towards Boston Harbor and will provide guests with sweeping water views and proximity to nightlife and entertainment venues.

The residential and hotel buildings are located on the western and eastern ends of the Project site, respectively, and are organized around a ground level urban court that will serve as a public open space and ground-level entrance to the development. Meanwhile, an elevated courtyard terrace with outdoor dining, hotel and residential amenity spaces surrounds this area at a mezzanine level. This elevated courtyard terrace will offer spectacular framed views northward to the harbor, and southward across the Seaport District. At the ground level, the Project's streetscapes along Northern Avenue and Congress Street will be enlivened with wide sidewalks and a mix of restaurant and retail uses, and will have direct physical and visual connection with the existing neighbors.

A three level, below-grade parking garage with approximately 640 spaces supports not only the parking requirements of the entire development, but also the public parking demands of the Innovation District. The close proximity of the Project to the public transit options offered by the adjacent MBTA Silver Line and Boston Harbor Water Taxis makes it a truly transit-oriented development. Equally important, its proximity to established and emerging employment centers will afford its residents ample opportunity to commute by walking and bicycling. This sustainable Project is being designed in anticipation of obtaining LEED Silver certification from the United States Green Building Council (USGBC).

The Project will offer the area a unique sense of place, taking cues from the neighboring Boston Marine Industrial Park as well as the vibrant South Boston Waterfront. The hotel features an elegantly detailed glass façade, creating a sleek, modern destination which will anchor the western edge of the CFDA and serve the commercial uses along the waterfront. The residential building façade will merge warm materials with metal and large expanses of glass to create an industrial loft feel, while a series of balconies will activate the building façades, providing residents and guests a connection to the neighborhood atmosphere. The animated street level promises distinct opportunities to dine, shop, and gather with a host of retail, restaurant and café spaces, coupled with outdoor seating, attractive landscaping and a well-designed pedestrian streetscape that will complement the Harborwalk, Liberty Wharf and Bank of America Pavilion activities.

1.2 Project Identification and Team

The Proponent has enlisted a team of professional Boston-based planners, engineers, attorneys, architects and consultants to assist them with the development of the Proposed Project. The Project Team is listed below:

Project Name:	Parcel K, South Boston
Location:	The Project is located on the south side of Northern Avenue between Congress Street and Massport Haul Road.
Proponent:	**Parcel K LLC** 800 Technology Center Drive Stoughton, MA 02072 (781) 344-5656 Terry Conroy Jr., Manager

Land Owner:	**Massachusetts Port Authority** Economic Planning and Development Department One Harborside Drive, Suite 200S East Boston, MA 02128 (617) 568-1090 James P. Doolin, Chief Development Officer Beth Rubenstein Juan Carlos Loveluck Andrew Hargens
Architect:	**Arrowstreet** 212 Elm Street Somerville, MA 02144 (617) 623-5555 George Tremblay, AIA, Principal Amy Korté, AIA, Principal
Attorney:	**Dain, Torpy, Le Ray, Wiest, & Garner, P.C.** 120 South Street Boston, MA 02111 (617) 542-4800 Donald W. Wiest
Permitting Consultant:	**Epsilon Associates, Inc.** 3 Clock Tower Place, Suite 250 Maynard, MA 01754 (978) 897-7100 Andrew D. Magee David Hewett
Transportation Consultant:	**Vanasse & Associates, Inc.** 10 New England Business Center Drive, Suite 314 Andover, MA 01810 (978) 474-8800 Jeffrey S. Dirk, P.E., PTOE
Civil Engineer:	**H.W. Moore Associates, Inc.** 112 Shawmut Avenue Boston, MA 02118 (617) 357-8145 Fred Keylor

Structural Engineer	**McNamara/Salvia** 160 Federal Street, #5 Boston, MA 02110 (617) 737-0040 John Matuszewski
MEP Engineer	**WSP** 88 Black Falcon Avenue, Suite 210 Boston, MA 02210 (617) 210-1730 Roselin Osser
Geotechnical Consultant / Hazardous Waste Consultant:	**GZA GeoEnvironmental, Inc.** 133 Federal Street Boston, MA 02110 (617) 963-1000 Mary Hall
Wind Consultant	**Rowan, Williams, Davies & Irwin, Inc.** 650 Woodlawn Road West Guelph, Ontario Canada N1K 1B8 (519) 823-1311 Jordan Gilmour

1.3 Project Description

As introduced above, the Parcel K Project will provide much-needed rental housing; a new hotel that will serve a broader customer base, including the Boston Convention & Exhibition Center; flex office space for emerging businesses and entrepreneurs; and a mix of restaurants and retail shops supporting Boston's Innovation District and the larger Seaport neighborhood. The context and components of the Project are described in the following sections.

1.3.1 Project Context – South Boston Waterfront and the Innovation District

In January 2010 the City of Boston re-branded the South Boston Waterfront as the "Innovation District" as part of a plan to transform these 1,000 acres of waterfront land into a 24-hour, 7-days-a-week urban environment defined by world-class restaurants, an active nightlife, new housing opportunities and a cluster of entrepreneurial companies. This emerging district grew out of master planning efforts in the 1990's by Massport and the City of Boston, which established a framework for mixed-use development while preserving the needs of the working port.

In the past two decades, substantial public investments have been made in this district to improve the transportation infrastructure and to develop public amenities such as the South Boston Maritime Park and the Harborwalk. Moreover, an aggressive marketing campaign has attracted start-ups, large technology companies, and creative businesses, such as architecture firms, social media, and greentech companies. As reported in the BRA "*Innovation District – 3 years + Counting*" report (February 28, 2013), since the launch of the district three years ago, more than 200 companies and 4,000 jobs have moved into the area. An additional 200 companies and 2,500 jobs are anticipated in the near future.

Parcel K is situated on a prime waterfront location within the Innovation District (see Figure 1.3-1, *Project Site Locus - USGS Map*, and Figure 1.3-2, *Project Site Locus – Vertical Aerial Photograph*). The 2.38-acre (103,484 square feet) site, currently used as surface parking, is part of the larger 30-acre Massport CFDA, as shown in Figure 1.3-3, *Commonwealth Flats Development Area*.

The Project capitalizes on panoramic views of the Harbor, close proximity to the restaurants at Liberty Wharf, live concerts at the Bank of America Pavilion, and multiple transit options such as the MBTA Silver Line and Boston Harbor water taxis. The surrounding neighborhood features amenities such as the Boston Harpoon Brewery, located east of the site within the Boston Marine Industrial Park, multiple hotels and the Boston Convention and Exhibition Center west of the site, and a variety of commercial, residential, and maritime uses along Northern Avenue. The southwestern edge of the site is bound by Parcel H, an undeveloped parcel currently used as a surface parking lot, and by the South Boston/Ted Williams tunnel, which provides convenient vehicular access to Logan International Airport, Interstate 90 and Interstate 93. These uses are shown on Figure 1.3-4, *Area Context - Ground Floor Building Uses.*

1.3.2 Proposed Development Program

The Proponent proposes to develop Parcel K into a mixed-use neighborhood, comprised of a residential apartment building, a hotel, an underground parking garage, public open spaces, and a mix of restaurant, retail and flex office spaces activating the streetscape. The Project has been designed to will enhance the waterfront and pedestrian streetscape as a destination for Boston residents, workers and visitors. The various elements of the Project are described below. A perspective drawing from Northern Avenue is presented in Figure 1.3-5, *Northern Avenue Perspective*, while building sections of the residential apartment building and the hotel are presented in Figure 1.3-6, *Building Long Section – Residential,* and Figure 1.3-7, *Building Long Section – Hotel*, respectively. A ground level plan and a courtyard terrace level plan are presented in Figure 1.3-8 and Figure 1.3-9, respectively. Finally, typical floor plans for the residential apartment and hotel buildings are presented in Figure 1.3-10, *Levels 4 through 10,* and Figure 1.3-11, *Level 11*.

Residential. The residential apartment building is located at the intersection of Congress Street and Northern Avenue and will become the visual focal point at the end of Congress Street. The 11-story building will have a total of 304 rental apartments. Micro-units and studio apartments located on the courtyard terrace level will be designed with floor-to-ceiling glass, connecting the living spaces to the outside. Within this landscaped courtyard terrace, a series of shared yards, amenity spaces, and balconies have been designed to foster a sense of community. Meanwhile, rooftop terraces will provide spectacular views from the penthouse level and, coupled with the glass façade along Northern Avenue, create a clear identity for the residential address.

Hotel. A 247-room, 10-story boutique hotel will wrap around the eastern perimeter of the site to maximize water views for guests. Locating a hotel at this site will offer convenient access for events at the Boston Convention and Exhibition Center and World Trade Center facilities, and will serve other visitors to Boston with ready access to the MBTA Silver Line, the Massachusetts Turnpike and Logan International Airport and water taxis serving downtown, the North End, and East Boston. A ground floor lobby and an outdoor dining area at the courtyard terrace level immediately above and overlooking the street will further activate the pedestrian streetscape and complement the street life of Liberty Wharf.

Flex Office. Approximately 16,500 square feet of "innovation" flex office space will be located around the southern edge of the site, between the residential and hotel uses. Immediately adjacent to the MBTA Silver Line Way station, the office will support small entrepreneurial, start-up firms and directly contribute to further activation of the Innovation District. Alternatively, this space could be leased by a larger retail tenant to serve the district.

Retail/Restaurant. The streetscape along Northern Avenue, Congress Street and Starboard Lane will be lined with approximately 20,000 square feet of retail and restaurant spaces. These spaces will be designed with ample outdoor seating areas at the street level and dining areas at the courtyard terrace level.

Open Spaces. The sidewalks along Northern Avenue and Congress Street will provide space for an outdoor café and public seating and will allow pedestrians to gather at the street level. In addition, the elevated courtyard terrace between the residences and hotel will foster social connections between the different site activities. The courtyard terrace is envisioned as a series of visually connected outdoor spaces that cater to the needs of each use, while creating pockets of shared spaces for the residents, hotel guests, office workers and the public.

Parking. Three levels of subsurface parking with a total of 640 spaces will support the Project. Residents and visitors primary access to the garage will be from Congress Street through an interior street aligned with Park Lane, although some vehicles will utilize the right-in-only entrance along Northern Avenue. Access for loading and service vehicles will be via a curb cut on Massport Haul Road.

Table 1.3-1 summarizes the dimensions of the various Project elements.

Table 1.3-1 Project Program

Project Element	Dimension
Site Area	2.38 acres, or 103,484 square feet
Retail or Restaurant	20,000 square feet
Flex Office Space or Retail	16,500 square feet
Hotel	147,888 square feet 247 Hotel Rooms
Residential	291,170 square feet 304 Total Residential Apartment Units: 32 Innovation Units (10.5%) 93 Studio Units (30.6%) 103 1-Bedroom Units (33.9%) 76 2-Bedroom Units (25.0%)
Parking	Three levels of below grade parking 640 Total Parking Spaces: 152 Spaces for Rental Housing (0.5 spaces/unit) 124 Spaces for Hotel (0.5 spaces/room) 364 Spaces for District Parking
Building Height	140 feet (at penthouse): 11 stories residential/10 stories hotel
Full Build-Out	480,243 square feet

1.4 Summary of Project Benefits

The Project will result in numerous public benefits for the City of Boston in general and the Innovation District directly. Converting this currently underutilized parcel into a vibrant mixed use development will complement the significant improvements that have already occurred and that are anticipated for this emerging district. The proposed combination of residential apartment, hotel, flex office and retail space is supportive of and consistent with the surrounding commercial, residential and industrial setting. Specific public benefits associated with the Project are reviewed in the following section and include, but are not limited to:

- Increased supply of rental housing, including micro-units, studio, one-bedroom, and two-bedroom units;
- Contribution to affordable rental housing in voluntary accordance with the Inclusionary Development Program (IDP) approved by the BRA;

- Designated flex office space in direct support of the City's Innovation District initiative;
- Public restaurant spaces facing the waterfront and the courtyard terrace, with seasonal outdoor seating;
- A 247-room hotel supporting the commercial, business and visitor resources of the area and the City, and contributing to the supply of much needed hotel rooms within walking distance of the Boston Convention and Exhibition Center;
- Additional open spaces, including a landscaped courtyard terrace, designed to facilitate a variety of events and activities;
- Improved and active street and pedestrian environment;
- Leadership in Energy and Environmental Design (LEED) Silver certified buildings;
- New public parking facility consistent with the CFDA planning requirements serving both the Project and the district;
- Significant numbers of new construction and permanent jobs;
- New tax payments to the City of Boston in the form of Property Tax, Sales Tax, Hotel Occupancy Tax, and Meals Tax; and
- Increased lease payments and other revenues to Massport to finance and support additional maritime improvements and operations.

1.4.1 Increased Rental Housing

The Project will create over 300 residential apartment units in the City of Boston, the majority of which will be micro-units, studio, or one-bedroom units. In doing so, the Project will promote the active mixed-use of this portion of the waterfront while supporting the City's "Housing Boston 2020" initiative to construct 30,000 new residential apartment units by the year 2020. The Project's mix of unit types and proximity to mass transit will appeal to multiple demographics including recent college graduates working in the Innovation District.

1.4.2 Affordable Rental Housing

The Inclusionary Development Program ("IDP") approved by the BRA on June 22, 2010, which implemented the Mayor's Executive Order dated February 29, 2000 as modified through September 27, 2007, established as City policy that any new development project seeking zoning relief must either (a) create units within the project that are affordable, as that term is defined in the IDP, in a number that is equivalent to no less than 15% of the project's market rate units; (b) create affordable units in a number that is equivalent to 15%

of the total number of project units; or (c) contribute to a housing creation fund a per unit subsidy for 15 percent of the total number of project units. Although the Project does not require zoning relief, the Project will voluntarily comply with the IDP.

1.4.3 Design

The Project is being designed as a neighborhood with a variety of building heights, materials and open spaces to create a distinct identity for each building and use. Careful attention is being paid to the building massing and façade articulation so as to create view corridors into and around the site as well as out to the harbor. These view corridors will help connect the surrounding urban context to the exterior open spaces and interior spaces of the buildings, drawing pedestrians into the site and framing views of the water and City beyond.

Along Northern Avenue and Congress Street the façades of the residential apartment building will be set back from both the ground level retail below and the eight floors of residential apartment above, to create a dynamic building massing and to accentuate the major entry points. A signature terrace and generous overhang will define outdoor rooms at the courtyard terrace level and will create a series of overlapping public and private spaces visible from the street below.

The hotel is envisioned as a destination for guests and locals, as it connects the Innovation and BMIP Districts. A portion of the building will cantilever toward Northern Avenue to become a visual focal point from the Northern Avenue approach, while the top of the building is sculpted to form large outdoor roof decks, offering unparalleled views of the city and water beyond. At the street level, an undulating façade will draw visitors into the hotel entry at the urban court, define vehicular and pedestrian circulation paths, and create a figural space at the center of the Project. The façades facing the water are envisioned as a dynamic arrangement of transparent and spandrel blue glass panels, with the urban court façade clad in a lightly toned masonry, establishing a more intimate scale within the interior of the development.

In addition to the above, an outdoor courtyard terrace, connecting the residences and hotel, will foster social connections between the different site uses. For example, at the residences, the courtyard terrace will function as an outdoor "living room" for the micro-units. Directly outside each micro-unit, a series of shared yards will create a communal space between neighboring micro-units that can facilitate open studio events or impromptu gatherings between the residents and their neighbors. These yards will also help create the perception of a larger apartment by extending the interior space seamlessly to the exterior through large picture windows.

1.4.4 Smart Growth/Transit-Oriented Development

Parcel K is a transit-oriented development (TOD) adjacent to both the MBTA Silver Line Way Station and the City Water Taxi Stop, offering convenient public transportation to downtown Boston and Logan International Airport. As a TOD, the Project takes advantage of its adjacency to the MBTA Silver Line Way Station by creating a dense, mixed-use urban neighborhood of rental housing, office, hotel, retail, and other on-site amenities and by contributing to the district's walkability. Other TOD benefits include increased transit ridership, increased public safety from the addition of more daytime and evening activities, a reduction of vehicle miles traveled for those living or working at Parcel K, a reduction in household costs, and a reduction in air pollution and energy consumption rates. As outlined later in this document, a comprehensive Transportation Demand Management program will be implemented to reduce automobile trips and promote alternative transit choices such as public transportation, walking, shuttles, and car sharing.

As a compact, mixed-use development, Parcel K exemplifies a number of Smart Growth principles. These include creating a more walkable neighborhood by improving the pedestrian environment around and through the site, redeveloping an underutilized site into a community with a strong sense of place, and creating and preserving open space through an elevated courtyard terrace that supports a range of recreational activities. By replacing the existing surface parking lot with a below-grade garage, the Project will capitalize on its close proximity to the existing highway infrastructure, allowing Innovation District employees and visitors to conveniently park and then either walk or take public transit to their final destination.

1.4.5 Improved Street and Pedestrian Environment

The Parcel K Project has been oriented to focus pedestrian movement and activity along Northern Avenue and Congress Street. The residential apartment lobby is located off of Congress Street while the hotel lobby is designed as a thru-lobby with pedestrian access from Northern Avenue and the central urban court. Similarly, retail, restaurants, and outdoor dining spaces are concentrated along Congress Street and Northern Avenue. Sidewalk access extends around the perimeter of the Project, with the sidewalks of Northern Avenue, Congress Street, and Starboard Lane at 12 to 15 feet in width, and the Massport Haul Road sidewalk at approximately 10 feet in width. Primary vehicular access into the development will be from Congress Street, while a curb cut and urban court facilitates a right turn in only from Northern Avenue. Nighttime lighting of the sidewalks and urban court, attractive building façades, signage, and plantings will support pedestrian activity and contribute to the increased safety and vitality of the area throughout the day and into the evening.

1.4.6 Sustainable Design/Green Building

The Parcel K Project is committed to the advancement of sustainable and environmentally conscious design and construction. The Proponent will seek a rating of LEED Silver through the design, construction and implementation of key sustainable strategies, consistent with the policies of Massport, the Commonwealth of Massachusetts, and the City of Boston. In addition, the Project is taking a multi-disciplinary and pro-active approach to designing the buildings and site infrastructure for flood resilience. The Proponent is embracing the recommendations outlined in the City of Boston *Climate Action Plan* and The Boston Harbor Association report *Preparing for Rising Tide*, while also drawing from the City of New York Building Resiliency Task Force reports, published this past June. Additional detail on the development's sustainable features and climate preparedness is presented in Section 3.14, *Sustainable Design*.

1.4.7 Urban Design

Development of Parcel K will build upon and enhance the City of Boston's long-standing vision for the South Boston Waterfront and Massport's plans for the 30-acre Commonwealth Flats Development Area (CFDA). The proposed development realizes the planning goals described in both the BRA Public Realm Plan and the Innovation District; specifically by creating a 24-hour neighborhood with a synergy between residential, hotel, office, commercial, public, and retail/restaurant uses. The diverse mix of spaces have been designed and strategically located to foster relationships between the different program elements and site context, facilitating connections and helping to establish the block as a true innovation ecosystem.

1.4.8 Retention of Public Parking

The existing commercial surface parking spaces will be maintained within the proposed below-grade garage which will be available to the public, providing an important amenity to both visitors to and employees within the CFDA. Maintaining and expanding public parking near the existing highway infrastructure complements the goals of a transit oriented development as the parking garage can be accessed easily from the highway system, allowing people to walk or take public transportation to their final destination. This is also consistent with Massport's CFDA planning, as Parcel K was identified as a site suitable for public parking supply, balancing other Massport development sites which are unable to offer self-park facilities.

1.4.9 Increased Employment

The Project is projected to create approximately 900 new construction jobs and approximately 350 permanent jobs.

1.4.10 New Property Tax Revenue

The new development is projected to generate a substantial increase in additional tax revenue for the City as a result of converting an undeveloped parcel into a mixed-use office, residential apartment and hotel development with public parking and retail and commercial outlets. These uses will significantly contribute to the City of Boston's tax bases. Ancillary support businesses will be required by the new development, thereby creating opportunities for additional and enhanced tax revenues from these support businesses.

1.5 Public Participation

The Proponent is committed to a comprehensive, inclusive and effective community outreach program and will continue to engage community leaders, stakeholders and all other interested parties to ensure public input on the Project. The Proponent has already begun the process of meeting with community groups, community representatives and other interested parties, including those listed below to review and discuss the Project. The Proponent is committed to continuing this comprehensive outreach throughout the approval process.

- Massachusetts Port Authority
- Massachusetts Department of Environmental Protection – Waterways Program.
- Massachusetts Executive Office of Energy and Environmental Affairs – MEPA Office
- Massachusetts Convention Center Authority
- City of Boston, Mayor's Office
- City of Boston; Boston Redevelopment Authority
- City of Boston; Economic Development and Industrial Corporation
- City and State Representatives
- The Boston Harbor Association
- Boston Freight Association
- Cargo Ventures, LLC
- Legal Sea Foods
- No Name Restaurant
- Bank of America Pavilion

1.6 Legal Information

1.6.1 Legal Judgments Adverse to the Proposed Project

The Proponent is not aware of any legal judgments in effect or other legal actions pending which involve the Project.

1.6.2 History of Tax Arrears on Property

Neither the Proponent nor the current owner, Massport, owns any real estate in Boston on which real estate tax payments are in arrears.

1.6.3 Evidence of Site Control/Nature of Public Easements

The Project site is owned by Massport. The Project site is shown on the plan titled "Existing Conditions Plan," prepared by the Bay Colony Group, Inc., and dated July 26, 2012. A copy of this survey is included in Appendix A. The Proponent, Parcel K, LLC, has been granted development rights to the parcel through the execution of a Development Agreement with Massport dated June of 2009. A further amendment to the Development Agreement was approved by the Massport Board of Directors in September of 2013.

The Project site is subject to rights, reservations, easements, and restrictions of record to the extent in force and applicable.

1.7 Parcel K Consistency with Zoning

Due to its location on land owned by Massport, the Project is not subject to local zoning regulations. However, the Proponent is voluntarily submitting this Expanded Project Notification Form for the purpose of initiating voluntary project review by the Boston Redevelopment Authority ("BRA") consistent with the provisions of Article 80B of the Boston Zoning Code (the "Code"), Large Project Review.

1.8 Consistency with Planning and District Goals

The South Boston Waterfront area has been the subject of several comprehensive planning efforts. These include the Boston Redevelopment Authority *South Boston Waterfront Public Realm Plan* (February 1999), the Massport *Commonwealth Flats Strategic Plan* (May 2000), the *Commonwealth Flats Development Area Draft and Final Environmental Impact Report* (December 2000), and the *Final Northern Avenue Waterfront Development Plan* (August 2001) and associated "Memorandum of Understanding between Massachusetts Port Authority and The Commonwealth of Massachusetts Department of Environmental Protection" (March 2001). The latter two planning documents were created by Massport as it planned for mixed-use commercial development on its property within the South Boston Waterfront area.

These planning documents, filings, and certificates have all articulated a goal of increasing the amount of residential, retail, hotel, and other commercial uses in the district, and to have these uses be located, designed, and executed in a manner that is compatible with the needs of the working port and associated trucking activity. The proposed Parcel K Project has been designed in a manner that reflects the various plans that have been created for the area and the principles behind them. As an example, while the proposed residential apartment use represents an adjustment of previous plans (for reasons described below), the residential component of the proposed Parcel K Project has been located on the western side of the parcel, facing existing residential uses (Park Lane Seaport Apartments), and away from Massport Haul Road. The hotel component has been placed to the east, facing Northern Avenue and Massport Haul Road. Further, the Project has been programmed and is being designed so as to minimize both pedestrian and non-commercial vehicles from negatively impacting Massport Haul Road. This has been achieved by allowing only one curb cut from the Project site onto the Haul Road, which will be primarily used for service vehicles. Moreover, all of the Project pedestrian elements are programmed along Northern Avenue and Congress Street, and within the interior of the site, with the urban court and elevated courtyard terrace.

In addition to physical consistency with established plans and planning principles, the value created from these mixed-use developments, Parcel K included, will generate substantial economic benefits in the form of property, room, and meal taxes paid to the City of Boston and, through ground lease payments to Massport, a significant and dependable revenue stream to support and protect the working port and the infrastructure it requires to operate successfully. In addition, the Parcel K Project provides additional public parking for the district, consistent with Massport's CFDA planning, in which certain parcels were identified as being able to provide district-wide parking capacity beyond their own parking needs.

In previous plans, particularly Massport's CFDA planning, Parcel K was defined as a transitional site between the commercial development to the west and the maritime industrial uses to the east. Parcel K was further subdivided into Parcels K-1 and K-2, with Parcel K-2 facing Massport Haul Road being identified as the appropriate site for an above-grade parking garage with a Massport maintenance facility or other light industrial uses. While above-grade parking garages are widely acknowledged to detract from urban environments (and for this reason are actively discouraged by the City), at that time, an above-grade garage was thought to be an appropriate transitional use for Parcel K-2 in that it presented a use immune to the assumed noise and visual impacts of the maritime industrial uses to the east while providing a needed parking resource for Massport's CFDA District, where Massport's planning had been sufficiently evolved to identify which development parcels could not self-park and which parcels presented opportunities for providing a public parking supply beyond their own parking needs.

In the Certificate on the CFDA Final Environmental Impact Report, dated January 29, 2001, the Secretary of Environmental Affairs (now Energy and Environmental Affairs) asked

Massport to "re-examine the appropriate types and intensities of truly transitional uses allowable on these parcels (referring to Parcels K-1 and K-2), prior to the completion of upcoming MEPA review of any CFDA parcels within Chapter 91 jurisdiction." The Secretary's letter also requested a larger amount of residential use in Massport's proposed developments. In response to the Secretary's request, Massport worked collaboratively with representatives of the working port, the BMIP, and special interest organizations to define what uses would be allowed on Parcel K. The above-grade parking garage described above was a result of this process, as was an agreement that residential used would not be allowed on either Parcel K-1 or Parcel K-2.

This commitment was made in 2001, which importantly was before Park Lane Seaport Apartments had been constructed. At that time, the presence of residential uses within the CFDA was considered by many to be inappropriate and a potential long-term threat to the working port. The genesis of this concern was related to the perception that residential uses have a high sensitivity to the visual and noise impacts which were considered characteristic of the working port, particularly with respect to trucking activities which were considered to be particularly incompatible with residential use.

When the first residential project was constructed on Massport land, Park Lane Seaport Apartments, Massport imposed several specific restrictions through its ground lease intended to mitigate potential conflict between the residential use and port- and aviation-related activities, including trucking. These requirements were:

- A prohibition on any residential uses being located on the first floor;
- A maximum apartment lease term of 2 years;
- Requirement that all residential spaces be constructed to have an interior noise level of not more than 45 dBA (Ldn);
- All apartment tenants are required to sign an acknowledgement, as part of their apartment rental lease, whereby each apartment tenant acknowledges the location of the apartment they are leasing relative to the working port, including the Fish Pier, the adjacent truck routes, Logan International Airport, and acknowledging that the working port and Logan Airport operate on a 24 hour, 365 day basis and may emit noise and other impacts.

The experience with Park Lane Seaport Apartments, which opened in 2006, has been overwhelmingly positive. To the best knowledge of the Proponent, no apartment resident has ever filed a complaint regarding noise, be it from truck or aircraft activity, or has objected in any manner to any other activity related to the working port.

Since 2001, development of the South Boston Waterfront has accelerated rapidly, with several residential developments having been constructed or currently under construction. Although this has coincided with a national trend towards urban living, part of the attraction of the South Boston Waterfront as a residential address is the unique, mixed use nature of

the neighborhood, be it the charm of fishing vessels at the Fish Pier, the proximity of the cruise terminal, the presence of a variety of restaurants, the views of the harbor and the activities which occur thereon, or the views of Logan Airport and the Boston Harbor Islands. Residents who voluntarily move to this area do not have negative or entrenched perspectives of the working port or the airport as detracting from their quality of life. As other developments such as Liberty Wharf and the Renaissance Boston Waterfront Hotel (Massport imposes the same acoustical standards to hotel rooms) have been completed, the vision of a vibrant, mixed-use district has become a reality, and the mitigation measures implemented by Massport to address concerns regarding conflicts between residential uses and port related uses, combined with the demographic changes which have occurred, have proven to be effective.

As discussed in Section 2.0, Transportation, the existing residential, hotel and retail development within the Northern Avenue WDP area (indeed, within the entire CFDA and beyond) has not created negative impacts to the industrial traffic on Massport Haul Road. As important, traffic analyses of the proposed Parcel K development as presented herein similarly indicates that the proposed Project will not negatively impact industrial traffic movement on Massport Haul Road or within the industrial port. Meanwhile, as presented in Section 3.11, Noise, and as described above, the implementation of interior noise prevention measures at the residential and hotel developments (Massport imposes the same interior noise standard of 45 dBA (Ldn) on hotel projects built on its land) within the CFDA (including the Northern Avenue WDP area) has resulted in residential uses being successfully integrated into the area and indeed contributing the vitality and desirability of the district as a whole. As discussed in Section 3.11, the same mitigation measures described above will be implemented in the Parcel K development. The 45dBA (Ldn) noise standard will be applied to the living spaces within the hotel as well as the residential apartment component of the Project.

In light of the overwhelmingly positive experience with residential uses within CFDA and in the entire South Boston Waterfront, the evolving nature of the district and its demographics, and the demonstrated protections against impacts on residential development from Port-related activities, the Proponent will propose to MEPA to modify the prohibition of residential use with respect Parcel K. Specifically, the Proponent will seek to permit residential use on Parcel K-1, which does not front on Massport Haul Road and has similar characteristics to Parcel J located directly across Congress Street.

As discussed in Section 4.0, Urban Design, the introduction of mixed-use development into the Northern Avenue WDP area has defined the urban fabric of the area and offers office space for businesses and their employees, residential apartments for residents, hotels supporting the visitor economy, and restaurant-dominated retail which acts as an amenity for every user class. The residential apartment component affords the ability for residents to commute to work in the Seaport District or the Financial District by walking, transit, and bicycle, reducing the traffic impacts that might otherwise be generated from this scale of

development. This mix of uses has successfully established itself without negative impacts to the working port and to the truck routes which support it.

While the planning documents referenced above addressed the physical design of the buildings and streetscapes of the Northern Avenue WDP area, measures such as increasing the allowable building heights on Northern Avenue have been demonstrated to be both appropriate and successful. As discussed in Section 4.0, limiting the building height on Parcel K-2 to 100 feet so as to relate to the industrial buildings within the Boston Marine Industrial Park (BMIP) can and should be re-evaluated. The Proponent's proposal for Parcel K calls for residential development on Parcel K-1 as originally envisioned in the EIR process and increases the height on Parcel K-2 to 120 feet, with a 140 foot maximum height for the penthouse and rooftop screening. These proposed heights, coupled with the generous buffer zone created by the width of Massport Haul Road and the Ted Williams Tunnel, will produce an appropriate and more thoughtful urban transition between the Northern Avenue WDP area and the BMIP, and more specifically, between Parcel K and the BMIP.

The opportunity resulting from this re-evaluation of the land use controls on Parcel K is to allow active, income-generating development uses, including hotel, retail and office in lieu of above-grade structured parking. While the above-grade parking garage on Parcel K-2 was once seen as an appropriate transition between the Northern Avenue WDP area and the industrial port to the east, the experience of the last 10 to 15 years has clearly demonstrated that such a structure's negative impacts outweigh the benefits provided by thoughtfully designed mixed use development. Such development better complements the overall development pattern in the South Boston Waterfront and provides additional housing and hotel rooms supporting the BCEC and Boston's visitor economy. In addition the City has discouraged above-grade parking structures for reasons related to urban design and encouraging the vitality of street fronts and neighborhoods.

The development of Parcel K as proposed herein will, in contrast, allow *below*-grade structured parking to become economically viable, with the development as a whole complementing the existing and successful mixed use development pattern, provide a thoughtfully designed termination to the zone of commercial development, while providing significant new tax revenues to the City and significant new revenue streams to Massport via ground lease payments which will help finance maritime operations and capital improvements. Placing parking below grade is also a much better outcome in terms of urban design and place-making, and more consistent with Massport's and the City's goals for this area. As presented and analyzed in this Expanded PNF, the mixed use development of Parcel K, including the introduction of residential use on Parcel K-1 as envisioned early in the MEPA process but subsequently abandoned, will create a vibrant, mixed-use development that enlivens and contributes to the South Boston waterfront and surrounding community to the benefit of the area's residents, visitors, and workers. As described in Section 4.0, the Project has been designed with sensitivity to its bordering uses, placing the active, pedestrian-oriented features on Congress Street and Northern Avenue.

1.9 Regulatory Controls and Permits

Table 1.9-1 presents a preliminary list of permits and approvals from governmental agencies which, based on currently available information, are anticipated to be required for the Project. It is possible that not all of these permits or actions will be required, or that additional permits or actions may be needed, all of which will become evident during the design and development process. This list should not be considered all inclusive, and does not contain agreements and memoranda associated with various approval and/or permitting processes.

Table 1.9-1 Anticipated Permits, Approvals and Reviews

Agency Name	Permit/Approval/Review
Federal	
Massachusetts Historical Commission	National Historic Preservation Act Section 106; State Register Review
Federal Aviation Administration	Determination of No Hazard to Air Navigation
US Environmental Protection Agency	NPDES Phase II Stormwater Notice of Intent
State	
Executive Office of Energy and Environmental Affairs	MEPA Review
Massachusetts Department of Environmental Protection	Chapter 91 License; Environmental Results Program (ERP) for Boilers; Sewer Connection Permit; Cross-Connection Permit; Air Plan Approval; Notice of Construction/Demolition
Massachusetts Office of Coastal Zone Management	CZM Consistency Review
Massachusetts Port Authority	Parking Freeze Permit or Exemption; Development Agreement and Ground Lease; Construction Management Plan; Design review and related approvals; Storage Tank Approval; Storage of Inflammables License
Department of Public Safety	Demolition and Building Permits; Certificate of Occupancy; Plumbing Permits
Massachusetts Department of Transportation	MGL c40, s.54A – Permit for Construction on (former) Railroad Right-of-Ways
Massachusetts Water Resources Authority	Temporary Construction Site Dewatering Permit
Massachusetts Historical Commission	Determination of No Adverse Impact
Local	
Boston Redevelopment Authority	Article 80B Large Project Review (voluntary) – Certification of Compliance
Boston Civic Design Commission	Design Review
Boston Transportation Department	Construction Management Plan; Transportation Access Plan Agreement
Boston Water and Sewer Commission	Sewer Connection and Cross Connection Permits; Water Permit; Hydrant Permit
Boston Inspectional Services Department	Electrical Permit; Gas Permit

1.10 Schedule

The filing of this Expanded PNF initiates the formal public review process for the Project. The Proponent anticipates completing the permitting of the Project in the third quarter of 2014, with construction following shortly thereafter. It is anticipated that the Project will be completed within eighteen to twenty-four months of the initiation of construction.

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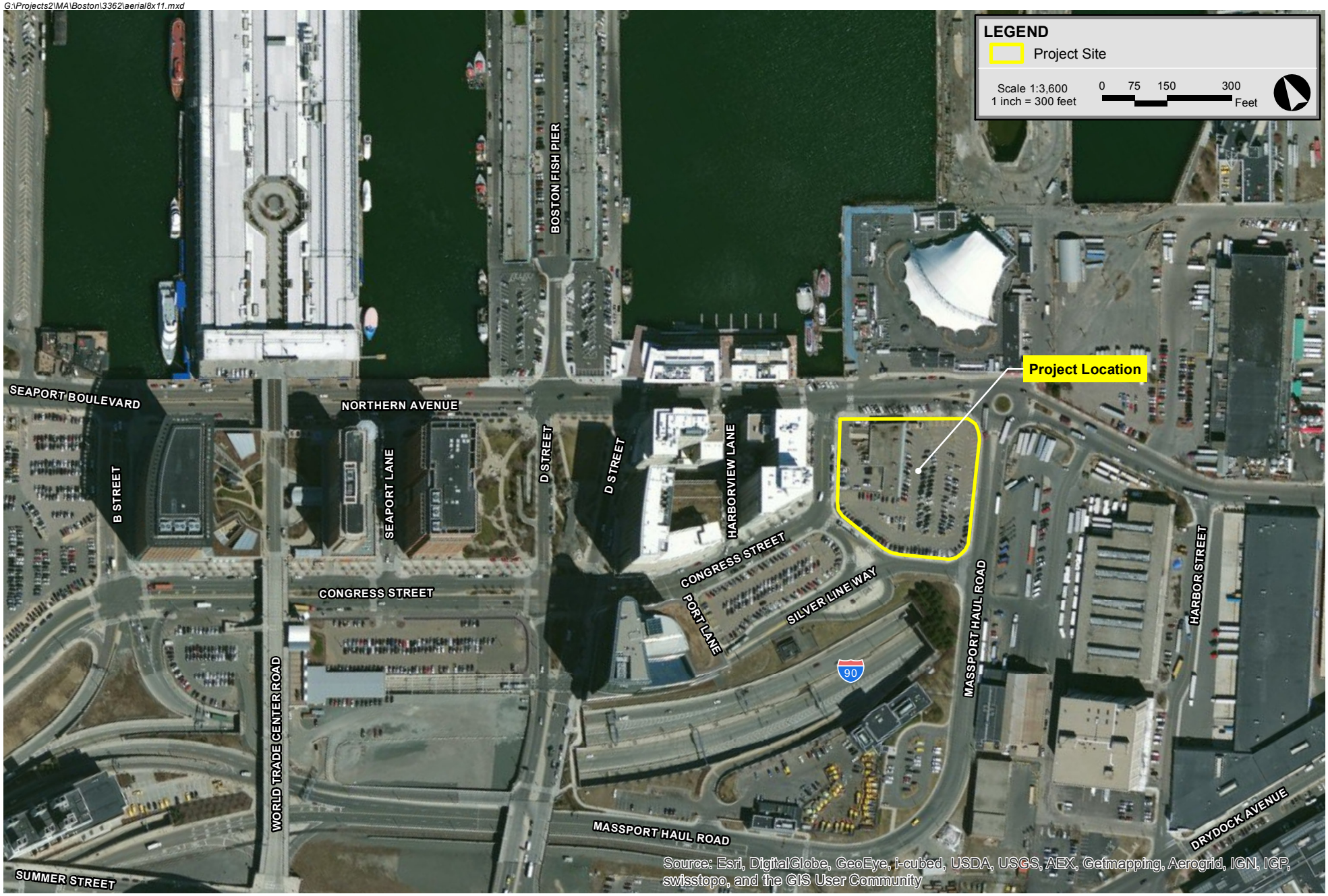


Parcel K Boston, Massachusetts

Epsilon ASSOCIATES INC.

Figure 1.3-1
Project Site Locus - USGS Map

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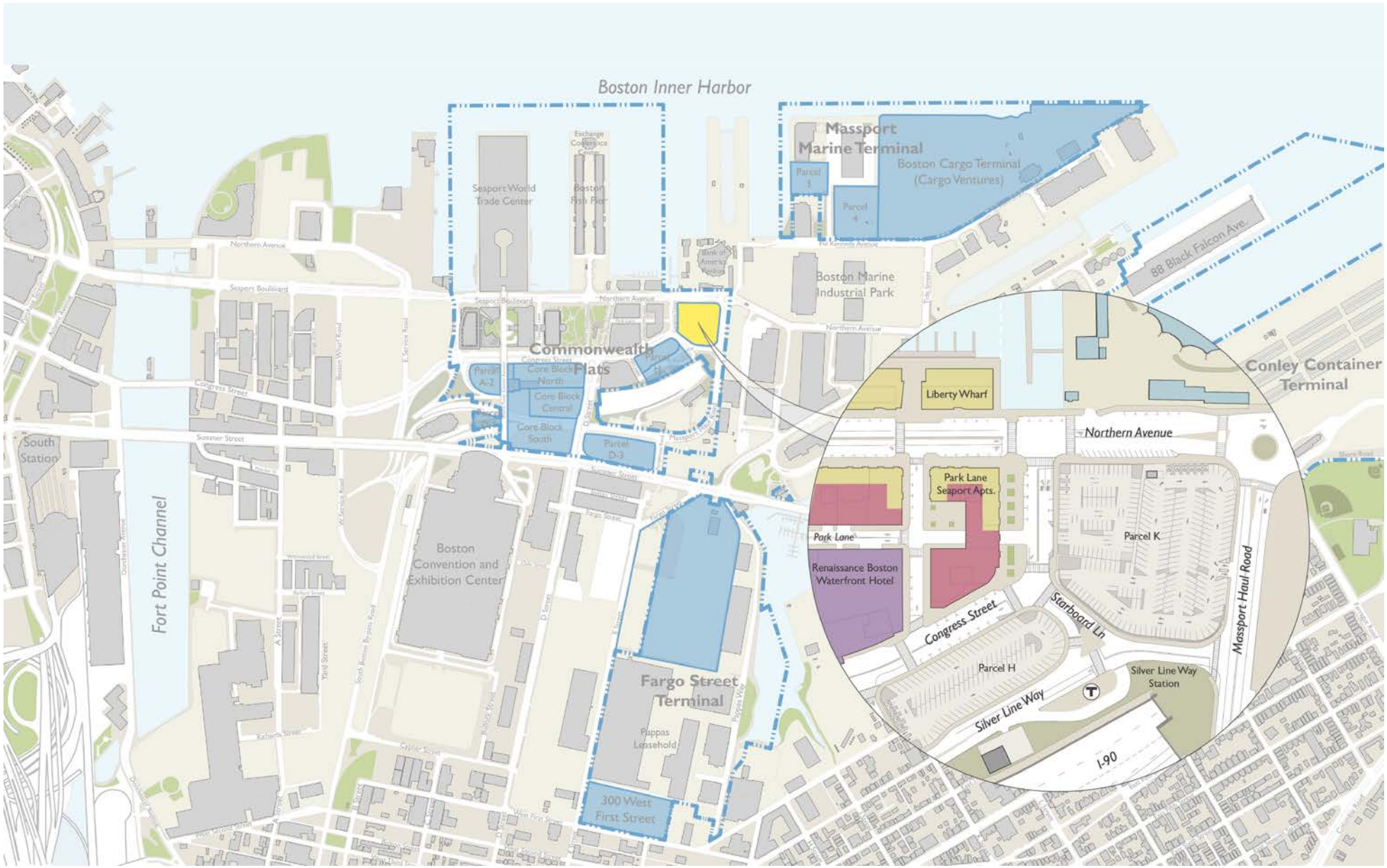


Parcel K Boston, Massachusetts

Epsilon Associates Inc.

Figure 1.3-2

Project Site Locus - Vertical Aerial Photograph

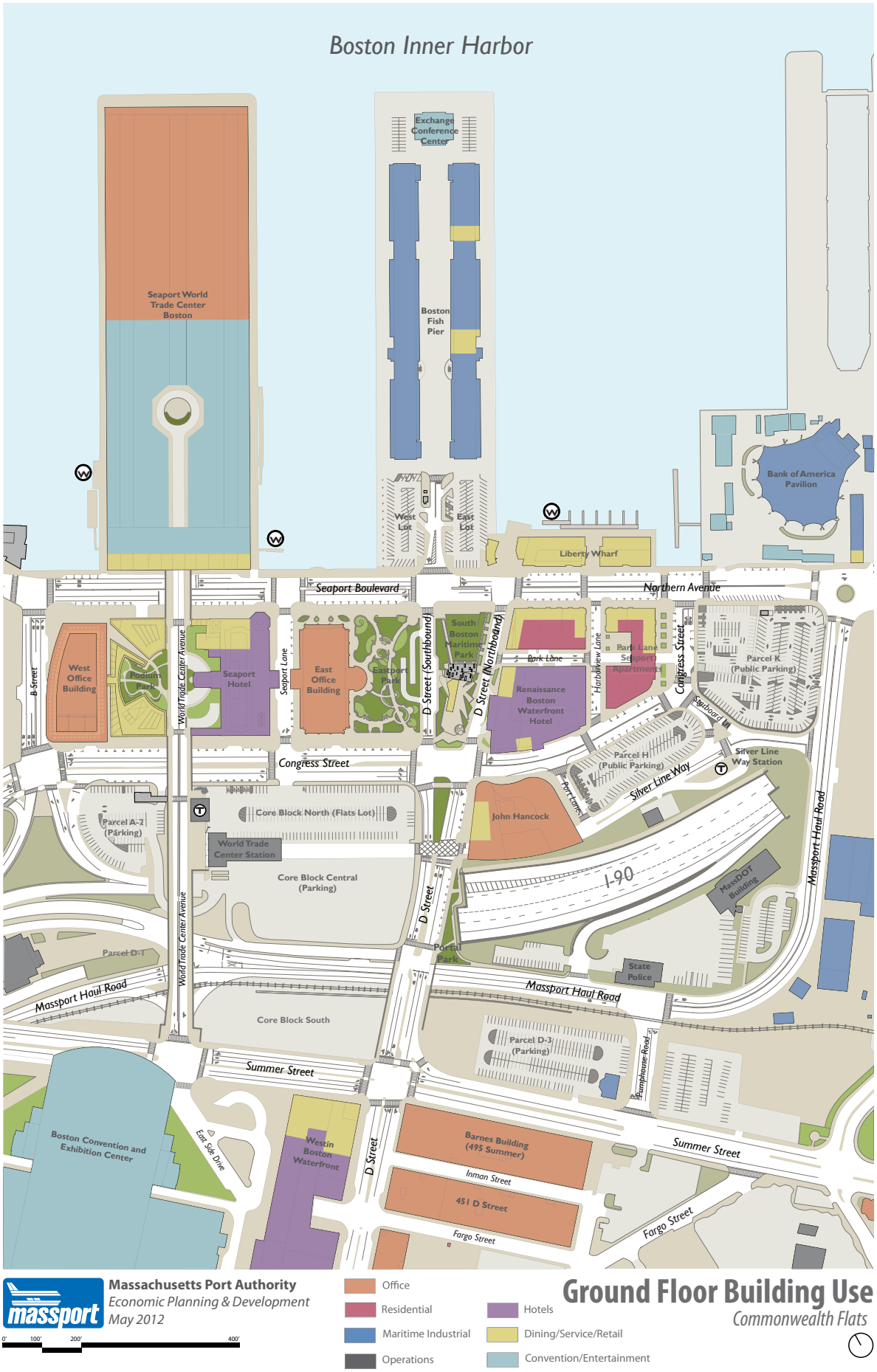


Parcel K Boston, Massachusetts

Epsilon ASSOCIATES INC.

Figure 1.3-3

Commonwealth Flats Development Area



Parcel K Boston, Massachusetts

Epsilon Associates Inc.

Figure 1.3-4
Area Context - Ground Floor Building Uses



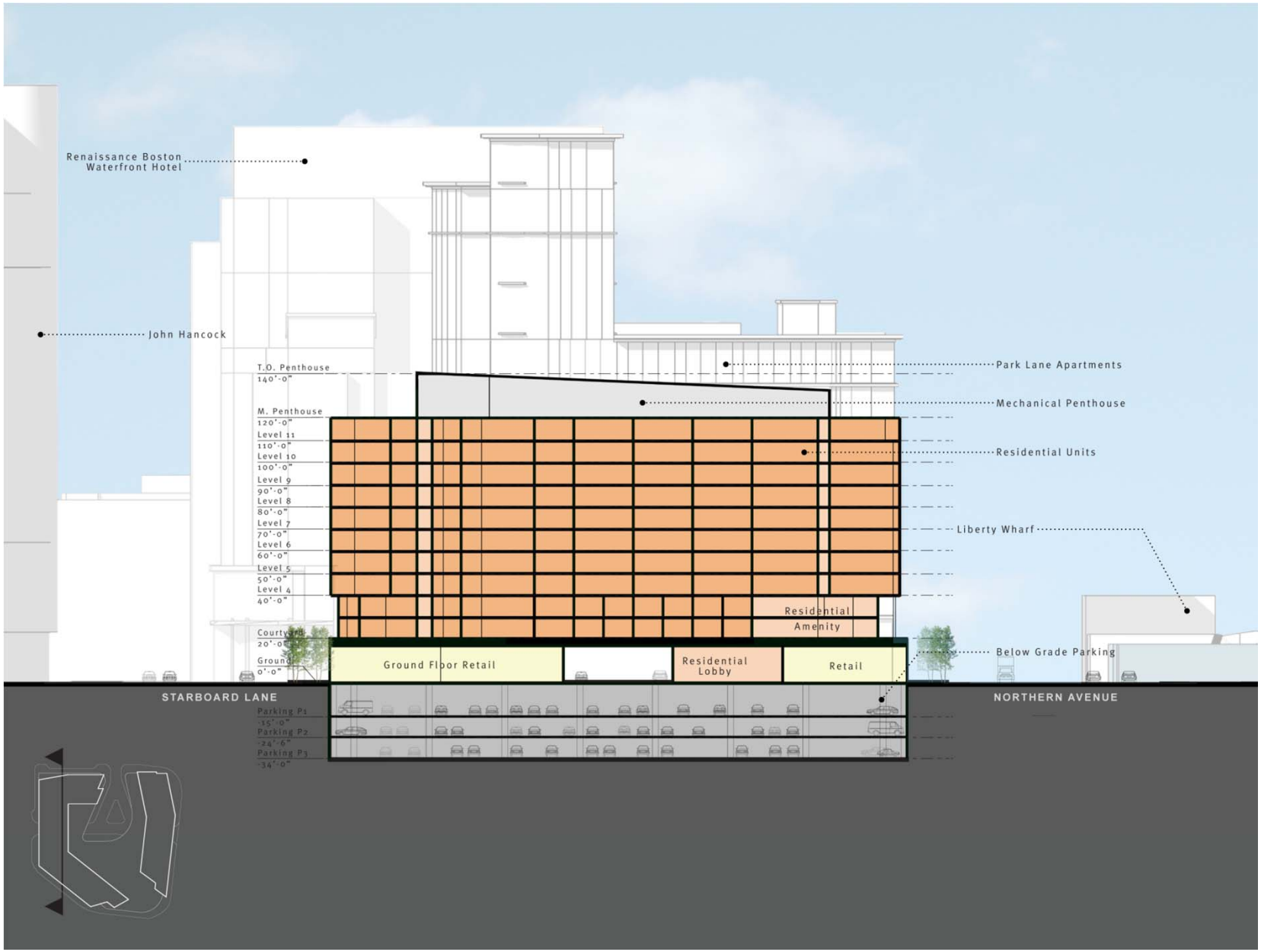
Source: Arrowstreet

Parcel K Boston, Massachusetts

Epsilon ASSOCIATES INC.

Figure 1.3-5

Northern Avenue Perspective



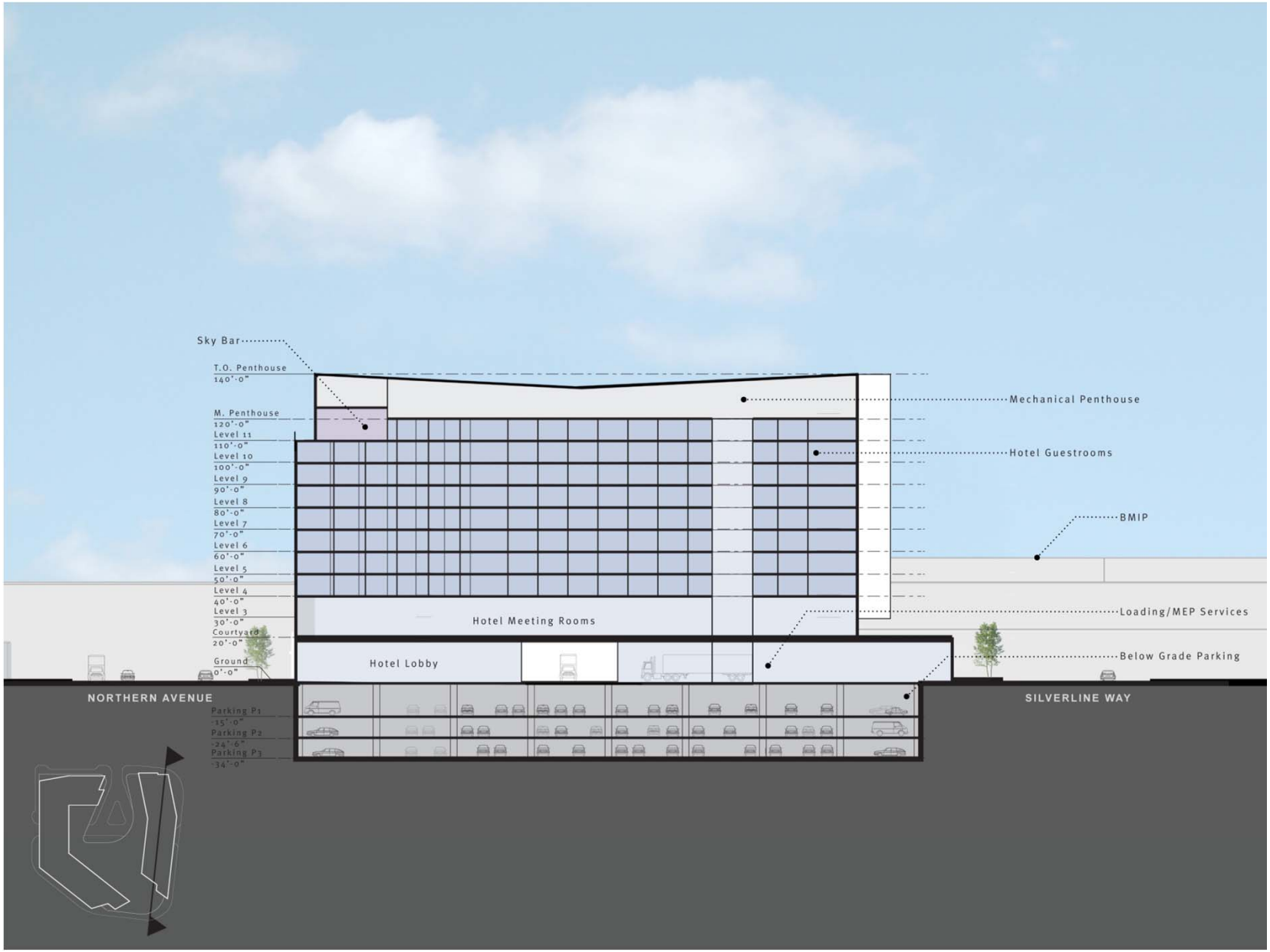
Parcel K **Boston, Massachusetts**

Source: Arrowstreet

Epsilon ASSOCIATES INC.

Figure 1.3-6

Building Long Section – Residential



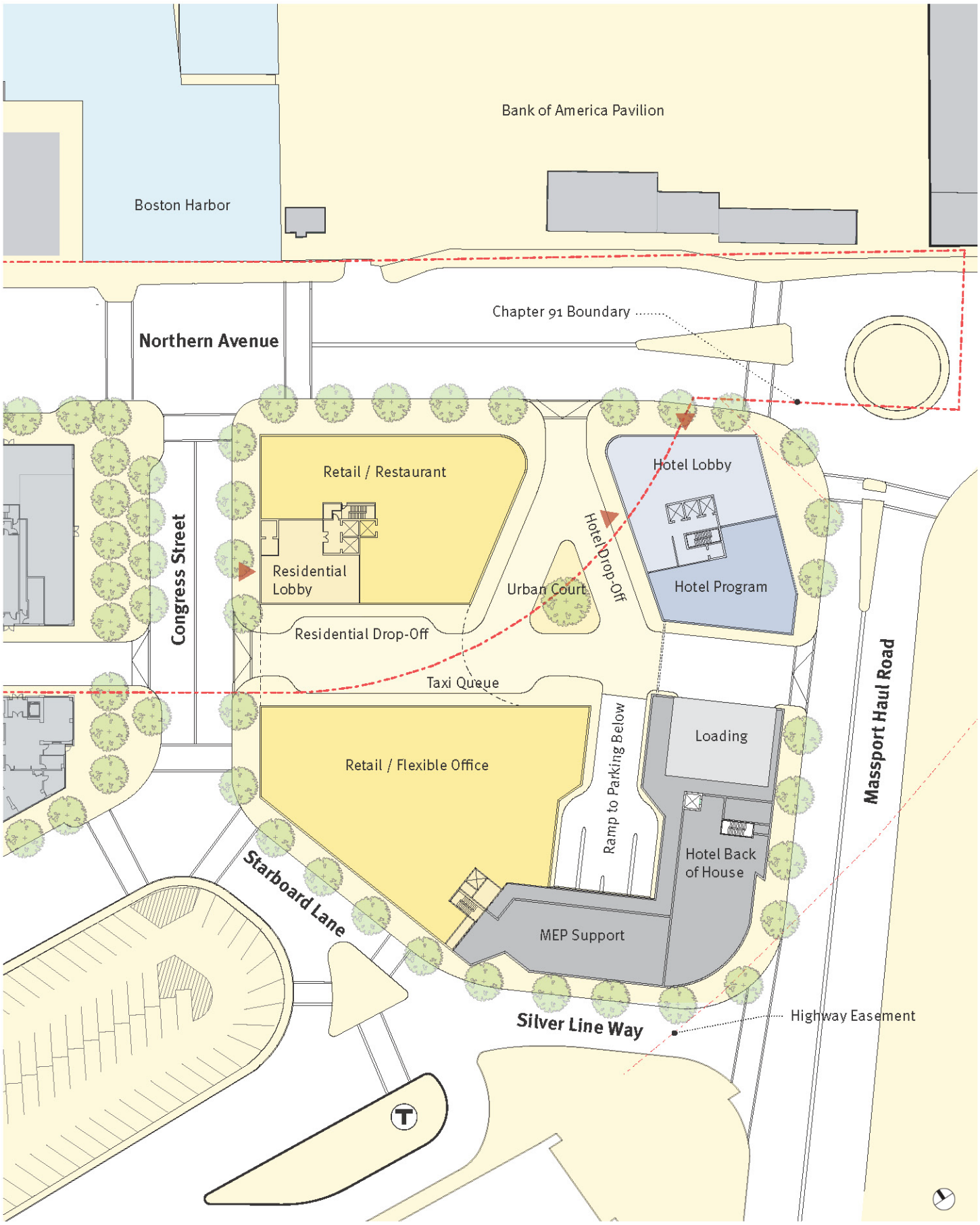
Parcel K **Boston, Massachusetts**

Source: Arrowstreet

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Figure 1.3-7

Building Long Section – Hotel

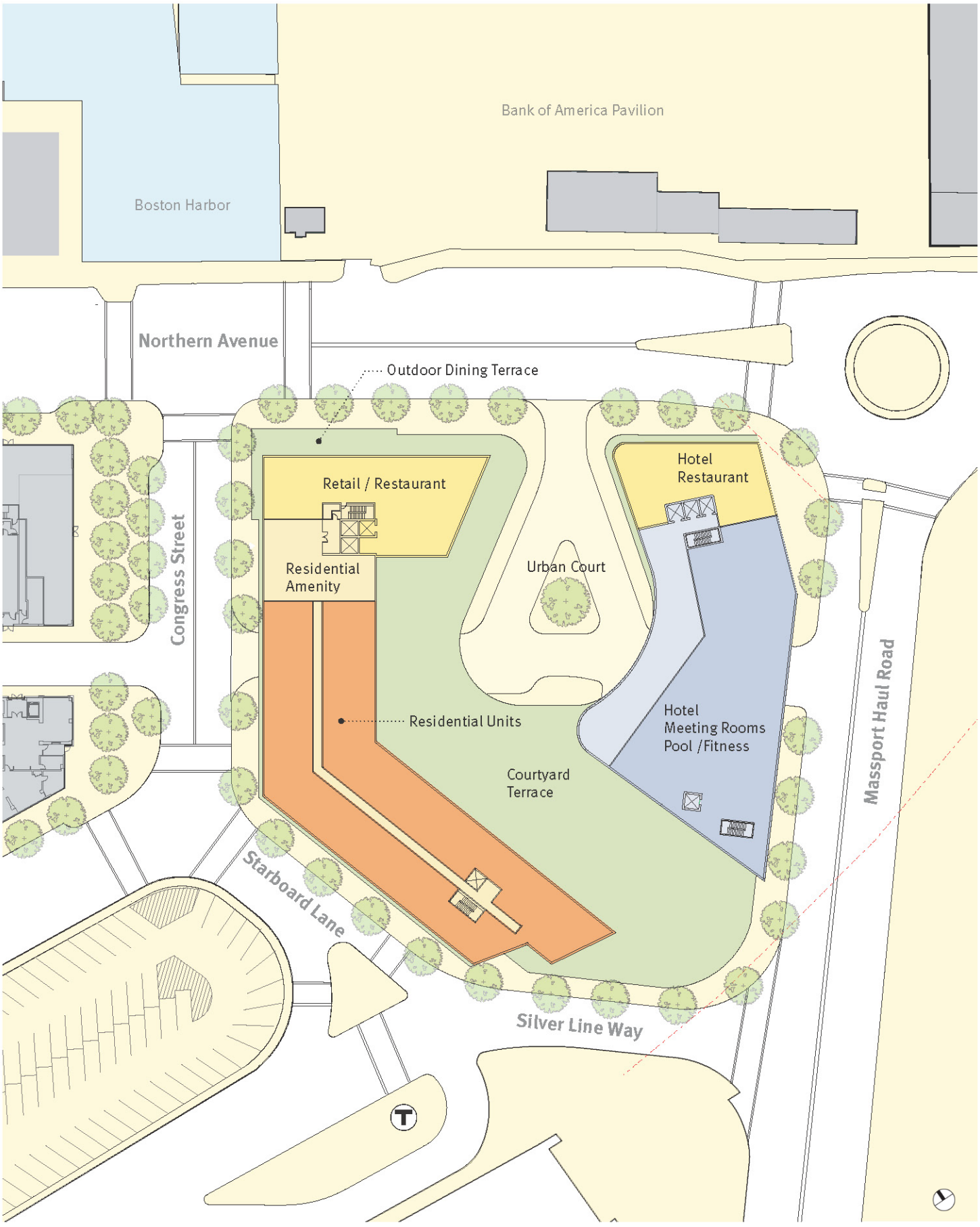


Source: Arrowstreet

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Figure 1.3-8
Ground Level Plan

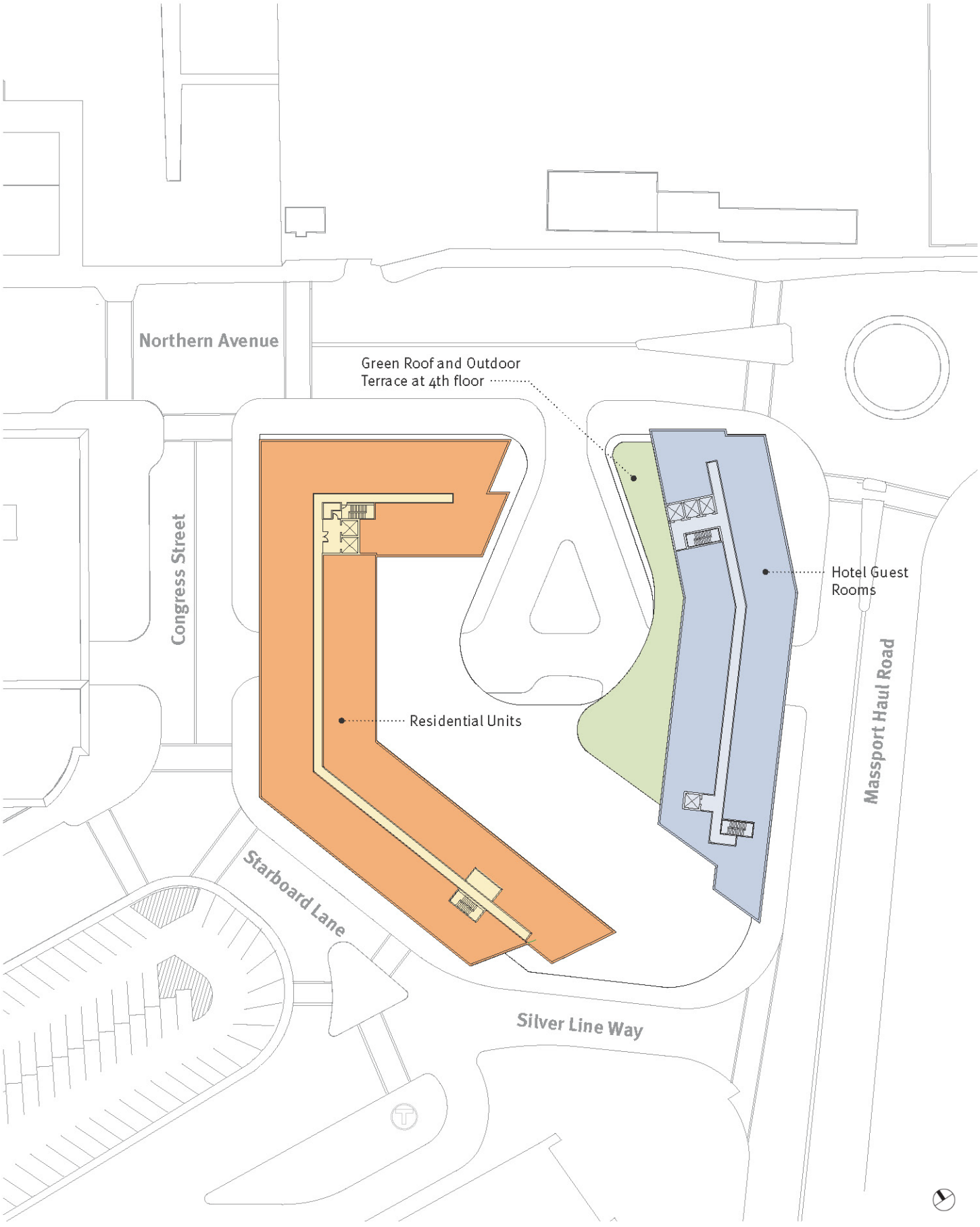


Source: Arrowstreet

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Figure 1.3-9
Courtyard Terrace Level Plan

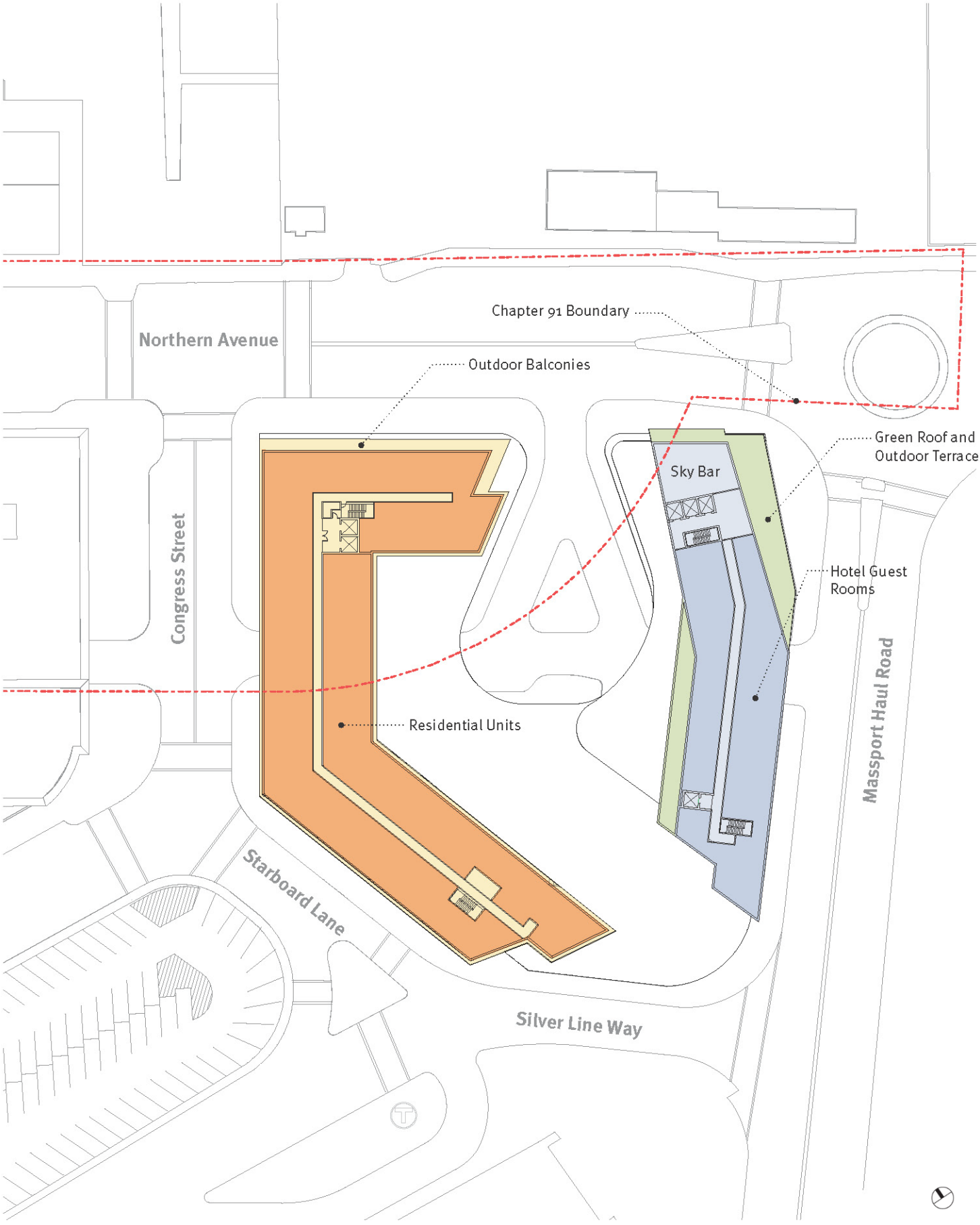


Source: Arrowstreet

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Figure 1.3-10
Levels 4 through 10, Typical Plan



Source: Arrowstreet

Parcel K Boston, Massachusetts

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Figure 1.3-11
Level 11, Typical Plan

Section 2.0

Transportation

2.0 TRANSPORTATION

2.1 Introduction

Vanasse & Associates, Inc. (VAI) has conducted a Traffic Impact and Access Study (TIAS) of the Parcel K Project in order to determine the potential impacts on the transportation infrastructure associated with the construction of this proposed mixed-use Project at the southwest corner of the intersection of Northern Avenue and Massport Haul Road in Boston, Massachusetts. The TIAS presents a comprehensive assessment of the transportation infrastructure serving the Project site with respect to: i) access requirements; ii) potential off-site improvements; and iii) safety considerations; and identifies and analyzes existing and future traffic conditions both with and without the Project along Seaport Boulevard/Northern Avenue and Congress Street, and at the intersections of Congress Street at D Street; Seaport Boulevard and Northern Avenue at D Street; Northern Avenue at Congress Street; Northern Avenue at Massport Haul Road; and Congress Street at Park Lane.

The complete TIAS is presented in Appendix B of this Expanded PNF. The "Conclusions" and "Recommendations" of the TIAS are presented below.

2.2 Traffic Impact and Access Study (TIAS) Conclusions

The TIAS assessment presented in Appendix B was completed by VAI in accordance with State and Boston Transportation Department (BTD) standards, and those of the Traffic Engineering and Transportation Planning professions for the preparation of such reports. Based on this assessment, VAI has made the following conclusions with respect to the Project:

1. Using trip-generation statistics published by the Institute of Transportation Engineers (ITE)[1] for similar land uses as those proposed, the Project is expected to generate approximately 1,662 new automobile trips (two-way, 24-hour volume), 1,298 transit trips and 3,338 pedestrian/other trips on an average weekday; with approximately 100 new automobile vehicle trips, 86 transit trips and 174 pedestrian/other trips expected during the weekday morning peak-hour; and 140 new automobile trips, 107 transit trips and 275 pedestrian/other trips expected during the weekday evening peak-hour;

2. The Project was found to meet the comparability tests for compliance with the CFDA Master Plan with respect to the peak-hour traffic demands, transit trips and parking supply allocated to the Project site (Parcel K);

[1] *Trip Generation*, 9th Edition; Institute of Transportation Engineers; Washington, DC; 2012.

3. The Project will provide a parking supply of 640 underground garage spaces, which is sufficient to accommodate the parking demands of the Project and other uses within the CFDA while also encouraging the use of alternative modes of transportation that are available to the Project site and within the study area;

4. The addition of Project-related traffic to the study area roadways and intersections was not shown to result in a significant impact on motorist delays or vehicle queuing over No-Build conditions, with the majority of the movements at the study intersections shown to continue to operate at a level-of-service of "D" or better during the peak periods;

5. Sufficient capacity is afforded by the pedestrian and public transportation infrastructure that serves the study area to accommodate the projected increase in pedestrian and transit trips that may be associated with the Project;

6. No discernible safety deficiencies were noted with respect to the study area intersections based on a review of the Massachusetts Department of Transportation (MassDOT) motor vehicle crash data; and

7. The Project site driveways are appropriately designed and located so as to provide the required line of sight to function in a safe manner.

Based on a review of these findings, VAI has concluded that the existing transportation infrastructure affords sufficient capacity to accommodate the Project in a safe and efficient manner. Further and as documented in the complete TIAS presented in Appendix B, the Project will have a less pronounced impact on the transportation infrastructure serving the Project site when compared to the impacts that were associated with the development identified in the CFDA Master Plan.

2.3 Traffic Impact and Access Study (TIAS) Recommendations

A detailed transportation improvement program has been developed for the Project that is designed to provide safe and efficient access to the Project site while minimizing impacts to motorists traveling along adjacent roadways and to the working port. The following improvements have been recommended as a part of this evaluation specifically related to the Project, and will be completed subject to receipt of all necessary rights, permits and approvals, and will be formalized in the Transportation Access Plan Agreement (TAPA) to be executed between the Project Proponent and the BTD.

2.3.1 Project Access

Access to the Project site will be provided by way of two (2) new driveways as follows: a full access driveway that will intersect the east side of Congress Street opposite Park Lane and a right-turn entrance only driveway that will intersect the south side of Northern Avenue approximately 150 feet east of Congress Street. An additional access drive for

service and delivery vehicles is proposed along the west side of Massport Haul Road, south of Northern Avenue. The following recommendations are offered with respect to the design and operation of the Project driveways and the Project site, and to indicate compliance with the relevant design standards:

- The Project site driveways should be a minimum of 24 feet in width and accommodate two-way travel

- The right-turn entrance only Project site driveway should be a minimum of 16 feet in width with appropriate signs and pavement markings provided to indicate the function of the driveway as a right-turn entrance only facility.

- The existing raised median on Northern Avenue approaching Massport Haul Road should be extended to the west so as to prohibit left turns entering the Project site driveway.

- The Project site driveways and circulating roadways within the Project site should provide sufficient width to accommodate bicycle travel in a shared travelled-way configuration.

- Vehicles exiting the Project site should be placed under STOP-sign control with illumination (lighting) provided.

- All signs and pavement markings to be installed as a part of the Project shall conform to the applicable standards of the *Manual on Uniform Traffic Control Devices* (MUTCD).[2]

- Signs and landscaping adjacent to the Project site driveways and within the Project site should be designed and maintained so as not to restrict lines of sight.

- Marked crosswalks and wheelchair ramps should be provided for crossing the Project site driveways or the driveways should be designed to be flush with the sidewalk and then ramp down to the intersecting roadway (i.e., a "pan-type" driveway).

As indicated above, these recommendations are being incorporated into the design and operation of the Project.

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[2] *Manual on Uniform Traffic Control Devices* (MUTCD); Federal Highway Administration; Washington, DC; 2009.

2.3.2 Transportation Demand Management (TDM) Program

The Project site is served by public transportation resources provided by the MBTA and is bounded by an interconnected sidewalk infrastructure, both of which serve to provide an opportunity to reduce automobile trips associated with the Project. In an effort to facilitate trip-reduction measures for the Project, a comprehensive Transportation Demand Management (TDM) program will be implemented in conjunction with the Project and will include the following major elements:

- A full-time Transportation Coordinator will be assigned;
- Join the local Seaport Transportation Management Association (TMA);
- Coordinate with MassRIDES through the Seaport TMA to provide commuter services to residents and employees of the Project;
- Provide on-site sale of MBTA Charlie cards;
- Make available information regarding public transportation services, maps, schedules and fare information;
- Participate in the MBTA Corporate T-Pass Program to the extent practical and as allowable pursuant to commercial tenant lease requirements;
- Promote the use of public transportation to hotel guests in website based materials, including links to the appropriate homepages of the MBTA and MassRIDES;
- Provide a periodic newsletter or bulletin concerning commuting options as provided through the Seaport TMA;
- Encourage employees to participate in MassRIDES' NuRide program which rewards employees that choose to walk, bicycle, carpool, vanpool or use public transportation;
- Offer a "Guaranteed Ride Home" through the Seaport TMA to all employees that commute to the Project by means other than private automobile;
- Work with the Seaport TMA and tenants to develop an informational packet of commuting alternatives to be made available to residents, employees and hotel guests;
- Work with the Seaport TMA to provide information regarding bicycle commuting and area bicycle and pedestrian facilities, including the Harborwalk;
- Provide short-term exterior bicycle parking spaces proximate to the Project building entrances and long-term bicycle parking within the parking garage;

- Provide dedicated parking for car sharing services (ZipCar), car/vanpools and alternatively fueled vehicles within the parking garage; and

- Provide electric vehicle charging stations within the parking garage

- Proportionately participate in a shared shuttle service for the hotel should such a service be proposed in the future.

2.3.3 Annual Monitoring and Reporting Program

An Annual Monitoring Report will be provided to Massport and the BTD that will document the basic transportation and commuting characteristics of the tenants, residents, employees and guests of the Project. The Annual Monitoring Report will be developed in conjunction with the Seaport TMA and will include an employee and resident survey of commuting modes, traffic monitoring of the parking garage (parking utilization and number of vehicles serviced), and documentation concerning the elements of the TDM program currently available to employees, residents and guests. The results of the annual monitoring program will be provided to the BRA, the BTD, and Massport. The monitoring program will commence upon full completion and occupancy of the Project and will continue for a period of two years thereafter.

2.3.4 Loading and Deliveries

The Project has been designed to accommodate all loading and delivery functions on-site in a safe and efficient manner. Designated loading areas have been provided within the Project site to accommodate deliveries in a safe and efficient manner and separate from resident, customer and pedestrian traffic. Truck routes and hours of deliveries will be scheduled to the extent possible to minimize truck activity during the commuter peak hours. Reasonable efforts will be made to use service vendors currently serving the Project vicinity in an effort to reduce the overall number of new trucks in the area.

With implementation of the above recommendations, safe and efficient access will be provided to the Project site and the Project can be constructed with minimal impact on the roadway system.

2.3.5 Construction Management Plan (CMP)

An important component of the transportation plan for the Project is an effective series of measures that are designed to minimize traffic flow and safety impacts during the Project's construction phase. Summarized below are several measures which will be undertaken during the construction phase of the Project. These measures will be incorporated into the CMP, which will be reviewed and approved by Massport and the BTD.

- The Project Proponent and the general contractor will coordinate with Massport and the BTD regarding all transportation-related construction impacts of the Project.

- Designated truck routes will be established to govern how trucks access the Project site. The goal of this commitment is to have construction trucks use only the regional highway system (I-90), the South Boston By-Pass Road and Massport Haul Road, and to avoid travelling through residential areas and pedestrian oriented corridors to the extent practical.

- Secure fencing will be provided in areas affected by construction to protect nearby pedestrian and vehicular traffic. Gate entrances into the construction area will be determined jointly with Massport.

- During construction activities, as required by Massport, a police detail will be employed to safely manage pedestrian and vehicle traffic at the point of construction access to the Project site.

- Secure on-site storage will be provided for tools and equipment in an effort to minimize construction-related vehicle trips to the site.

- Full or partial street closures will be avoided to the extent possible. Should a partial street closure be necessary in order to off-load construction materials and/or complete construction-related activities which cannot be accommodated on site, the closure will be limited to off-peak periods. Police details will be used as required by Massport. Prior to the implementation of any planned construction activities within the public right-of-way, the contractor will submit to Massport for review and approval a traffic and pedestrian management plan.

- To the degree it is necessary and/or feasible, construction worker parking will be provided within the Project site and expressly prohibited along Congress Street, Northern Avenue, Massport Haul Road, and within residential neighborhoods.

- The general contractor will work with the Seaport TMA to implement appropriate measures to encourage ridesharing and the use of public transportation services by employees and subcontractors working on the Project.

With implementation of the above elements of the CMP, construction-related impacts associated with the Project will be appropriately managed and safe and efficient access for vehicles, pedestrians and bicyclists will be maintained.

Section 3.0

Environmental Protection Component

3.0 ENVIRONMENTAL PROTECTION COMPONENT

3.1 Introduction

The Article 80 Development Review and Approval Process, which the Proponent is voluntarily complying with, requires the proponent to conduct those studies necessary to determine the potential for direct or indirect impact to the environment as a result of Project implementation. The following sections review the Project in light of the potential for environmental impact and include a number of in-depth studies focused upon those resources most likely to be present at or near the Project site.

3.2 Pedestrian Level Winds

A pedestrian level wind (PLW) study has been performed by Rowan Williams Davies & Irwin, Inc., (RWDI) of Guelph, Ontario to assess the effect of the proposed Project on wind conditions in the pedestrian realm of the Project site and surrounding areas and to provide recommendations for minimizing any potential adverse effects. The results of the wind study are summarized herein, and a copy of the wind study results table is included herein as Appendix C.

The wind study involved wind simulations of the proposed Project on a 1:300 scale model of the proposed buildings and surroundings in a boundary-layer wind tunnel. A total of 99 wind measurement locations were examined in the wind tunnel under both the No-Build and the Build Condition for both mean wind speed and effective gust wind speed. An additional 14 locations were established on the proposed mezzanine-level courtyard terrace to assess the conditions in the Build Condition of this new pedestrian feature.

Of the 99 locations examined in the existing No-Build and the Build Condition, 82 are expected to experience either improved (21 sites) or unchanged (61 sites) conditions under mean annual wind conditions, while only 17 locations are expected to experience a decrease in wind comfort. Meanwhile, the site's location proximate to the water results in a gusty environment as evidenced by the fact that four existing locations currently experience "unacceptable" gusts on an annualized basis (one of these improve in the Build Condition). Meanwhile six pedestrian level and one courtyard terrace location in the Build Condition become unacceptable.

The PLW study was conducted prior to the development and design of landscaping and screening amenities. Adverse wind impacts will be mitigated using landscape and screening design techniques implemented along the exterior of the Project. These include at-grade tree plantings, variously scaled planters with trees and/or shrubs, transparent and/or permeable arcade screens, canopies, walkway and staircase screens. The design and placement of such amenities will be driven by the results of the wind study in combination with latter stage final building and urban court and courtyard terrace design refinements.

3.2.1 Background

Tall buildings, especially those that protrude above their surroundings, can cause increased local wind speeds at the pedestrian level. Typically, wind speeds increase with elevation above the ground surface, and taller buildings can intercept these faster winds and deflect them down to the pedestrian level. The funneling of wind through gaps between buildings and the acceleration of wind around corners of buildings may also cause increases in wind speed. Conversely, if a building is surrounded by others of equivalent height, it may be protected from the prevailing upper-level winds, resulting in no significant changes or even improvements to the local pedestrian-level wind environment. The most effective way to assess potential pedestrian-level wind impacts around a proposed new building is to conduct scale model tests in a wind tunnel. The Proponent retained RWDI, one of the foremost international experts in the field of wind modeling, to conduct the wind tunnel modeling for the proposed Project.

The consideration of wind in planning outdoor activity areas and public sidewalks, entrance locations, and gathering spaces is important since high winds in an area tend to deter pedestrian use. For example, winds should be light or relatively light in areas where people would be sitting, such as outdoor cafes or playgrounds. For bus stops and other locations where people are typically standing, somewhat higher winds can be tolerated. For frequently used sidewalks, where people are primarily walking, stronger winds are acceptable. Similarly, for infrequently used areas, the wind comfort criteria can be relaxed even further. Generally, actual effects of wind can range from pedestrian inconvenience, due to the blowing of dust and other loose material in a moderate breeze, to severe difficulty with walking due to the wind forces on the pedestrian.

3.2.2 Methodology

For its analysis, RWDI gathered information concerning the site and surrounding buildings and topography within a 1,200-foot radius of the Project site from topographic maps, BRA mapping, site plans and elevations of the proposed development Project provided by the Project design team. The wind tunnel study looked at a No-Build Condition consisting of the current existing site condition without the proposed Project, and at a Build Condition; specifically, the proposed Project as it is described in this Expanded PNF. All of the figures related to the wind analyses (Figures 3.2-1 through 3.2-9) described herein are included at the end of this section.

The scale model of the Project site and area was equipped with 113 specially designed wind speed sensors which were, in turn, connected to the wind tunnel's data acquisition system. This system is designed to record the mean and fluctuating components of wind speed at a full-scale height of five feet above grade in pedestrian areas throughout the study site. As noted above, certain sensors, specifically Sensors 98 through 111 were not applicable for the No Build Condition as these sensors are located on the elevated courtyard terrace. Wind speeds were measured for 36 wind directions, in 10-degree

increments, starting from true north. The measurements at each sensor location were recorded in the form of ratios of local mean and gust speeds to the reference wind speed in the free stream above the model. The results were then combined with long-term meteorological data, recorded during the years 1981 to 2011 at Boston's Logan International Airport, in order to predict full scale wind conditions. The analysis was performed separately for each of the four seasons and for the entire year.

Figures 3.2-1 through 3.2-3 present "wind roses" that summarize the seasonal and annual wind climate in the Boston area, based on the data from Logan International Airport. On an annual basis (Figure 3.2-3), the most common wind directions are those between southwest and northwest. These are also the dominant direction for strong winds.

3.2.3 Pedestrian Wind Comfort Criteria

The BRA has adopted two standards for assessing the relative wind comfort of pedestrians. First, the BRA wind design guidance criterion states that an effective gust velocity (hourly mean wind speed +1.5 times the root-mean-square wind speed) of 31 mph should not be exceeded more than one percent of the time. The second standard used by the BRA is based on the work of Melbourne and is used to determine the relative level of pedestrian wind comfort for activities such as sitting, standing, or walking, as shown in Table 3.2-1.[3] The criteria are shown in terms of benchmarks for the one-hour mean speed exceeded one percent of the time (*i.e.*, the 99-percentile mean wind speed).

Table 3.2-1 Boston Redevelopment Authority Mean Wind Criteria*

Level of Comfort	Wind Speed
Dangerous	> 27 mph
Uncomfortable for Walking	>19 and <27 mph
Comfortable for Walking	>15 and <19 mph
Comfortable for Standing	>12 and <15 mph
Comfortable for Sitting	<12 mph

* Applicable to the hourly mean wind speed exceeded one percent of the time.

The wind climate found in a typical downtown Boston location is generally comfortable for pedestrian use of sidewalks and thoroughfares and meets the BRA effective gust velocity criterion of 31 mph. However, the general wind climate in Boston is likely to be frequently uncomfortable for more passive activities such as sitting. Meanwhile, the wind climate in

[3] Melbourne, W.H., 1978, "Criteria for Environmental Wind Conditions," Journal of Industrial Aerodynamics, 3 (1978) 241 – 249.

the more robust and exposed waterfront environment of South Boston can be expected to be slightly less comfortable than the downtown areas, with harbor breezes and wind gusts not uncommon.

3.2.4 Pedestrian Level Wind Test Results

The following sections review the results of the pedestrian level wind tests for both the No-Build and Build Conditions. The results for the annualized mean wind speed analyses for both the No-Build and the Build Condition are presented in Figures 3.2-4 and 3.2-5, respectively. A map showing the net change in BRA comfort ratings between the No-Build and Build Conditions is presented in Figure 3.2-6. The results for the annualized effective gust wind speed analyses for both the No-Build and the Build Condition are presented in Figures 3.2-7 and 3.2-8, respectively.

3.2.4.1 No-Build

A total of 99 locations (on and off site) were tested under the No-Build Condition for mean wind conditions. On an annual basis, of the 27 on-site locations tested 23 were found to have mean annual wind speeds comfortable for "walking" and 4 were found to be "uncomfortable" (see Figure 3.2-4). The four "uncomfortable" locations were located at or near the intersection of Northern Avenue and Congress Street and, as might be expected, are the site locations closest to the open water of Boston Harbor.

Generally, many of the surrounding off-site locations were modeled as "walking." Most off-site locations to the north and east of the site were predicted to have mean wind speeds that were generally comfortable for walking or better. Only two locations east of the site (#74 near the Boston Freight Terminals building on Channel Street and #88 on the north side of the Northern Avenue/Massport Haul Road intersection) exist as uncomfortable. Several locations west of the site, including three on Congress Street (#26, #27, and #28), two on Park Lane (#44 and #54), and several others on D Street also exist as uncomfortable.

Overall, 19 of the 99 No-Build test locations were found to have uncomfortable wind conditions in the existing, No Build Condition. As noted above, most of these were located along the northwestern edge of the Project site and off site to the west. Meanwhile, the large majority of the comfortable locations under the No-Build Condition fell just within the comfortable range; specifically the comfortable for "walking" category (72 locations). As expected, this confirms that the proposed development site is somewhat windy under existing conditions. It can therefore be expected that when a proposed building, regardless of its height, is placed in this environment, uncomfortable wind conditions may continue to exist on an annual basis at certain locations, such as exposed building corners or isolated points where channeling wind might occur.

Finally, the windy existing conditions are reflected in the annual No-Build wind gust results, as shown in Figure 3.2-7. Four sites were found to have unacceptable wind gust levels, three along D Street two blocks west of the site, and one at the corner of Northern Avenue and Congress Street, opposite the site.

3.2.4.2 Build Condition

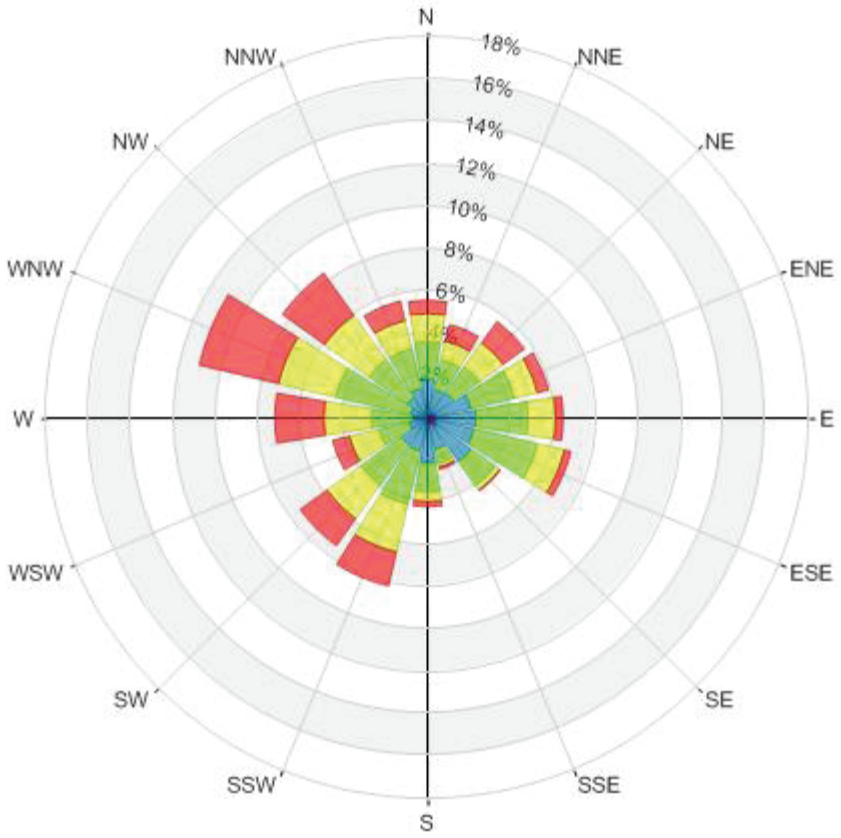
The scope of the Build scenario was determined by evaluating how far from the Project site the construction of the Project would have any material influence on annual PLW conditions. The Project will generally not adversely affect existing mean wind speed conditions and in fact is expected to actually improve wind comfort levels at a significant number of the locations that were measured. Predicted wind levels under the Build Condition are shown on Figure 3.2-5.

Figure 3.2-6 depicts the net changes in the BRA comfort ratings between the existing, No-Build Condition and the Build Condition. As noted above, a total of 113 locations were tested under the Build Condition (14 more than the No-Build Condition). Of the 99 locations that can be compared directly to the No-Build, the large majority (82 locations) showed either no change or improvements to their wind condition as described by BRA comfort ratings. Of these, a total of 21 locations are expected to experience improved wind conditions, mostly in the areas west and southwest of the proposed buildings.

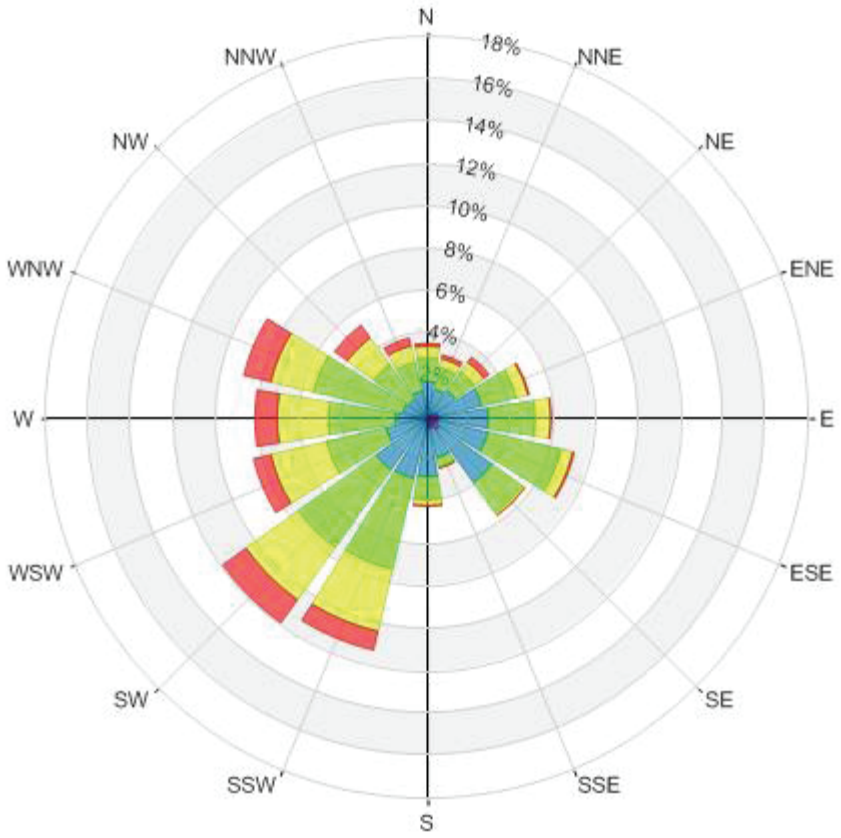
Of the17 locations that are predicted to experience an annualized decrease in wind comfort, none will rate a dangerous designation. One location will decrease from comfortable for standing to comfortable for walking, and sixteen will shift from comfortable for walking to uncomfortable. Of these latter locations, seven are located along Massport Haul Road and four are along Northern Avenue.

Finally, the Build Condition does show an increase in the number of unacceptable gust conditions. D Street remains gusty, and Congress Street registers two new unacceptable locations, with the one existing site improving. Two locations along Massport Haul Road are indicated as unacceptable. Figures 3.2-6 and 3.2-7 depict the gust conditions under the No Build and Build Conditions, respectively.

Adverse wind impacts will be mitigated using design techniques, such as landscaping or windscreens implemented along the exterior of the Project. These mitigation measures will be incorporated into both landscaping and building design as the Project progresses, so as to insure compliance with BRA standards. Moreover, as the area continues to be developed, the other buildings and structures to be constructed will further shield the Project site from adverse wind conditions.



Spring
(March - May)



Summer
(June - August)

Wind Speed (mph)	Probability (%) Spring	Summer
Calm	1.7	1.8
1-5	3.5	4.6
6-10	22.5	30.3
11-15	31.5	36.4
16-20	23.0	19.5
>20	17.8	7.4

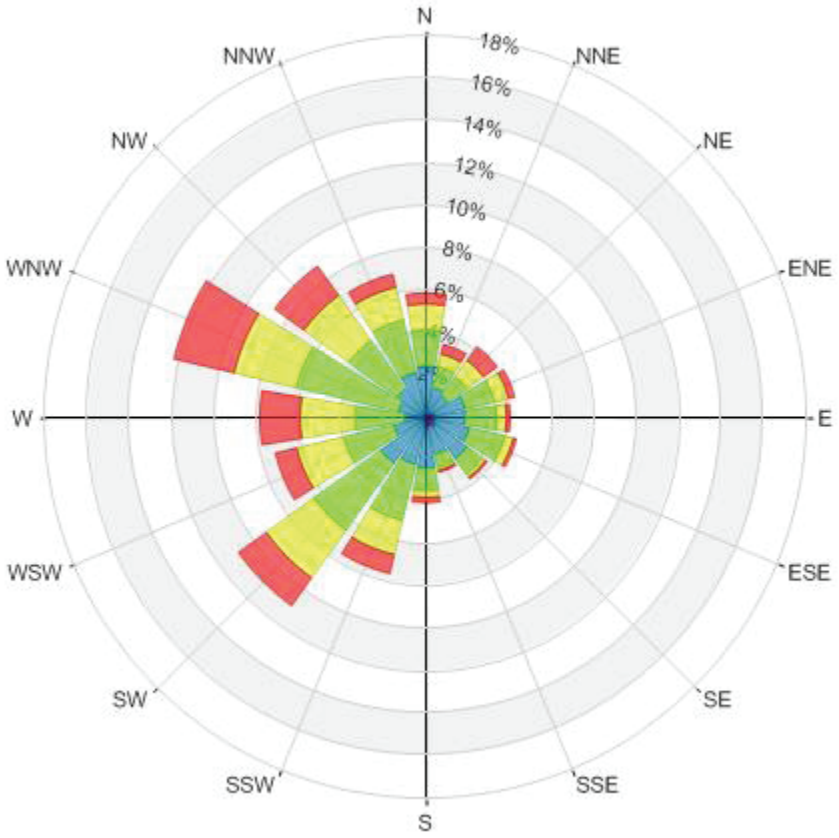
Source: RWDI, December 2, 2013

Parcel K Boston, Massachusetts

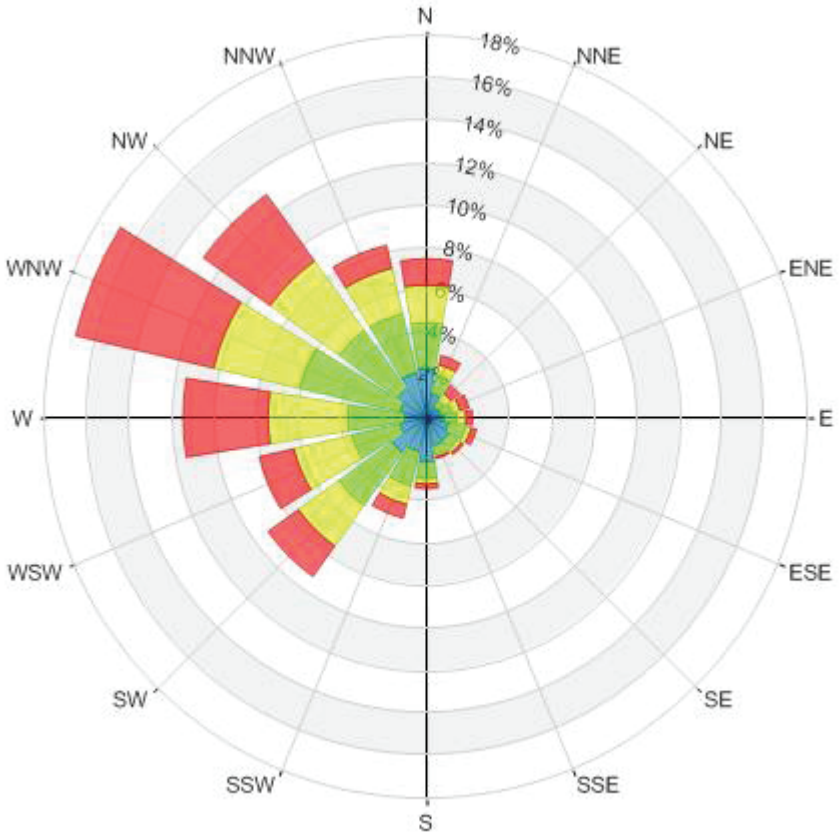
Epsilon ASSOCIATES INC.

Figure 3.2-1

Directional Distribution (%) of Winds (Blowing from) Boston Logan International Airport (1981-2011), Spring and Summer



Fall
(September - November)



Winter
(December - February)

Wind Speed (mph)	Probability (%) Fall	Winter
Calm	1.9	1.5
1-5	4.1	3.0
6-10	26.3	19.8
11-15	32.7	27.7
16-20	21.4	24.6
>20	13.5	23.4

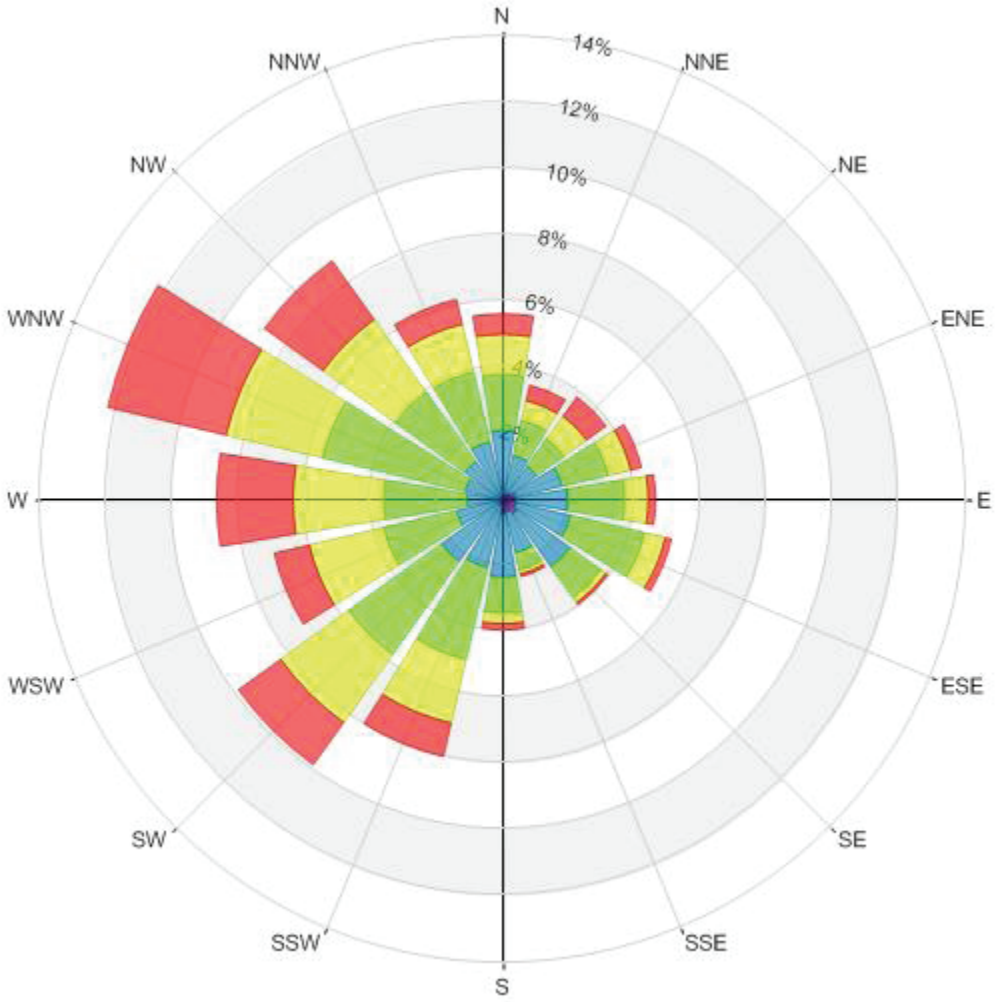
Source: RWDI, December 2, 2013

Parcel K Boston, Massachusetts

Epsilon ASSOCIATES INC.

Figure 3.2-2

Directional Distribution (%) of Winds (Blowing from) Boston Logan International Airport (1981-2011), Fall and Winter



Annual Winds

Wind Speed (mph)	Probability (%)
Calm	1.7
1-5	3.8
6-10	24.7
11-15	32.1
16-20	22.1
>20	15.5

Source: RWDI, December 2, 2013

Parcel K Boston, Massachusetts

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Figure 3.2-3

Directional Distribution (%) of Winds (Blowing from) Boston Logan International Airport (1981-2011), Annual Winds



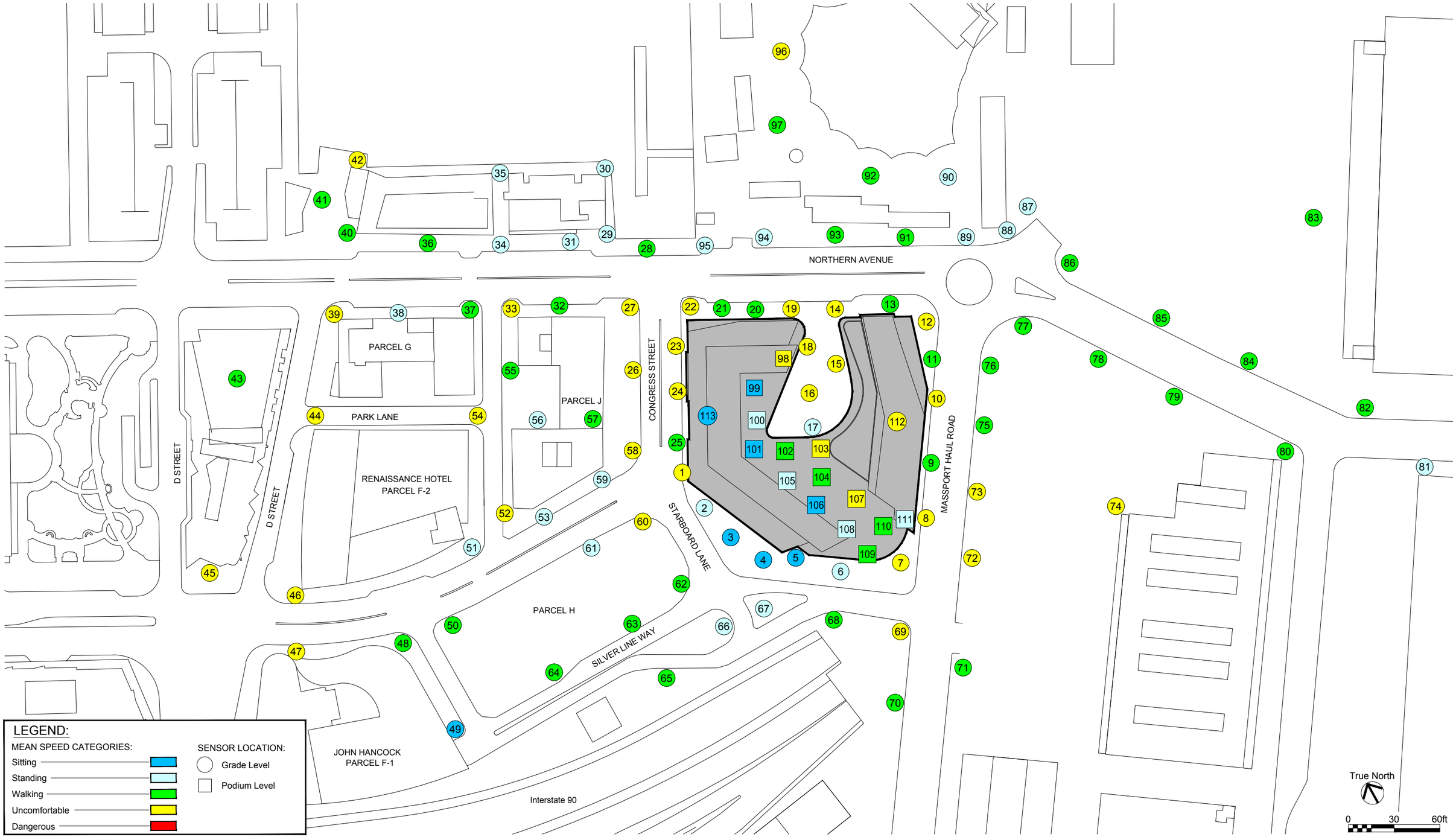
Source: RWDI, December 2, 2013

Parcel K Boston, Massachusetts

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Figure 3.2-4

Pedestrian Level Winds - No Build Annual

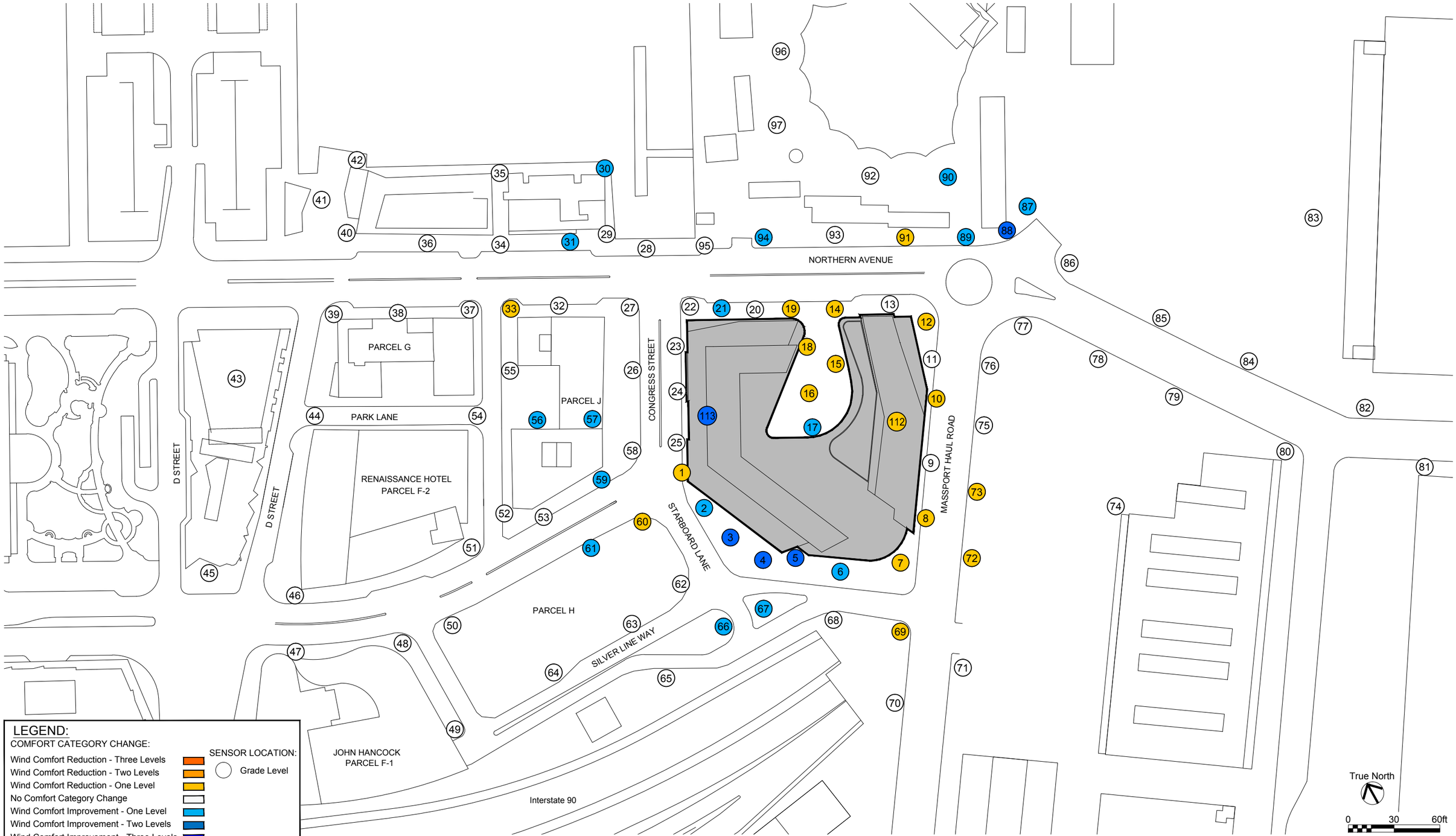


Source: RWDI, December 2, 2013

Parcel K **Boston, Massachusetts**

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Figure 3.2-5
Pedestrian Level Winds - Build Annual



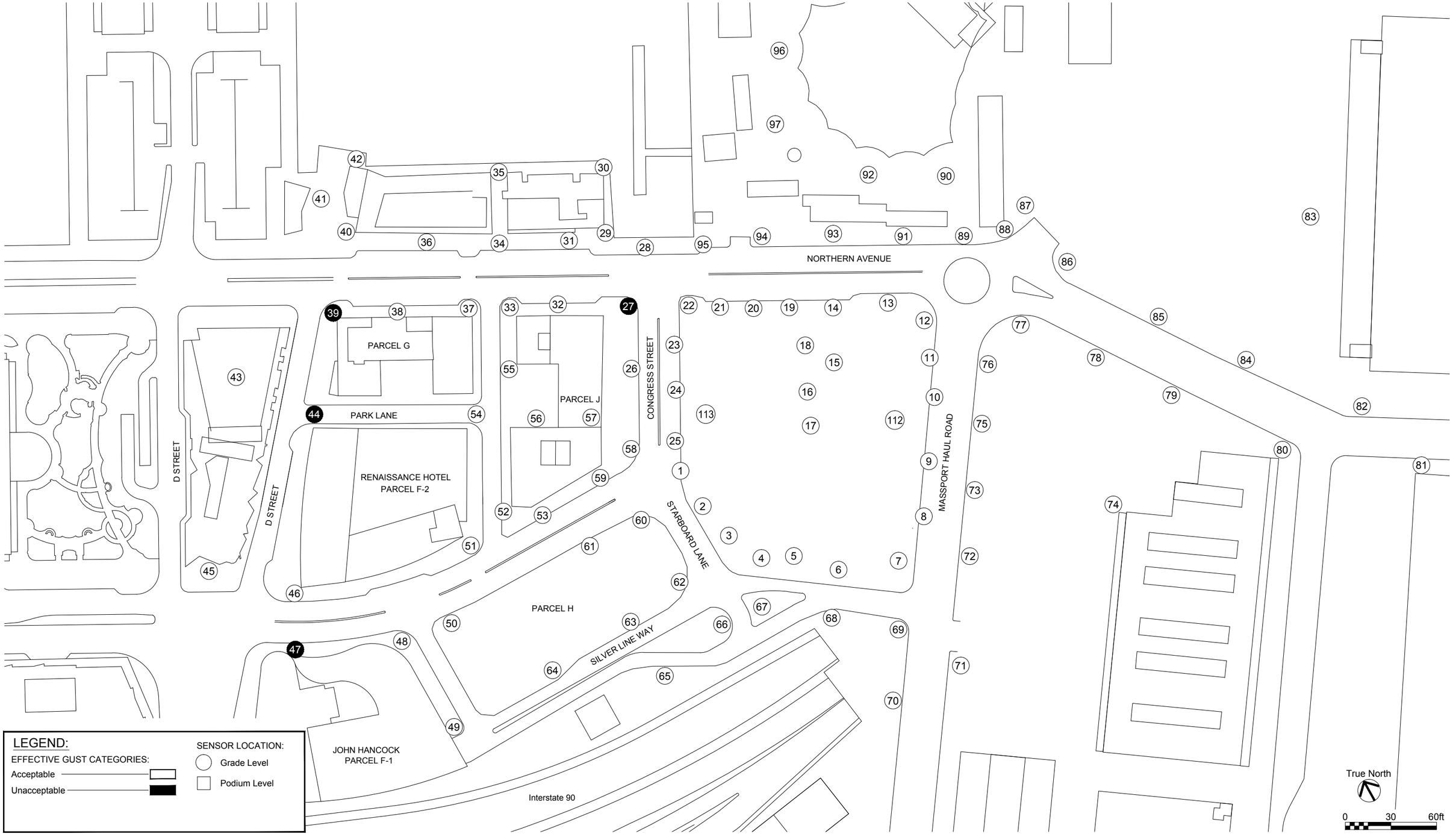
Source: RWDI, December 2, 2013

Parcel K Boston, Massachusetts

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Figure 3.2-6

Pedestrian Level Winds - Category Change



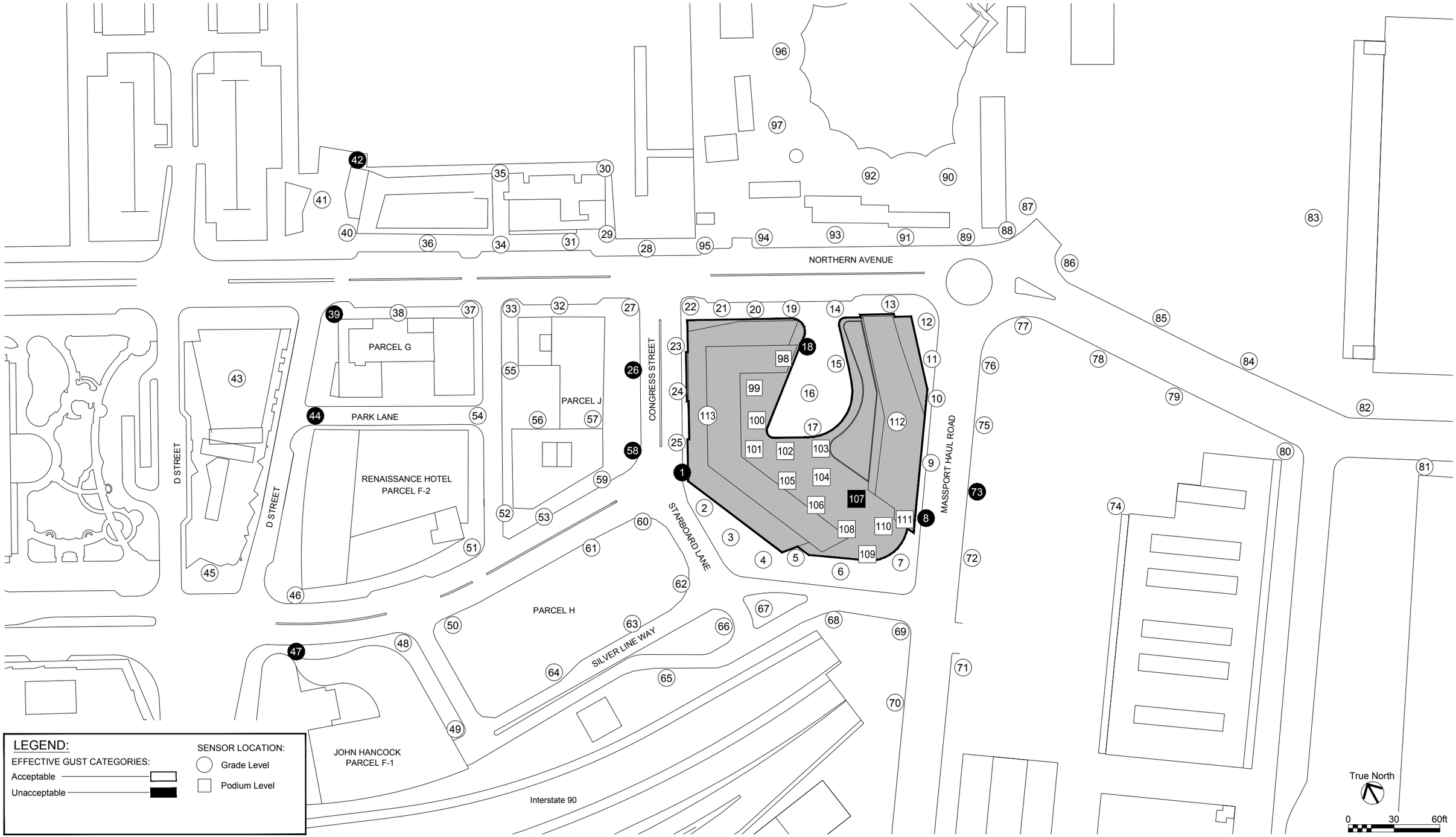
Source: RWDI, December 2, 2013

Parcel K Boston, Massachusetts

Epsilon ASSOCIATES INC.

Figure 3.2-7

Pedestrian Level Effective Wind Gusts - No Build Annual



Source: RWDI, December 2, 2013

Parcel K **Boston, Massachusetts**

Epsilon ASSOCIATES INC.

Figure 3.2-8

Pedestrian Level Effective Wind Gusts - Build Annual

3.3 Shadow Analysis

A shadow analysis of the proposed Project was conducted in accordance with BRA protocol to examine the shadow conditions associated with the Project for the 9:00 AM, 12:00 PM, and 3:00 PM hours during the vernal equinox (March 21), the summer solstice (June 21), the autumnal equinox (September 21), and the winter solstice (December 21). In addition, shadow studies were conducted for the 6:00 PM time period during the summer solstice and autumnal equinox. The results of this analysis are shown in Figures 3.3-1 through 3.3-4.

The shadow analysis focused on net new shadow cast on existing and proposed public open spaces, including the streets, sidewalks and plazas both on the site and in the vicinity of the site. Shadows were determined based on the Azimuth and Altitude Data for Boston, shown in Table 3.3-1.

Table 3.3-1 Shadow Analysis - Azimuth and Altitude Data for Boston

Date	Solar Time	Local Time	Solar Position	
			Altitude	Azimuth
March 21	9:08	9:00 AM EST	33.3	54.3 E/S
	12:08	12:00 PM EST	48	3.1 W/S
	15:08	3:00 PM EST	30.5	58.2 W/S
June 21	8:13	9:00 AM EDT	39.9	86.5 E/S
	11:13	12:00 PM EDT	68.8	30.6 E/S
	14:13	3:00 PM EDT	56.5	66.3 W/S
	17:13	6:00 PM EDT	23.9	79.3 W/N
September 21	8:22	9:00 AM EDT	25.9	64.7 E/S
	11:22	12:00 PM EDT	47.4	14 E/S
	14:22	3:00 PM EDT	37.4	47.1 W/S
	17:22	6:00 PM EDT	7.3	84.0 W/S
December 21	9:17	9:00 AM EST	14.2	86.5 E/S
	12:17	12:00 PM EST	24.1	4.4 W/S
	15:17	3:00 PM EST	10	44.9 W/S

The analysis also compared the anticipated shadow conditions for the Project with the baseline massing for Parcel K, described in the *Northern Avenue WDP* as a 140-foot tall office building on Parcel K-1 with a 100-foot tall parking garage on Parcel K-2. Within the Chapter 91 boundary, the 140-foot tall office stepped down to 130 feet. This baseline condition was modeled from Figures 14 through 17 of the *Northern Avenue WDP*. The results of this analysis are shown in Figure 3.3-5 through 3.3-8.

Finally, the results of the proposed and baseline shadow conditions were assessed to determine the amount of net shadow reduction or addition as a result of the Project. These results are tabulated in Table 3.3-2. As shown therein, the net result is a 7 percent reduction in the amount of shadow created by the Project as compared to the baseline

condition described in the *Northern Avenue WDP*. The following sections describe the shadow conditions for each of the equinox/solstice dates.

Table 3.3-2 Comparative Shadow Study Analysis: Shadow Impact on Public Space

Northern Avenue WDP Baseline Massing		Proposed Massing		Net Shadow Reduction (Addition)	
Date/Time	(SF)	Date/Time	SF	SF / %	
March 21, 9 AM EST	36,716	March 21, 9 AM EST	35,762	954	3%
March 21, 12 PM EST	32,711	March 21, 12 PM EST	27,468	5,243	16%
March 21, 3 PM EST	58,664	March 21, 3 PM EST	62,375	(3,711)	(6%)
March Subtotal	128,091	March Subtotal	125,605	2,486	2%
June 21, 9 AM EDT	49,007	June 21, 9 AM EDT	41,556	7,451	15%
June 21, 12 PM EDT	8,404	June 21, 12 PM EDT	7,528	876	10%
June 21, 3 PM EDT	21,585	June 21, 3 PM EDT	21,716	(131)	(1%)
June 21, 6 PM EDT	45,276	June 21, 6 PM EDT	67,443	(22,167)	(49%)
June Subtotal	124,272	June Subtotal	138,243	(13,971)	(11%)
September 21, 9 AM EDT	46,708	September 21, 9 AM EDT	40,821	5,887	13%
September 21, 12 PM EDT	35,282	September 21, 12 PM EDT	30,674	4,608	13%
September 21, 3 PM EDT	46,688	September 21, 3 PM EDT	40,251	6,437	14%
September 21, 6 PM EDT	38,385	September 21, 6 PM EDT	32,399	5,986	16%
September Subtotal	167,063	September Subtotal	144,145	22,918	14%
December 21, 9 AM EST	68,903	December 21, 9 AM EST	71,903	(3,000)	(4%)
December 21, 12 PM EST	85,198	December 21, 12 PM EST	75,240	9,958	12%
December 21, 3 PM EST	95,183	December 21, 3 PM EST	69,383	25,800	27%
December Subtotal	249,284	December Subtotal	216,526	32,758	(13%)
TOTAL BASELINE	**668,710**	**TOTAL PROPOSED**	**624,519**	**44,191**	**7%**

3.3.1 Vernal Equinox (March 21)

At 9:00 AM new shadow from the Project will extend northwest of the site onto the Congress Street and Starboard Lane sidewalks immediately adjacent to the Project. The proposed urban court and elevated courtyard terrace on Parcel K will be in shadow at this morning hour. The sidewalks on the south side of Northern Avenue adjacent to the Project will also be in shadow; however the street and the sidewalk across the street will receive full sun, as will Massport Haul Road and its sidewalks.

At 12:00 PM the Silver Line Way and Starboard Lane sidewalks adjacent to the Project will receive full sun. Shadow will be cast onto portions of the Congress Street and Northern Avenue streets and sidewalks immediately north and west of the site. The Northern Avenue entrance to the site will receive full sun. Massport Haul Road and its sidewalks will also receive full sun.

At 3:00 PM new shadow will extend across Northern Avenue and Massport Haul Road and be cast onto the adjacent Bank of America Pavilion parcel. The urban court will also be in

shadow during this time. The Congress Street, Starboard Lane and Silver Line Way sidewalks will be in full sun.

3.3.2 Summer Solstice (June 21)

At 9:00 AM new shadow will occur west of the site over Congress Street, Starboard Lane and Silver Line Way. The urban court and majority of the elevated courtyard terrace will also be in shadow. The streets and sidewalks along Northern Avenue and Massport Haul Road will receive full sun.

At 12:00 PM there will be minimal shadow cast on adjacent streets and sidewalks and optimal sunlight within and around Parcel K. The Congress Street and Northern Avenue sidewalks immediately adjacent to the Project will be in shadow. All other sidewalks along Massport Haul Road, Starboard Lane and Silver Line Way, as well as the majority of the urban court and elevated courtyard terrace, will receive full sun.

At 3:00 PM new shadow will extend approximately half way across Northern Avenue and Massport Haul Road in the northeast direction. The courtyard terrace will also be in shadow. The pedestrian crosswalks and sidewalks at the south to southwest quadrant of the site will receive sun.

As the sun begins to set at 6:00 PM, new shadow will occur in the east direction on a portion of Northern Avenue and across Massport Haul Road. At this time of day the existing neighboring buildings cast a significant amount of shadow in the vicinity of the site.

3.3.3 Autumnal Equinox (September 21)

Shadow will extend over Congress Street and Starboard Lane at 9:00 AM. The streets and sidewalks along Northern Avenue, Massport Haul Road, Silver Line Way and associated pedestrian crosswalks will receive full sun.

At 12:00 PM shadow will be cast north of the site over portions of the Northern Avenue and Congress Street sidewalks and streets, as well as the eastern half of the urban court. The Starboard Lane, Silver Line Way and Massport Haul Road streets, sidewalks and pedestrians crosswalks will be in full sun.

At 3:00 PM shadow will be cast northeast of the site over the streets and sidewalks of Northern Avenue and Massport Haul Road. The urban court and elevated courtyard terrace will also be in shadow. The streets, sidewalks and associated crosswalks along Congress Street, Starboard Lane and Silver Line Way will all receive full sun.

Due to the existing neighboring buildings, at 6:00 PM the majority of the Parcel K site and adjacent streets and sidewalks will be in shadow. New shadow will be cast east of the site over Massport Haul Road.

3.3.4 Winter Solstice (December 21)

At 9:00 AM new shadow associated with the Project will be cast northwest of the site over Northern Avenue to Liberty Wharf and a portion of the waterfront. The section of Congress Street between Park Lane and Parcel K will be in shadow, as will the urban court and elevated courtyard terrace. Massport Haul Road and Silver Line Way will receive full sun, with the exception of a small portion of the Silver Line Way sidewalk immediately adjacent to Parcel K.

At 12:00 PM new shadow will extend northward over Northern Avenue and portions of the adjacent Bank of America Pavilion parcel, while also shading most of the Parcel K urban court. Starboard Lane, Silver Line Way and Massport Haul Road streets, sidewalks and pedestrian crosswalks will be in sun.

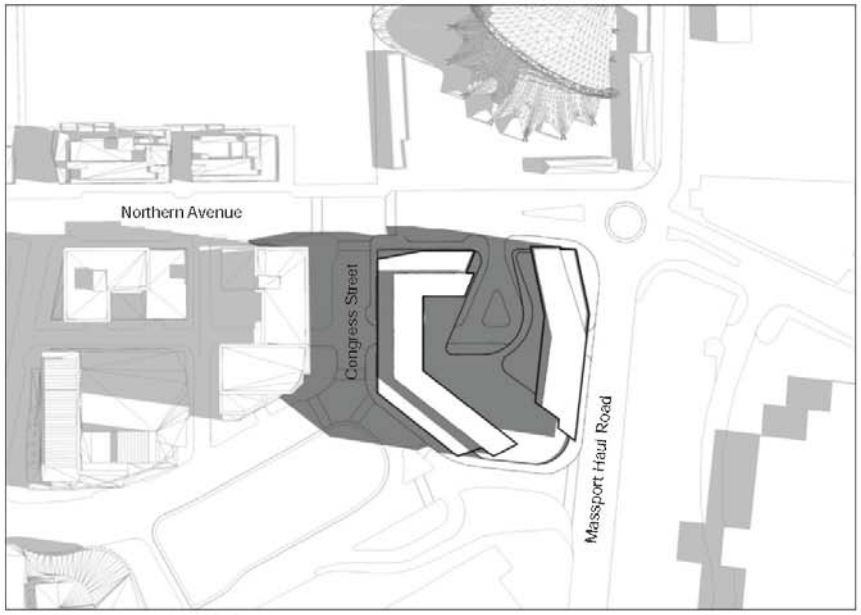
At 3:00 PM new shadow from the Project will be cast northward over Northern Avenue and the adjacent Bank of America Pavilion parcel. The urban court, courtyard terrace and majority of the Massport Haul Road sidewalk will also be in shadow. The Congress Street, Starboard Lane and Silver Line Way streets and crosswalks will receive sun with minimal shadows along the sidewalks directly adjacent to the Project.

3.3.5 Conclusions

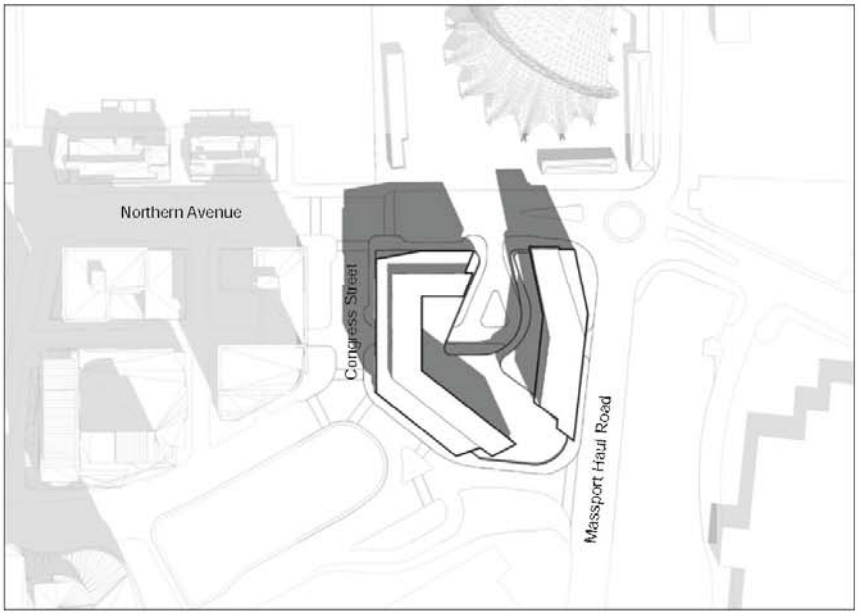
The BRA shadow analysis presented herein illustrates the shadow impacts from the Project during 14 time periods throughout the year. Because the existing site currently has no structures on it, new shadows from the Project are inevitable; however, the overall shadow impacts from the proposed Project are minor. The proposed development has an approximately 7% reduction in net new shadow when compared with the approved baseline massing as described in the *Northern Avenue WDP*. The baseline massing contemplated therein was a 140-foot tall office building on Parcel K-1 and a 100-foot tall parking garage on Parcel K-2. Within the Chapter 91 boundary, the 140-foot tall office stepped down to 130 feet, with no openings in the along Northern Avenue and no building setbacks.

Of the 14 time periods studied, only at 9:00 AM and 12:00 PM on December 21 were new shadows cast onto any portion of the Harborwalk, which is consistent with the shadow impacts from the approved baseline condition.

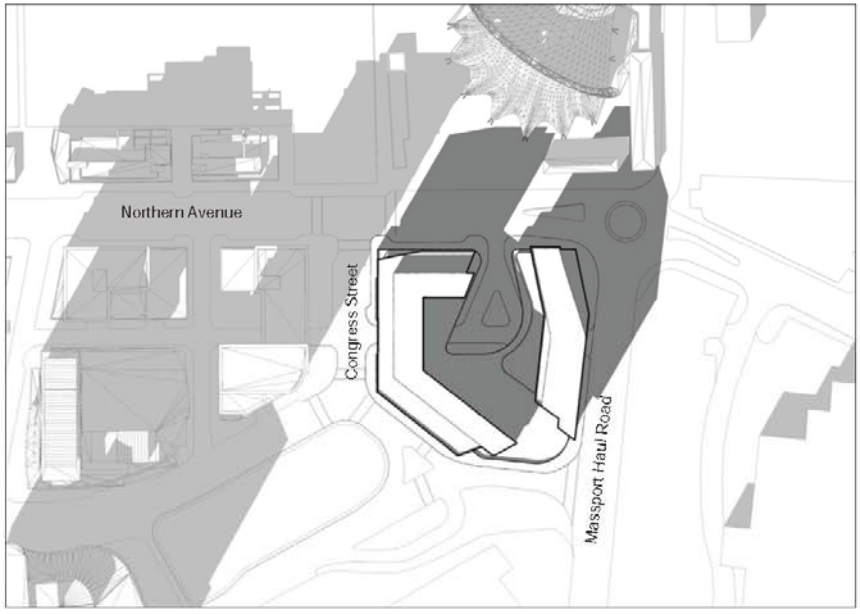
It is of note that the shadow impacts to the north, onto portions of Northern Avenue, and to the west, onto the Congress Street sidewalks, are to be expected with any development of Parcel K. The Proponent has minimized the shadow impacts to the north with the creation of an urban court between the two proposed buildings which allows for direct sunlight onto portions of the Northern Avenue sidewalks and streetscape.



MARCH 21 9AM EST



MARCH 21 12PM EST



MARCH 21 3PM EST

Existing Shadow New Shadow

Parcel K Boston, Massachusetts

Source: Arrowstreet

Epsilon ASSOCIATES INC.

Figure 3.3-1

Shadow Analysis, March 21 – Proposed Massing



Parcel K Boston, Massachusetts

Source: Arrowstreet

Epsilon ASSOCIATES INC.

Figure 3.3-2

Shadow Analysis, June 21 – Proposed Massing



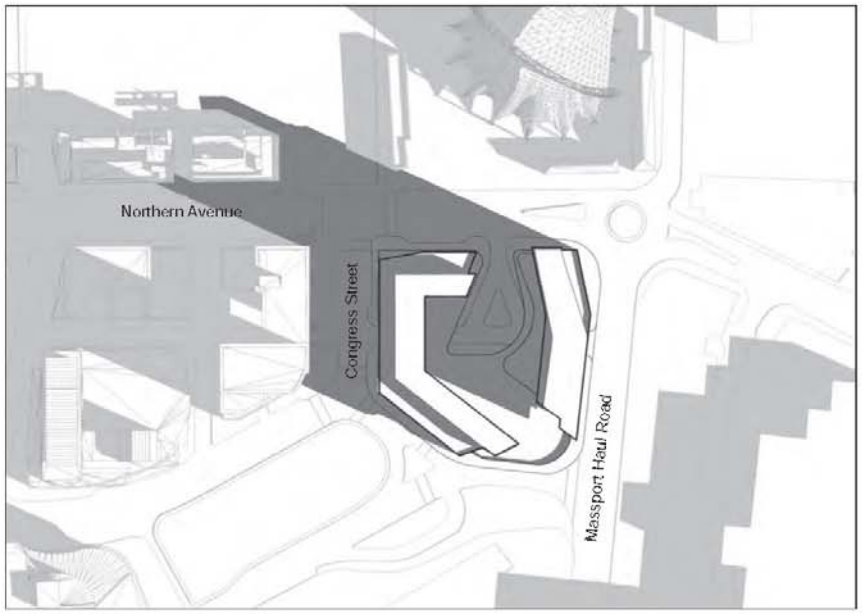
Parcel K Boston, Massachusetts

Source: Arrowstreet

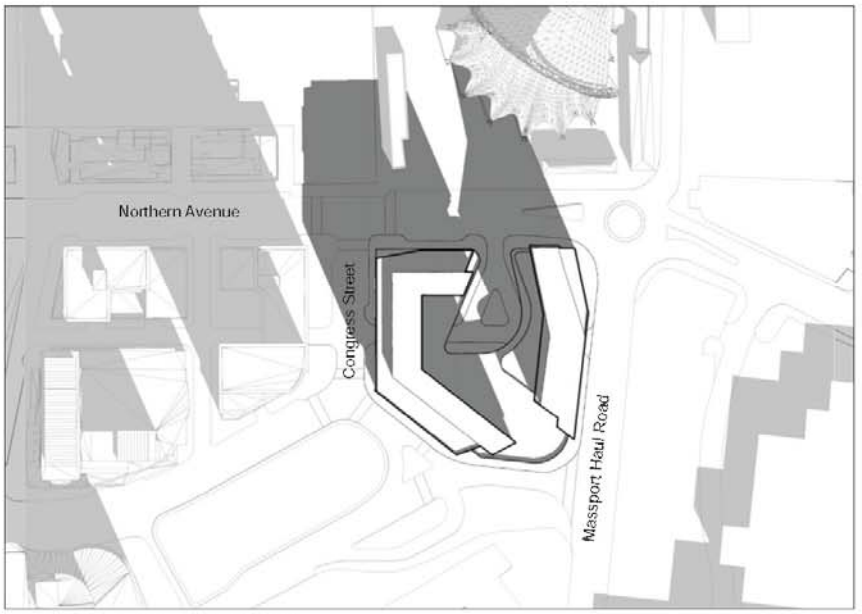
Epsilon ASSOCIATES INC.

Figure 3.3-3

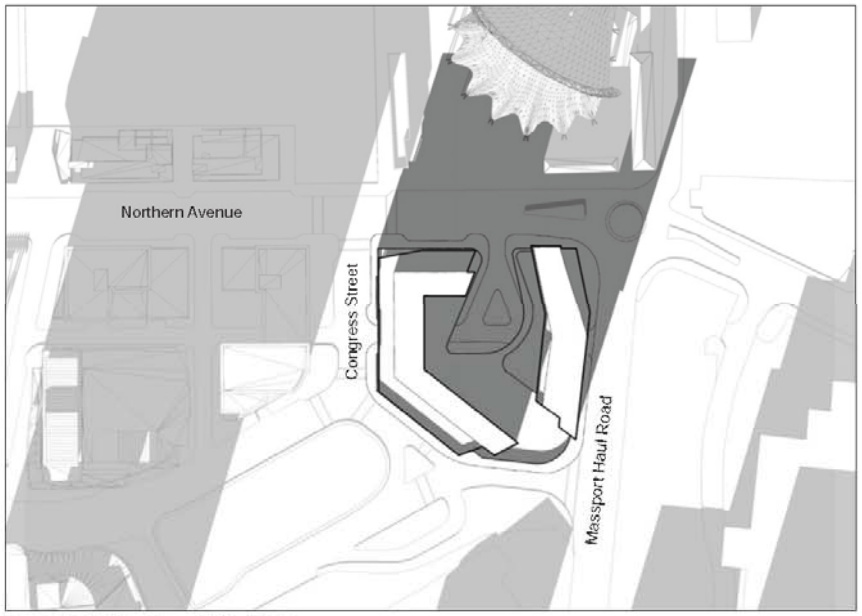
Shadow Analysis, September 21 – Proposed Massing



DECEMBER 21 9AM EST



DECEMBER 21 12PM EST



DECEMBER 21 3PM EST

Existing Shadow New Shadow

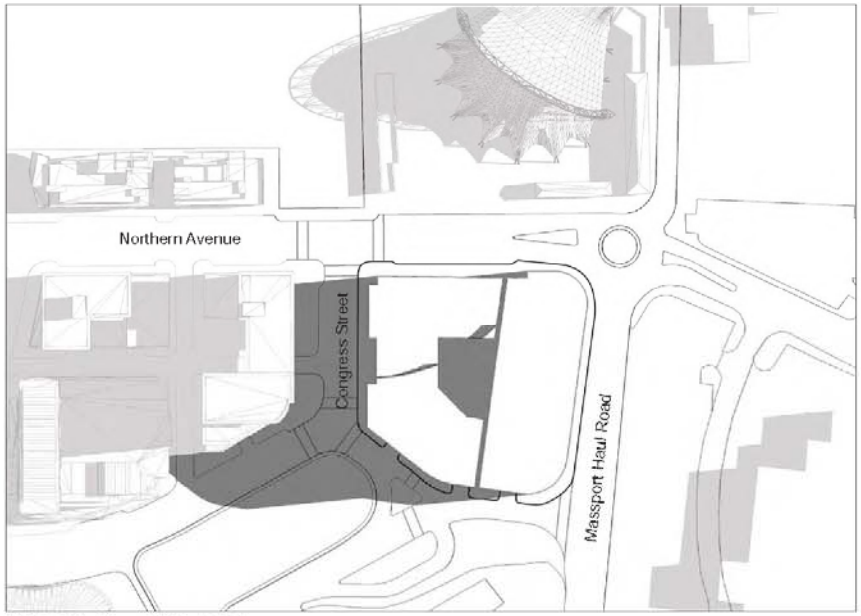
Parcel K Boston, Massachusetts

Source: Arrowstreet

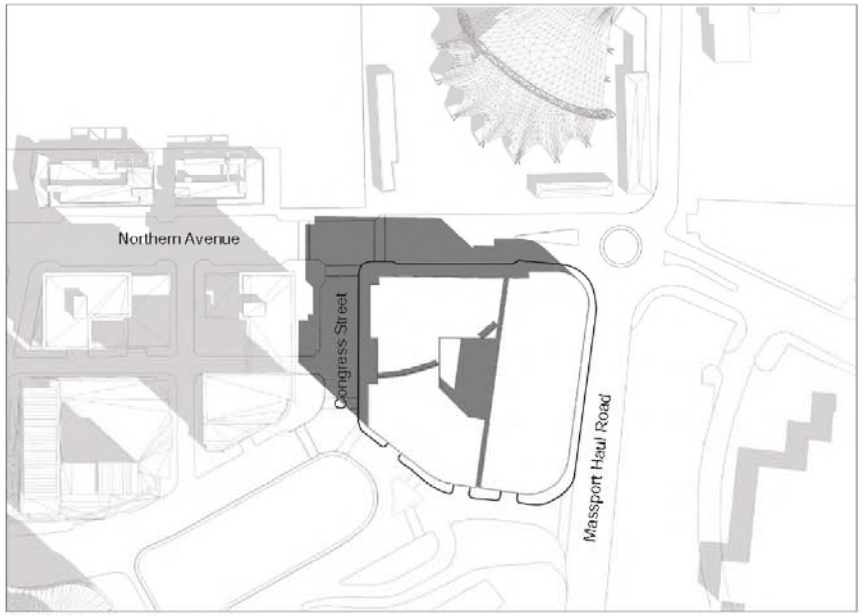
Epsilon ASSOCIATES INC.

Figure 3.3-4

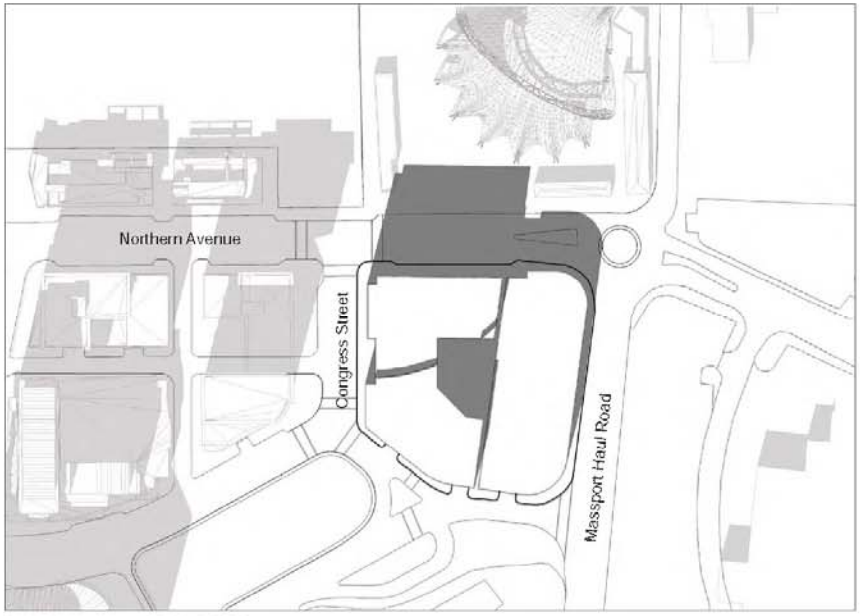
Shadow Analysis, December 21 – Proposed Massing



MARCH 21 9AM EST



MARCH 21 12PM EST



MARCH 21 3PM EST

Existing Shadow New Shadow

Parcel K Boston, Massachusetts

Source: Arrowstreet

Epsilon ASSOCIATES INC.

Figure 3.3-5

Shadow Analysis, March 21 – Baseline Massing



Parcel K Boston, Massachusetts

Source: Arrowstreet

Epsilon ASSOCIATES INC.

Figure 3.3-6

Shadow Analysis, June 21 – Baseline Massing



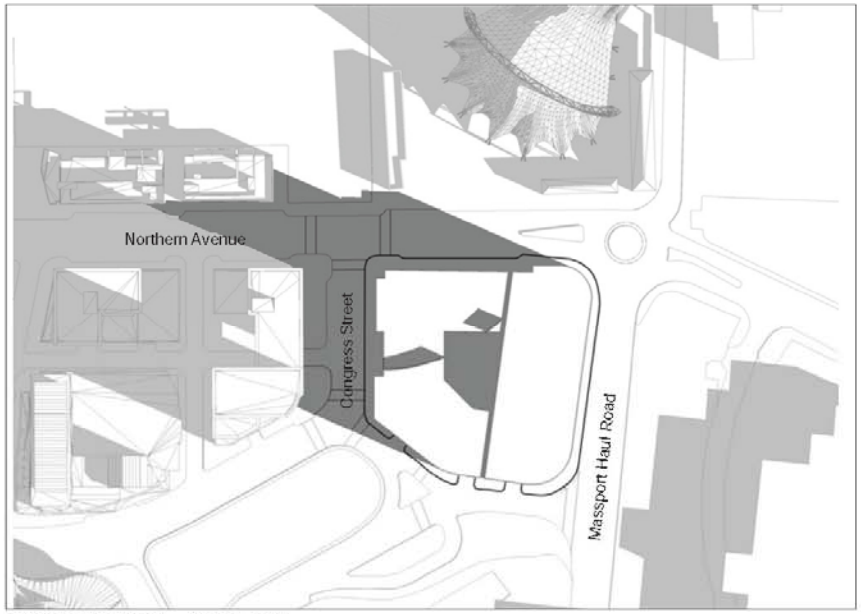
Parcel K Boston, Massachusetts

Source: Arrowstreet

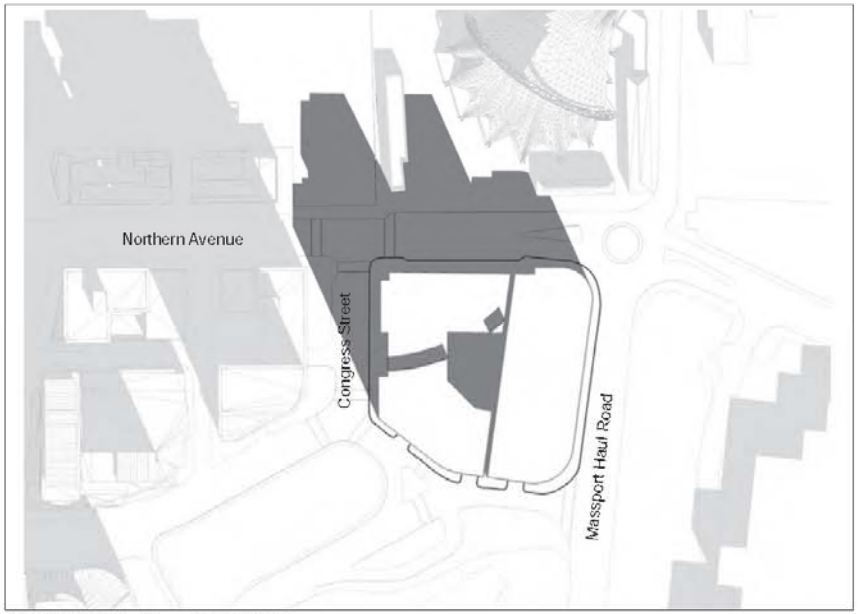
Epsilon ASSOCIATES INC.

Figure 3.3-7

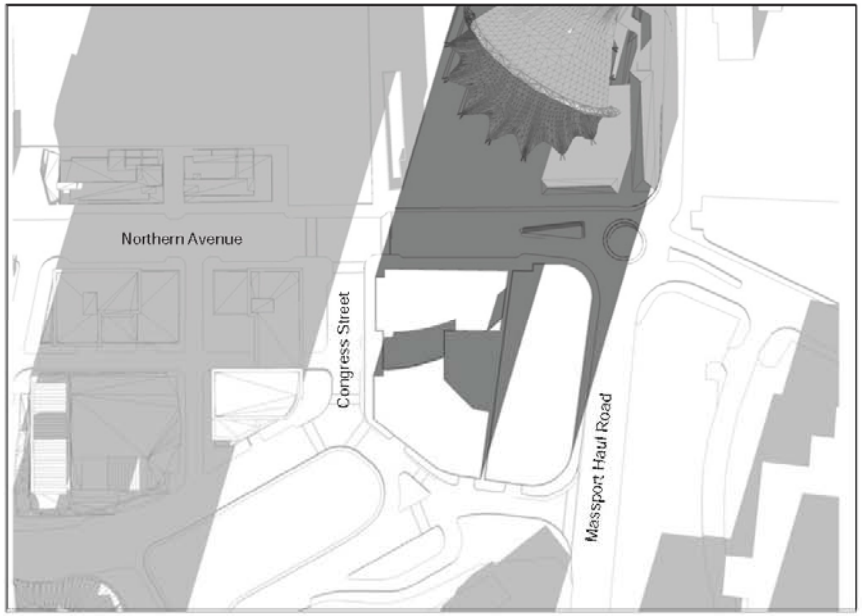
Shadow Analysis, September 21 – Baseline Massing



DECEMBER 21 9AM EST



DECEMBER 21 12PM EST



DECEMBER 21 3PM EST

Existing Shadow New Shadow

Parcel K Boston, Massachusetts

Source: Arrowstreet

Epsilon ASSOCIATES INC.

Figure 3.3-8

Shadow Analysis, December 21 – Baseline Massing

3.4 Daylight Analysis

A daylight analysis was performed using the Boston Redevelopment Authority Daylight Analysis (BRADA) computer program.[4] The purpose of this analysis is to estimate the extent to which a proposed Project will affect the amount of daylight reaching the streets and the pedestrian areas adjacent to the Project site. As is typically required by the BRA, the daylight analysis for the Project considers existing and proposed daylight conditions as well as those of the surrounding area.

The existing site is occupied by a surface parking lot, and thus has a zero percent daylight obstruction value on all sides. Although the Project will result in daylight obstruction, the resulting condition will be similar to nearby areas and typical of urban areas.

3.4.1 Methodology

As indicated above, the daylight analysis was performed using the BRADA computer program. This program measures the percentage of sky-dome that is obstructed by a project and is a useful tool in evaluating the net change in obstruction from existing to build conditions at a specific site.

Using BRADA, a silhouette view of the building is taken at ground level from the middle of the adjacent city streets or pedestrian ways centered on the Project. The façade of the building facing the viewpoint, including heights, setbacks, corners and other features, is plotted onto a base map using lateral and elevation angles. The two-dimensional base map generated by BRADA represents a figure of the building in the "sky dome" from the viewpoint chosen. Due to the constraints of the BRADA program, the setbacks of the building may be simplified or the building may be divided into sections in some cases.

The BRADA program calculates the percentage of daylight that will be obstructed on a scale of zero percent to 100 percent based on the width of the view, the distance between the viewpoint and the building, and the massing and setbacks incorporated into the design of the building; the lower the number, the lower the percentage of obstruction of daylight from any given viewpoint.

The daylight analysis presented herein compares three conditions:

- Existing conditions;
- Proposed conditions; and
- The context of the area.

---

[4] Method developed by Harvey Bryan and Susan Stuebing, computer program developed by Ronald Fergle, Massachusetts Institute of Technology, Cambridge, MA, September 1984.

Viewpoints were chosen from the three public ways surrounding the Project site: Northern Avenue (Viewpoint 1), Congress Street (Viewpoint 2), and Massport Haul Road (Viewpoint 3). The two roads abutting the Project site to the southwest (Starboard Street and Silver Line Way) are designated for the MBTA Silver Line and are not anticipated to experience a high level of pedestrian activity. Additionally, this study considered area context points to provide a basis of comparison to existing conditions in the surrounding area. These viewpoints were taken along Congress Street (AC1) and Northern Avenue (AC2, AC3, and AC4). The Project site viewpoints and area context viewpoints are illustrated on Figure 3.4-1.

3.4.2 Daylight Analysis Results

The results for each viewpoint under each condition are summarized in Table 3.4-1 and described in the following sections. The BRADA results for the three Project site viewpoints are illustrated on Figures 3.4-2 and 3.4-3, while the BRADA results for the four site context viewpoints are illustrated on Figures 3.4-4 and 3.4-5.

Table 3.4-1 Daylight Obstruction Values

Viewpoint Locations		Existing	Proposed
Viewpoint 1	Northern Avenue looking southwest at the Project site	0%	53.8%
Viewpoint 2	Congress Street looking southeast at the Project site	0%	80.7%
Viewpoint 3	Massport Haul Road looking northwest at the Project site	0%	84.3%
Area Context Points			
AC1	Congress Street looking at the 1 Park Lane Seaport Apartments building		65.4%
AC2	Northern Avenue looking at 225 Northern Avenue		84.2%
AC3	Northern Avenue looking at 1 Park Lane Seaport Apartments building		77.2%
AC4	Northern Avenue looking at 250 Northern Avenue (Liberty Wharf)		38.8%

3.4.2.1 Existing Conditions

The Project site is currently occupied by a paved parking lot. Because no structures stand on the site, existing daylight obstruction is zero percent from each of the three site Viewpoints.

3.4.2.2 Northern Avenue – Viewpoint 1

Northern Avenue runs along the northeastern edge of the Project site. Viewpoint 1 was taken from the center of Northern Avenue, looking southwest towards the Project site. The daylight analysis demonstrates that the proposed Project will result in an increase in daylight obstruction to 53.8 percent. This daylight obstruction value is lower than for other viewpoints because of the large opening between the two site buildings that leads to the urban court and courtyard terrace in the middle of the site.

3.4.2.3 Congress Street – Viewpoint 2

Congress Street runs along the northwestern edge of the Project site. Viewpoint 2 was taken from the center of Congress Street, looking southeast towards the Project site. The Project building will increase this daylight obstruction value from this viewpoint to 80.7 percent. This daylight obstruction value is similar to the daylight obstruction values in the surrounding area, as discussed in Section 3.4.2.5, below.

3.4.2.4 Massport Haul Road – Viewpoint 3

Massport Haul Road runs along the southeastern edge of the Project site. Viewpoint 3 was taken from the center of Massport Haul Road, looking northwest toward the Project site. The Project building will increase this daylight obstruction value to 84.3 percent at this location. This daylight obstruction value is similar to those found in the surrounding area.

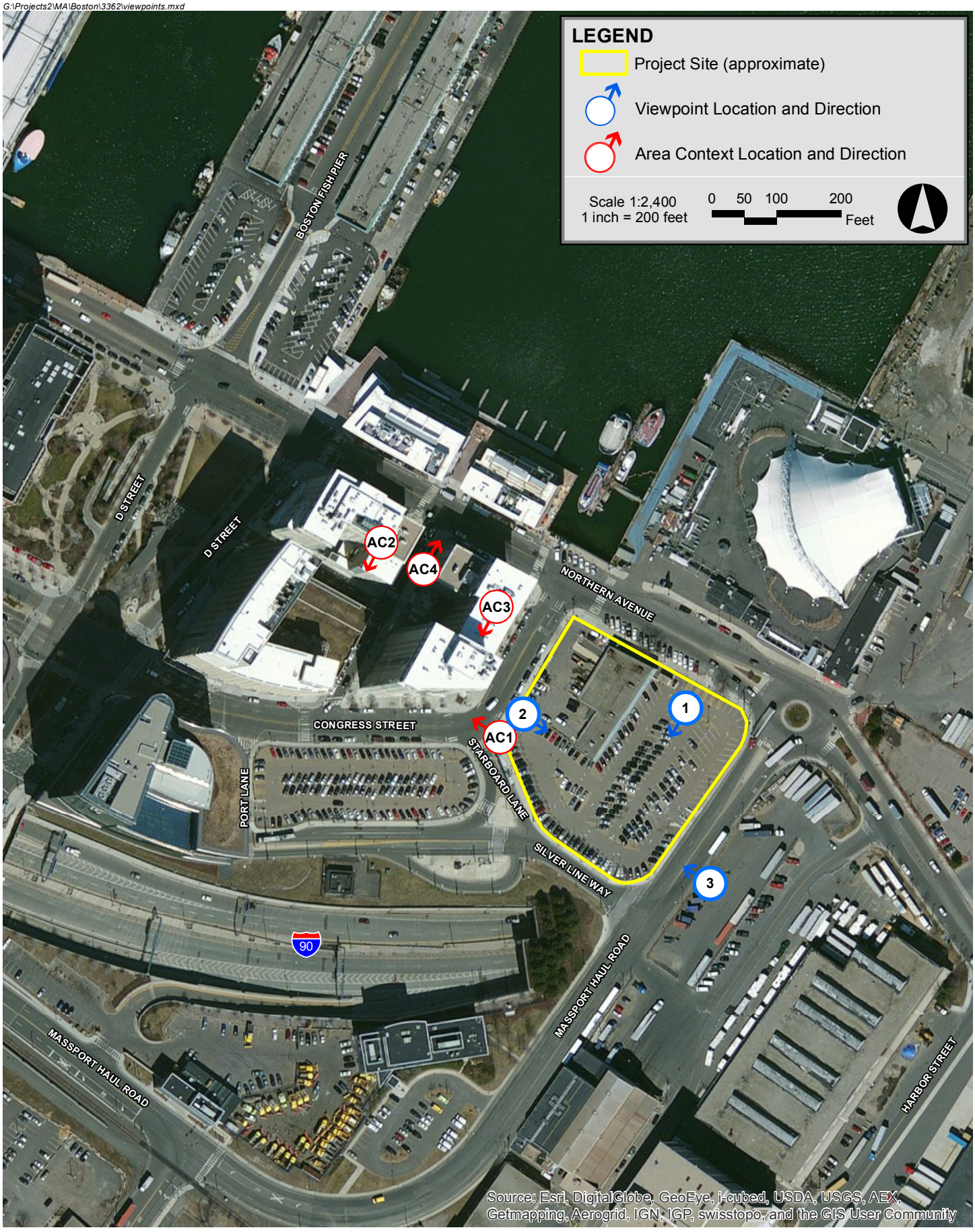
3.4.2.5 Area Context

The Project area is in transition with some tall buildings built within the last 15 years near the Project site, a number of large projects proposed, including Seaport Square, and an industrial and port area to the east. To evaluate general daylight conditions in the area, the analysis included two area context viewpoints. From Congress Street, the 1 Park Lane building (AC1) has a daylight obstruction value of 65.4 percent. The building at 225 Northern Avenue (AC2) has an obstruction value of 84.2 percent from the center of Northern Avenue. The 1 Park Lane Seaport Apartments building viewed from the center Northern Avenue (AC3) has an obstruction value of 77.2 percent. The buildings at 250 Northern Avenue, Liberty Wharf (AC4), from the center of Northern Avenue, have an obstruction value of 38.8 percent.

3.4.3 Conclusions

The BRADA daylight analysis conducted for the Project describes existing and proposed daylight obstruction conditions at the Project site and in the surrounding area. The results of the BRADA analysis indicate that daylight obstruction will increase due to the fact that the existing site is currently a surface parking lot that contains no structures. Northern Avenue is anticipated to see the most pedestrian activity, especially considering the

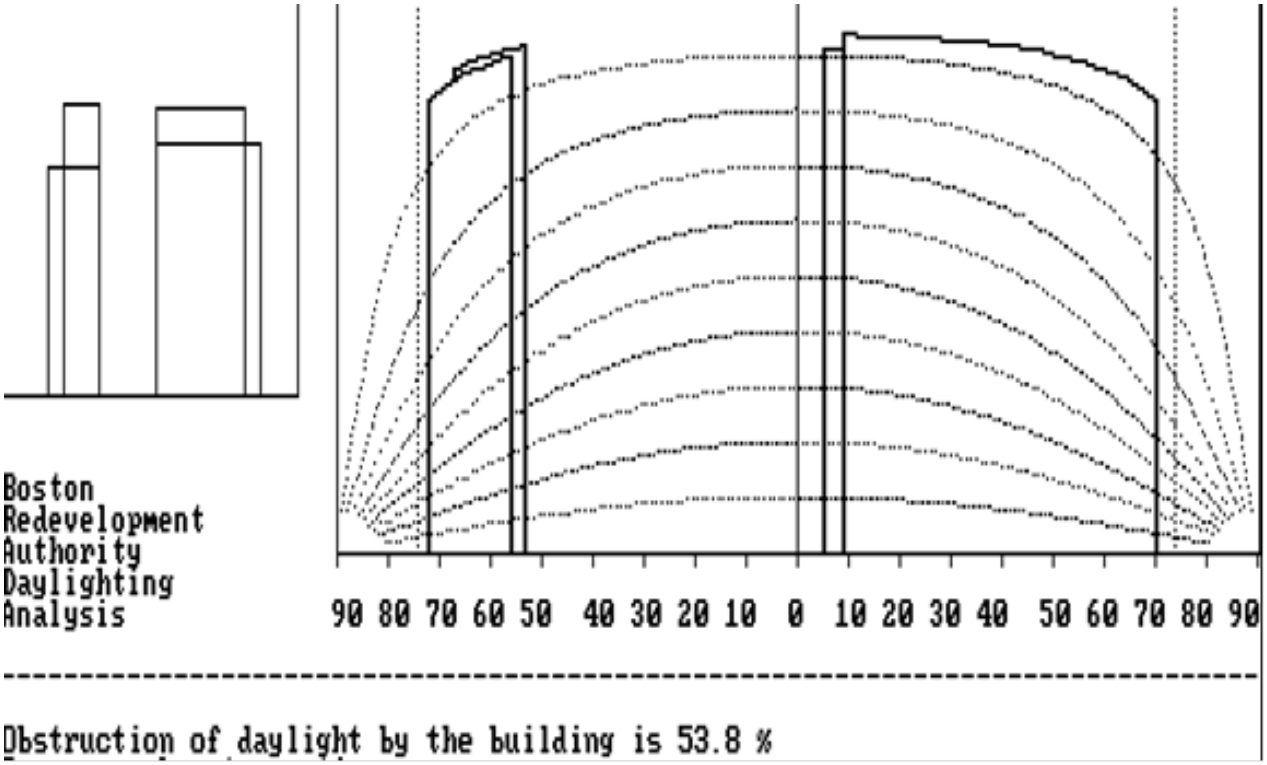
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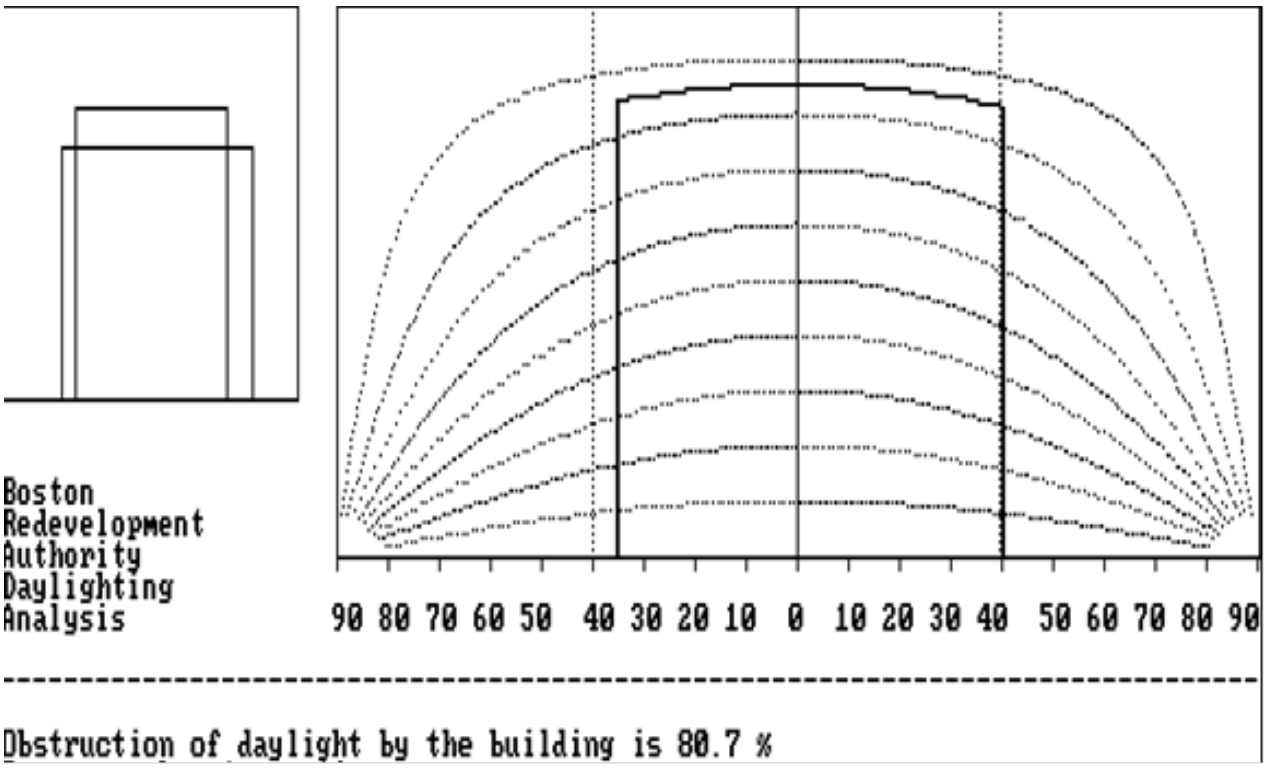
Parcel K Boston, Massachusetts

Epsilon ASSOCIATES INC.

Figure 3.4-1
Daylight Analysis: Viewpoint Locations



Viewpoint 1: Proposed Conditions: Northern Avenue Looking Southwest at the Project Site

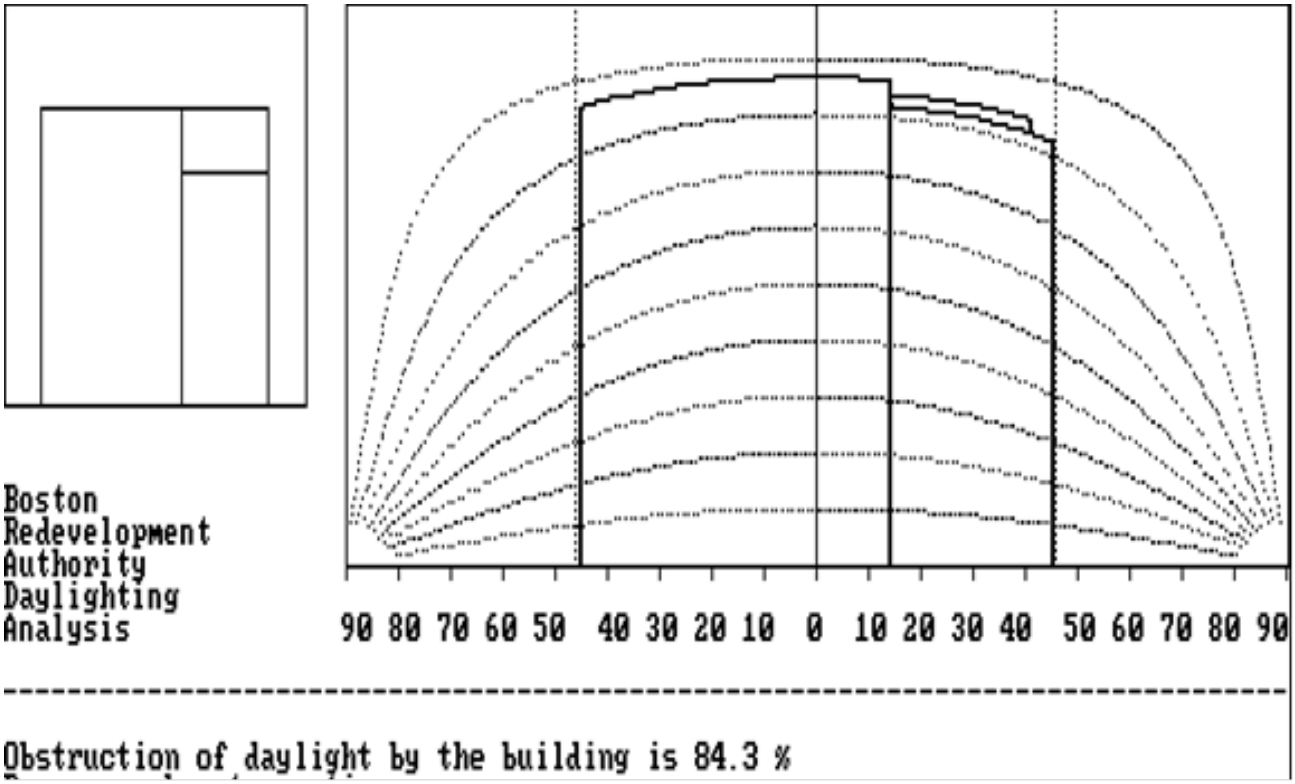


Viewpoint 2: Proposed Conditions: Congress Street Looking Southeast at the Project Site

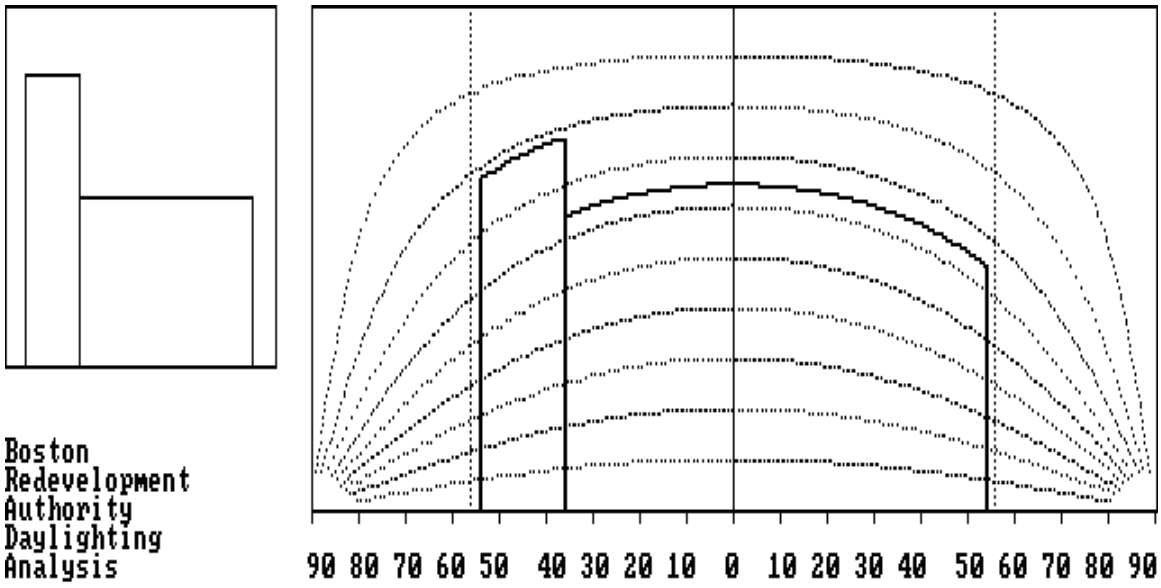
Parcel K Boston, Massachusetts

Epsilon ASSOCIATES INC.

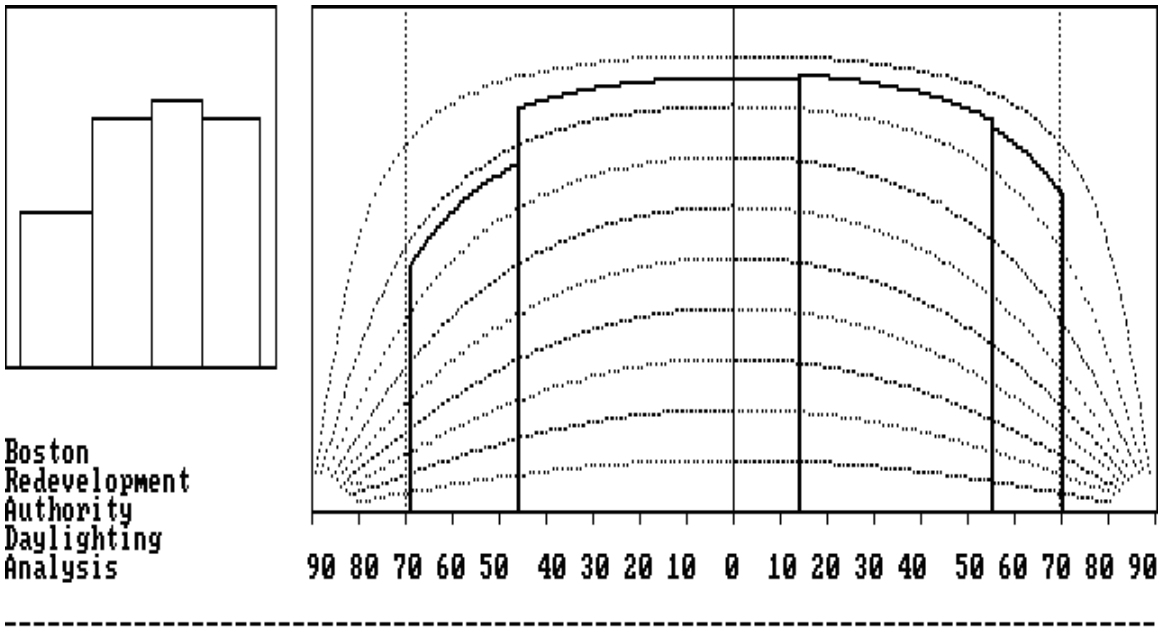
Figure 3.4-2
Daylight Analysis: Viewpoints 1 and 2



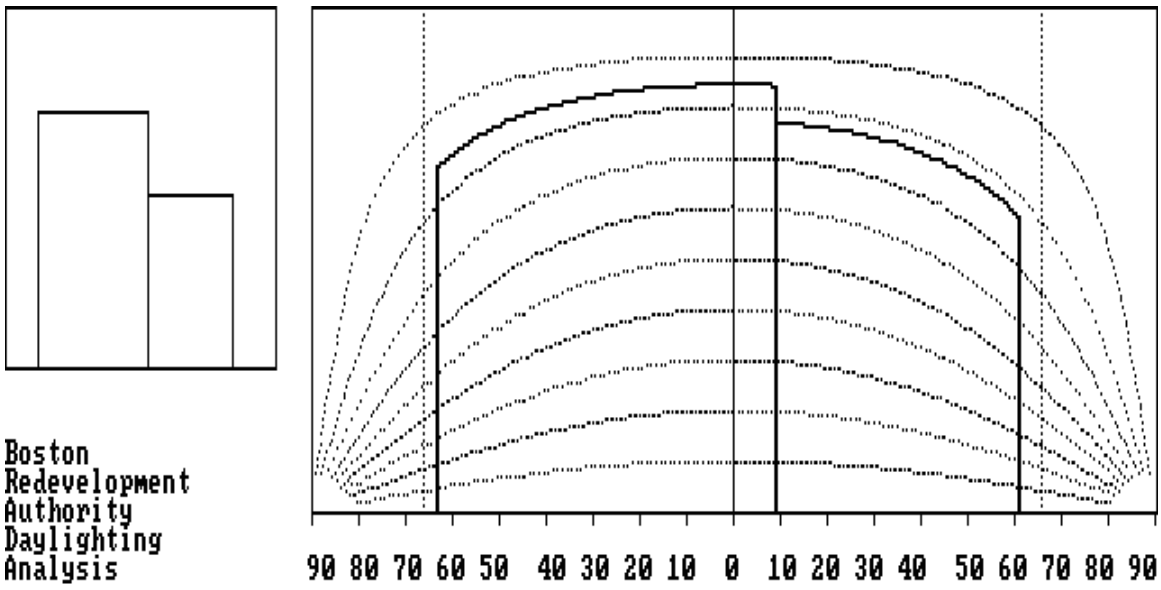
Viewpoint 3: Proposed Conditions: Haul Road Looking Northwest at the Project Site



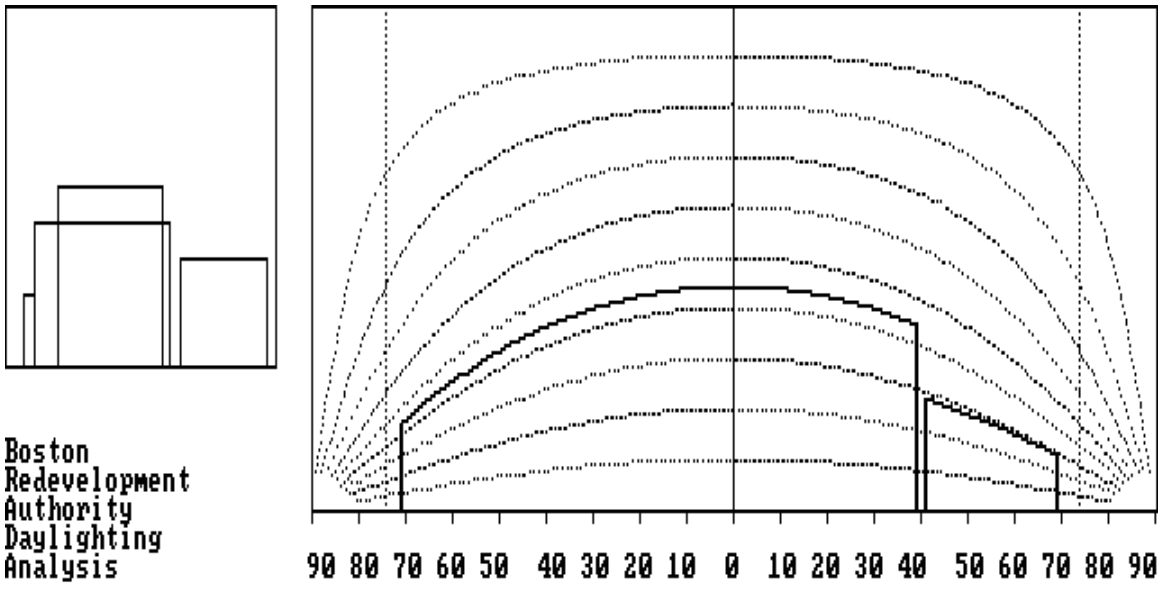
AC1: Congress Street Looking at 1 Park Lane



AC2: Northern Avenue Looking at 225 Northern Avenue



AC3: Northern Avenue Looking at 1 Park Lane



AC4: Northern Avenue Looking at 250 Northern Avenue (Liberty Wharf)

proposed open leading to the urban court and courtyard terrace at the center of the Project site. The Project's daylight obstruction from Northern Avenue will be less than viewpoints from other locations around the building and less than viewpoints of portions of the surrounding area. Overall, the daylight obstruction values related to the Project will be similar to those found in the surrounding area, and typical of urban areas.

3.5 Solar Glare

The Proposed Project will incorporate low-E, high performance glass, that is non-reflective and which reduces heat loads in warm weather and lowers heat loss during cool weather. Consequently, the Proponent does not anticipate the creation of either an adverse solar glare impact or any solar heat buildup in nearby buildings to be caused by window reflection.

The façade materials for the proposed buildings have not yet been finalized. The Proponent will, however, demonstrate during further design review that the materials selected will not create a visual nuisance and/or a hazard to motorists, boaters, or pilots (as it interferes with vision and concentration), and will employ mitigation measures to eliminate any adverse reflective glare should it be necessary.

3.6 Air Quality Analyses

A series of air quality analyses were conducted in order to determine the impact of emissions from both mobile and stationary sources associated with the Project. These included a mesoscale analysis, a microscale analysis and a stationary source analysis.

Mesoscale analyses are typically performed to determine whether and to what extent a project will increase the amount of ozone precursors in the area, as well as to determine if the project is consistent with the Massachusetts State Implementation Plan (SIP). Microscale analyses are typically performed to evaluate the potential air quality impacts of carbon monoxide (CO) due to traffic flow around a project area. Finally, for stationary sources (i.e. combustion source stacks, and garage vents), United States Environmental Protection Agency (EPA) approved air dispersion models are used to estimate project-generated ambient concentrations of nitrogen oxides (NOx), particulate matter (PM-10 and PM-2.5), and sulfur dioxide (SO_2), in addition to CO.

3.6.1 National Ambient Air Quality Standards and Background Concentrations

Background air quality concentrations and federal air quality standards were utilized to conduct the above air quality impact analyses. Specifically, the emissions associated with the Project were added to monitored background values and compared to the Federal National Ambient Air Quality Standards (NAAQS). These standards were developed by US Environmental Protection Agency (EPA) to protect the human health against adverse health effects with a margin of safety. The modeling methodologies were developed in

accordance with the latest Massachusetts Department of Environmental Protection (MassDEP) modeling policies and Federal modeling guidelines.[5] The following sections outline the NAAQS standards and detail the sources of background air quality data.

3.6.1.1 National Ambient Air Quality Standards

The 1970 Clean Air Act was enacted by the US Congress to protect the health and welfare of the public from the adverse effects of air pollution. As required by the Clean Air Act, EPA promulgated National Ambient Air Quality Standards (NAAQS) for the following criteria pollutants: nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM) (PM10 and PM2.5), carbon monoxide (CO), ozone (O_3), and lead (Pb). The NAAQS are listed in Table 3.6-1. Massachusetts Ambient Air Quality Standards (MAAQS) are typically identical to NAAQS.

NAAQS specify concentration levels for various averaging times and include both "primary" and "secondary" standards. Primary standards are intended to protect human health, whereas secondary standards are intended to protect public welfare from any known or anticipated adverse effects associated with the presence of air pollutants, such as damage to vegetation. The more stringent of the primary or secondary standards were applied when comparing to the modeling results for this Project.

A new one-hour NO_2 standard was promulgated on January 22, 2010 to protect public health, including the health of sensitive populations (e.g., people with asthma, children, and the elderly). The final rule for the new hourly NO_2 NAAQS was published in the Federal Register on February 9, 2010 and became effective on April 12, 2010. The form of this standard is the three-year average of the 98th percentile of the daily maximum one-hour concentrations.

Similarly, a new one-hour SO_2 standard was promulgated on June 2, 2010 to protect public health, including the health of sensitive populations (e.g., people with asthma, children, and the elderly). The final rule for the new hourly SO_2 NAAQS was published in the Federal Register on June 22, 2010 and became effective on August 23, 2010. The form of this standard is the three-year average of the 99th percentile of the daily maximum one-hour concentrations.

The inhalable particulate (PM10) NAAQS were promulgated on July 1, 1987 at the federal level with the intent of replacing the existing standards limiting ambient levels of Total Suspended Particulate (TSP). In 2006, the annual PM10 standard was revoked. However it remains codified in 310 CMR 6.00. EPA also promulgated a Fine Particulate (PM2.5)

[5] 40 CFR 51 Appendix W, Guideline on Air Quality Models, 70 FR 68228, Nov. 9, 2005

NAAQS, effective December 2006, with an annual standard of 15 $\mu g/m^3$ and the 24-hour standard of 35 micrograms per cubic meter ($\mu g/m^3$). The annual standard has since been strengthened to 12 $\mu g/m^3$ (in 2012).

The NAAQS also reflect various durations of exposure. The short-term periods (24 hours or less) refer to exposure levels not to be exceeded more than once a year. Long-term periods refer to limits that cannot be exceeded for exposure averaged over three months or longer.

Table 3.6-1 National Ambient Air Quality Standards

Pollutant	*Averaging Period*	*National Ambient Air Quality Standards and Massachusetts Ambient Air Quality Standards (micrograms per cubic meter)*	
		Primary	*Secondary*
NO_2	Annual [1]	100 (0.053 ppm)	Same
	1-hour [7]	188 (0.1 ppm)	None
SO_2	Annual [1]	80 (0.03)	None
	24-hour [2]	365 (0.14 ppm)	None
	3-hour [2]	None	1,300 (500 ppb)
	1-hour [7]	196 (o.075 ppm)	None
PM10 [6]	Annual	50	Same
	24-hour [3]	150	Same
PM2.5	Annual [4]	15	Same
	24-hour [5]	35	Same
CO	8-hour [2]	10,000 (9 ppm)	Same
	1-hour [2]	40,000 (35 ppm)	Same
Ozone	8-hour [3]	159 (0.075)	Same
Pb	3-month [1]	1.5	Same

Notes:

[1] Not to be exceeded

[2] Not to be exceeded more than once per year.

[3] Not to be exceeded more than an average of one day per year over three years.

[4] Not to be exceeded by the arithmetic average of the annual arithmetic averages from 3 successive years.

[5] Not to be exceeded based on the 98th percentile of data collection.

[6] Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, EPA revoked the annual PM10 standard in 2006 (effective December 17, 2006). However, the annual standard remains codified in 310 CMR 6.00

[7] Not to be exceeded. Based on the 3-yr average of the 98th (NO2) or 99th (SO2) percentile of the daily maximum 1-hour concentrations.

Source: 40 CFR 50 and 310 CMR 6.00

3.6.1.2 Background Concentrations

To estimate background pollutant levels representative of the area, the most recent air quality monitor data reported by the MassDEP in their Annual Air Quality Reports was obtained for 2007 to 2012.

The Clean Air Act allows for one exceedance per year of the CO and SO_2 short-term NAAQS per year. The highest second-high accounts for the one exceedance. Annual NAAQS are never to be exceeded. The 24-hour PM-10 standard is not to be exceeded more than once per year on average over three years. To attain the 24-hour PM-2.5 standard, the three-year average of the 98th percentile of 24-hour concentrations must not exceed 35 $\mu g/m^3$. For annual PM-2.5 averages, the average of the highest yearly observations was used as the background concentration. A new 1-hr NO_2 standard was recently promulgated. To attain this standard, the 3-year average of the 98th percentile of the maximum daily 1-hour concentrations must not exceed 188 $\mu g/m^3$.

Background concentrations were determined from the closest available monitoring stations to the proposed development. All pollutants are not monitored at every station, so data from multiple locations are necessary. The closest monitors are at Kenmore Square in Boston, One City Square in Boston, and 174 North Street in Boston. A summary of the background air quality concentrations are presented in Table 3.6-2.

Table 3.6-2 Observed Ambient Air Quality Concentrations and Selected Background Levels

Pollutant	Averaging Time	2010	2011	2012	Background Concentration ($\mu g/m^3$)	Location
SO_2 [1][7][8]	1-Hour	69.9	127.4	41.1	127.4	Kenmore Sq., Boston
	3-Hour	62.4	49.4	49.4	88.4	Kenmore Sq., Boston
	24-Hour	21.8	31.5	15.6	31.5	Kenmore Sq., Boston
	Annual	5.8	6.1	4.9	6.1	Kenmore Sq., Boston
PM-10	24-Hour	32.0	39.0	41.0	41.0	One City Sq. Boston
	Annual	15.1	15.9	16.8	16.8	One City Sq. Boston
PM-2.5	24-Hour [4]	24.8	23.9	20.9	23.2	174 North St., Boston
	Annual [5]	10.0	10.3	9.5	9.9	174 North St., Boston
NO_2 [3]	1-Hour [6]	119.4	140.8	114.7	140.8	Kenmore Sq., Boston
	Annual	35.9	38.3	35.9	38.3	Kenmore Sq., Boston
CO [2]	1-Hour	2166.0	1710.0	1596	2166.0	Kenmore Sq., Boston
	8-Hour	1710.0	1482.0	1254	1710.0	Kenmore Sq., Boston

Notes:

From 2007-2012 MassDEP Annual Data Summaries

[1] SO_2 reported in ppm or ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 2600 $\mu g/m^3$.

[2] CO reported in ppm or ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 1140 $\mu g/m^3$.

[3] NO_2 reported in ppm or ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 1880 $\mu g/m^3$.

[4] Background level for 24-hour PM-2.5 is the average concentration of the 98th percentile for three years.

[5] Background level for annual PM-2.5 is the average for three years.

[6] Maximum annual 1-hr concentrations.

[7] The 24-hour and Annual standards were revoked by EPA on June 22, 2010, Federal Register 75-119, p. 35520.

[8] The 2010 & 2011 SO_2 3-hr value is not reported. Years 2007-2009 used instead.

Air quality in the vicinity of the Project site is generally good, with all local background concentrations found to be well below the NAAQS. For use in the microscale analysis, background concentrations of CO in ppm were required. The corresponding maximum background concentrations in ppm were 1.9 ppm for 1-hour and 1.5 ppm for 8-hour CO.

3.6.2 Air Quality Modeling Methodology

The following sections describe the methodology for conducting the mesoscale, microscale and stationary source air quality modeling of the Project.

3.6.2.1 Mesoscale Analysis

A mesoscale analysis is required to ensure that the proposed Project will not adversely impact the existing State Implementation Plan (SIP), which tracks how the state intends to maintain compliance with the National Ambient Air Quality Standards (NAAQS) or plans for reductions in emissions to attain compliance in the future.

A mesoscale analysis predicts the change in regional ozone precursor emissions [oxides of nitrogen NOx0 and volatile organic compounds (VOCs)] due to the Project.

In accordance with MassDEP guidance[6], a mesoscale analysis is required for the following projects for which an ENF is filed under MEPA after May 1, 1991:

- any office project generating 3,000 or more ADT; and
- any other non-residential project generating 6,000 or more ADT.

A mesoscale analysis will be required for the following projects for which a decision on the adequacy of an EIR is issued under MEPA after May 1, 1991:

- any non-residential project generating 10,000 or more ADT.

A mesoscale analysis is required to ensure that a proposed project will not negatively impact the existing SIP. The SIP is created to track how the state intends to maintain compliance with NAAQS or to plan for future emissions reductions to attain compliance.

The analysis includes a comparison of the future Build conditions to the No-Action condition. If emissions are greater for the Build conditions, reasonable and feasible mitigation measures will be evaluated. The methodology and parameters for the mesoscale analysis follow methodology approved by MassDEP.

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6 MassDEP, Guidelines For Performing Mesoscale Analysis Of Indirect Sources, May 1991

The mesoscale analysis performed for this Project predicts the change in regional ozone precursor emissions due to the proposed redevelopment of the Project site. The total vehicle pollutant burden was estimated for the 2012 existing conditions and the No-Action and Build conditions for year 2018. The traffic conditions are described in more detail in Section 2.0 of this Expanded Project Notification Form.

The EPA's MOBILE6.2 computer program was used to estimate motor vehicle emission factors of VOC and NOx on the roadway network in the Project area. Conservatively, emission factors derived from MOBILE6.2 for VOC and NOx are based on the worst case of either wintertime or summertime conditions. Daily and yearly emission estimates were calculated using the vehicle count data, mileage between intersections, modeled signalized intersection delay times, and emission factors.

The traffic volumes provided in Section 2.0 form the basis of the mesoscale study. Approximately 15 roadway links and 7 intersections were included in the mesoscale analysis. Peak hour traffic volumes were provided by the transportation consultant. Estimates of ADT were made from the peak hour volumes assuming a 10% K-Factor. Average speeds assumed based on roadway type (30 mph for arterial roads, 20 mph for "driveways") were used for all links. Distances for the links were estimated with mapping software.

Average per-vehicle idle times were based on SYNCHRO output reports provided by the transportation consultant (see Section 2) to calculate emissions from idling vehicles. Further idling on roadway links was included assuming a one-minute per hour per vehicle idling time.

3.6.2.2 Microscale Analysis

The Proponent is required to analyze local effects of the potential increase in traffic on ambient air quality near specific intersections. The microscale analysis involves modeling of carbon monoxide (CO) emissions from vehicles idling at and traveling through both signaled and unsignalized intersections. Predicted ambient concentrations of CO for the existing, build, and no-action cases are compared with federal (and state) ambient air quality standards for CO.

The microscale analysis typically examines ground-level CO impacts due to traffic queues in the immediate vicinity of a project. CO is used in microscale studies to indicate roadway pollutant levels since it is the most abundant pollutant emitted by motor vehicles and can result in so-called "hot spot" (high concentration) locations around congested intersections. NAAQS have been established by the EPA for CO to protect the public health (known as primary standards). These standards do not allow ambient CO concentrations to exceed 35 parts per million (ppm) for a one-hour averaging period and 9 ppm for an eight-hour averaging period, more than once per year at any location. The widespread use of CO catalysts on late-model vehicles has reduced the occurrences of CO hotspots. Air quality

modeling techniques (computer simulation programs) are typically used to predict CO levels for both existing and future conditions to evaluate compliance of the roadways with the standards. The analyses followed the procedure outlined in U.S. EPA's intersection modeling guidance.[7]

The microscale analysis has been conducted using the latest versions of EPA MOBILE6.2 and CAL3QHC to estimate CO concentrations at sidewalk receptor locations.

Baseline (2012) and future year (2018) emission factor data calculated from the MOBILE6.2 model, along with traffic data, were input into the CAL3QHC program to determine CO concentrations due to traffic flowing through the selected intersections.

Existing background values of CO at the nearest monitor location at Harrison Avenue in Boston were obtained from the MassDEP. CAL3QHC results were then added to background CO values of 1.9 ppm (1-hour) and 1.5 ppm (8-hour), as provided by the MassDEP, to determine total air quality impacts due to the Project. This value was compared to the NAAQS for CO of 35 ppm (1-hour) and 9 ppm (8-hour).

Intersection Selection

The modeling guidance identifies the following steps to determine the intersections to be modeled.

- Rank the top 20 intersections by traffic volumes
- Calculate the Level of Service (LOS) for each intersection
- Rank the intersections by volume
- Rank the intersections by LOS
- Model the top three intersections based on worst LOS and the top three intersections based on the highest traffic volumes

Since only three signalized intersections were analyzed for traffic impacts (See Section 2.0), the same three intersections were analyzed for air quality impacts. The traffic volumes and LOS calculations provided in Section 2.0 form the basis of evaluating the traffic data versus the microscale thresholds.

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7 U.S. EPA, Guideline for Modeling Carbon Monoxide from Roadway Intersections; EPA-454/R-92-005, November 1992.

The following intersections were analyzed:

- #1, the intersection of Congress Street and D Street
- #1/#2, the intersections Seaport Boulevard, Northern Avenue and D Street (Northbound and Southbound)

Since Seaport Boulevard, Northern Avenue and D Street intersections are close, they were modeled together. The 2012 Existing conditions, the 2018 No Action and 2018 Build conditions were each evaluated.

Emissions Calculations (MOBILE6.2)

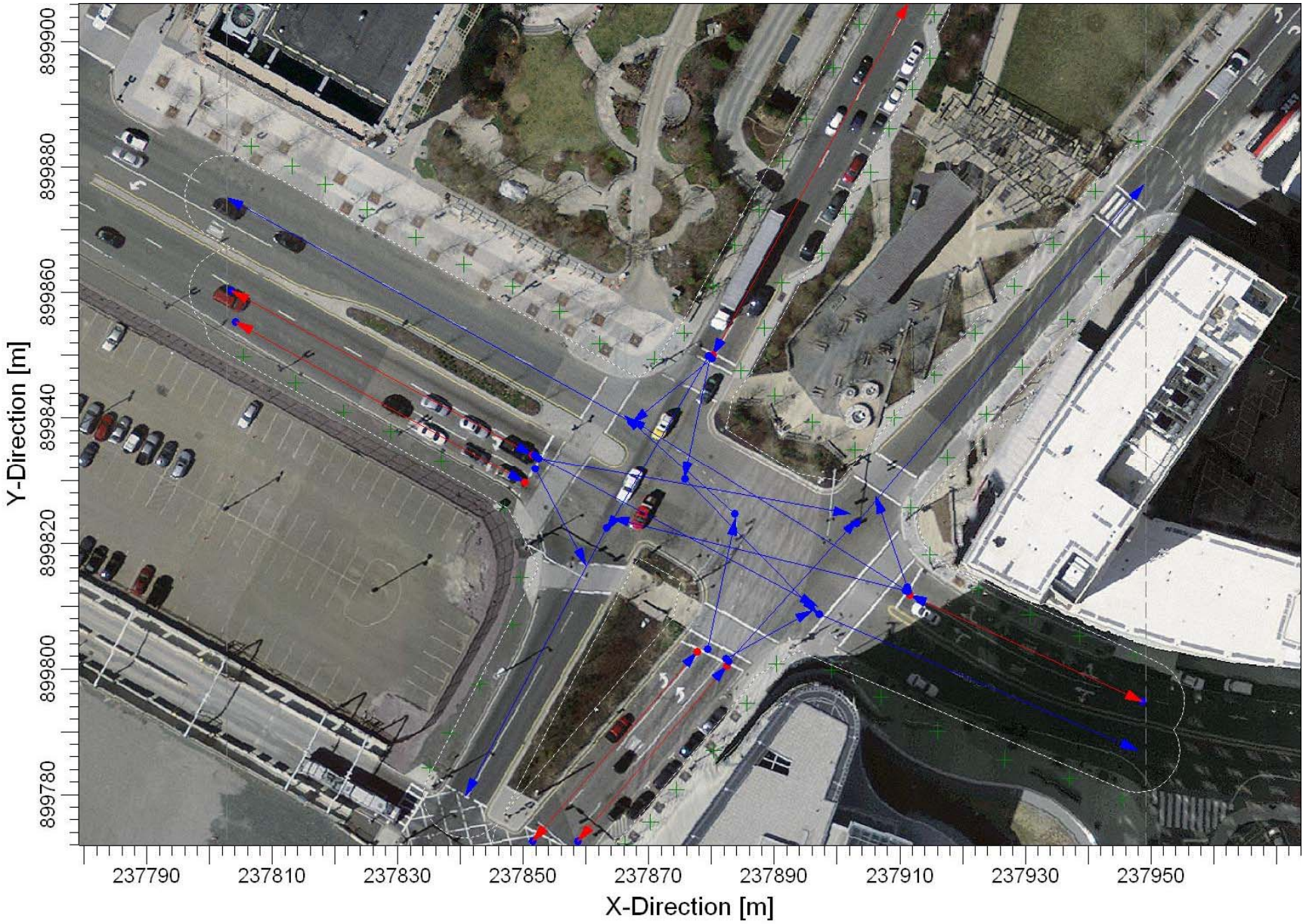
The EPA MOBILE6.2 computer program was used to estimate motor vehicle emission factors on the roadway network. Emission factors calculated by the MOBILE6.2 model are based on motor vehicle operations typical of daily periods. The Commonwealth's statewide annual Inspection and Maintenance (I&M) program was included, as well as the state specific vehicle age registration distribution. The input files for MOBILE6.2 for the existing (2012) and build year (2018) are provided by MassDEP. As is typical, minor edits to the files were necessary to allow the program to output emission factors for the various speeds used in the analyses.

The current version of MOBILE6.2 does not explicitly calculate idle emissions. However, idle emissions can be obtained from a vehicle speed of 2.5 mph. The resulting emission rate given in (grams/mile) is then multiplied by 2.5 mph to estimate idle emissions (in grams/hour). Moving emissions are calculated based on actual speeds at which free-flowing vehicles travel through the intersections. A speed of 30 mph is used for all free-flow traffic. Speeds of 10 and 15 mph were used for right (and U-turns, if necessary) and left turns, respectively.

Winter CO emission factors are typically higher than summer for CO. Therefore winter vehicular emission factors were conservatively used in the microscale analyses.

Receptors & Meteorology Inputs

Sets of up to 108 receptors were placed in the vicinity of each of the modeled intersections. Receptors extended approximately 100 to 300 feet on the sidewalks along the roadways approaching the intersection. The roadway links and receptor locations of the modeled intersections are presented in Figure 3.6-1, *Link and Receptor Locations for CAL3QHC modeling of Intersection 1* and Figure 3.6-2, *Link and Receptor Locations for CAL3QHC modeling of Intersection 2*.

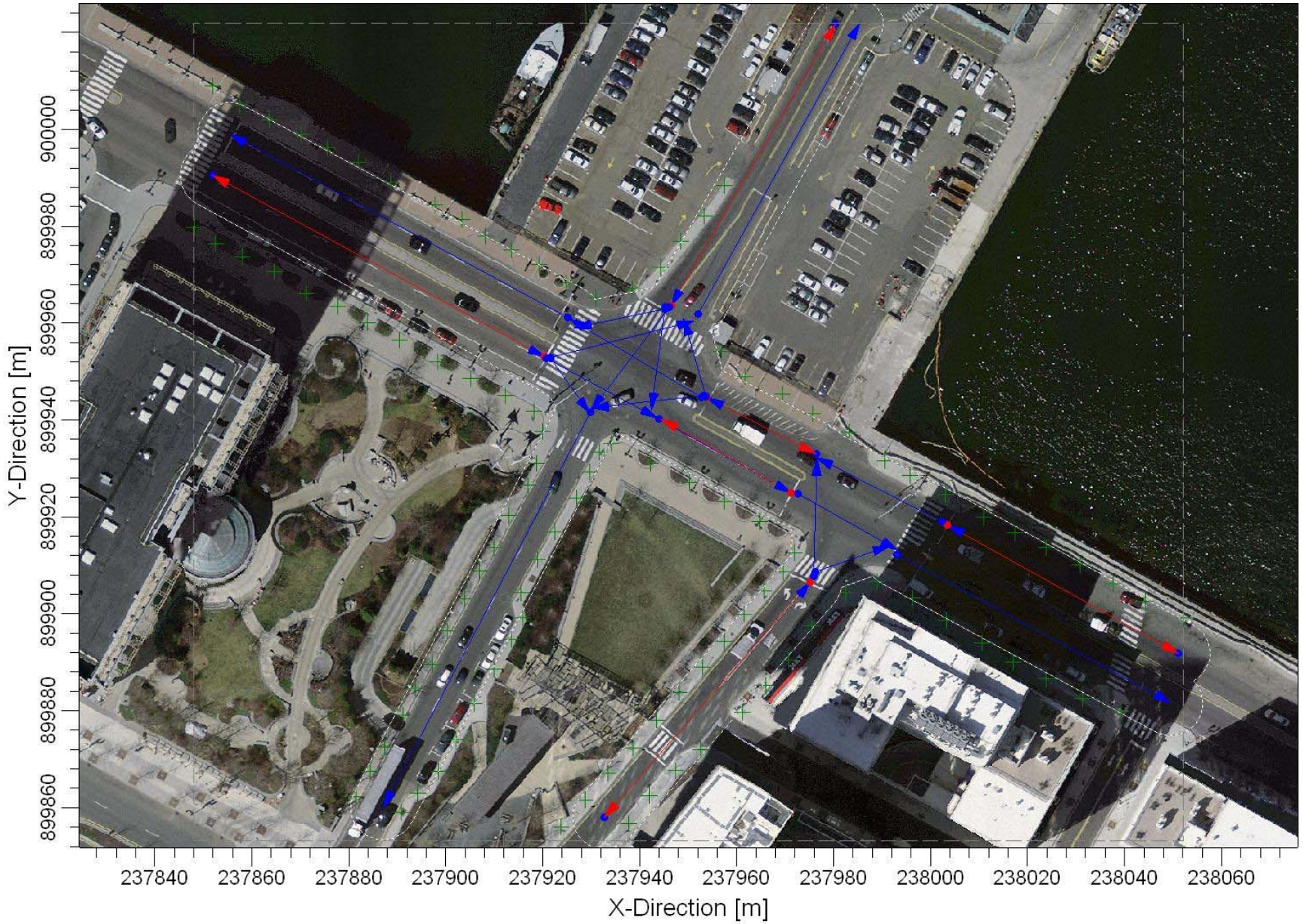


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Figure 3.6-1

Link and Receptor Locations for CAL3QHC modeling of Intersection 1: Congress & D Streets



Parcel K Boston, Massachusetts

Figure 3.6-2

Link and Receptor Locations for CAL3QHC modeling of Intersection 2: Seaport Blvd., Northern Ave., & D St.

For the CAL3QHC model, limited meteorological inputs are required. Following EPA guidance8, a wind speed of 1 m/s, neutral stability class D (4), and a mixing height of 1000 meters was used. To account for the intersection geometry, wind directions from 0 to 350 degrees, every 10 degrees were selected. A surface roughness length of 321 cm was selected for all three intersections.9

Impact Calculations (CAL3QHC)

The CAL3QHC model predicts one-hour concentrations using queue-links at intersections, worst-case meteorological conditions, and traffic input data. The one-hour concentrations were scaled by a factor of 0.7 to estimate 8-hour concentrations.[10] The CAL3QHC methodology was based on EPA CO modeling guidance. Signal timings were provided directly from the traffic modeling outputs. The CAL3QHC input parameters are described further in Appendix D, Air Quality.

3.6.2.3 Stationary Source Analysis

The most recent version of the U.S. EPA AERMOD refined dispersion model (Version 12345) was selected to predict concentrations from the stationary sources related to the Project. AERMOD is the U.S. EPA's preferred model for regulatory applications. The use of AERMOD provides the benefits of using the most current algorithms available for steady state dispersion modeling.

The AERMOD View graphical user interface (GUI) Version 8.0.5, created by Lakes Environmental, was used to facilitate model setup and post-processing of data. The AERMOD model was selected for this analysis because it:

- is the required U.S. EPA model for all refined regulatory analyses for receptors within 50 km of a source;
- is a refined model for facilities with multiple sources, source types, and building-induced downwash;
- uses actual representative hourly meteorological data;
- incorporates direction-specific building parameters which can be used to predict impacts within the wake region of nearby structures;

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8 U.S. EPA, *Guideline for Modeling Carbon Monoxide from Roadway Intersections.* EPA-454/R-92-005, November 1992.

9 U.S. EPA, *User's Guide for CAL3QHC Version 2: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections*. EPA –454/R-92-006 (Revised), September 1995

10 U.S. EPA, Screening Procedures for Estimating the Air Quality Impact of Stationary Sources; EPA-454/R-92-019, October 1992

- allows the modeling of multiple sources together to predict cumulative downwind impacts;

- provides for variable emission rates;

- provides options to select multiple averaging periods between one-hour and one year (scaling factors can be applied to adjust the one-hour impact to a peak impact less than one-hour); and,

- allows the use of large Cartesian and polar receptor grids, as well as discrete receptor locations.

Regulatory default options adopted for the model include:

- *Use stack-tip downwash (except for building downwash)*. Stack-tip downwash is an adjustment of the actual stack release height for conditions when the gas exit velocity is less than 1.5 times the wind speed. For these conditions, the effective release height is reduced a bit, based on the diameter of the stack and the wind and gas exit velocity. This option applies to point sources only, such as emergency generators, cooling towers, boiler units and garage vents.

- *Use the missing data and calms processing routines*. The model treats missing meteorological data in the same way as the calms processing routine, i.e., it sets the concentration values to zero for that hour, and calculates the short term averages according to U.S. EPA's calms policy, as set forth in the Guideline[11]. Since only 1-hour averages are being used, concentrations predicted with calm or missing data would not affect model results.

The AERMOD model is able to assign sources to a rural or urban category to allow specified urban sources to use the effects of increased surface heating under stable atmospheric conditions. The urban dispersion classification was selected based on a visual inspection of the area within a three kilometer radius of the Project site. A population estimate of 1,118,961 for Boston and surrounding towns was obtained from the U.S. Census website (www.census.gov) and is used in the AERMOD model to estimate the urban boundary layer height.

The regional meteorology in Boston is best approximated with meteorological data collected by the nearby Boston Logan International Airport in East Boston. The station is located approximately 1.67 miles (2.7 km) to the northeast of the Project site at an elevation of 15 feet (4.57 m) above mean sea level. This station is the closest site for which extensive meteorological data are available which are representative of similar topographic influences that affect the proposed site. Five years (2008-2012) of hourly surface data collected at the

11 Appendix W to 40 CFR Part 51, "Guideline on Air Quality Models", November 9, 2005.

station include wind speed and direction, temperature, cloud cover and ceiling height. Upper air data from Gray, Maine was processed along with the surface data. The processed meteorological files for use in AERMOD were provided by the MassDEP. These files have been used on other AERMOD applications in the area for review by MassDEP and are presumed to be of sufficient quality for regulatory applications.

A network of 1,668 receptors was used for the refined AERMOD modeling analysis. A nested grid of Cartesian receptors centered on the Project was used. The entire modeling domain encompassed 7.5 square kilometers. The spacing of the receptors was as follows:

- A 750 meter by 750 meter area bounding the Project with receptors spaced every 25 meters.
- An area extending 1,000 meters from the 25 meter grid with receptors spaced every 100 meters.

Receptors falling on Project building footprints were removed from the analysis.

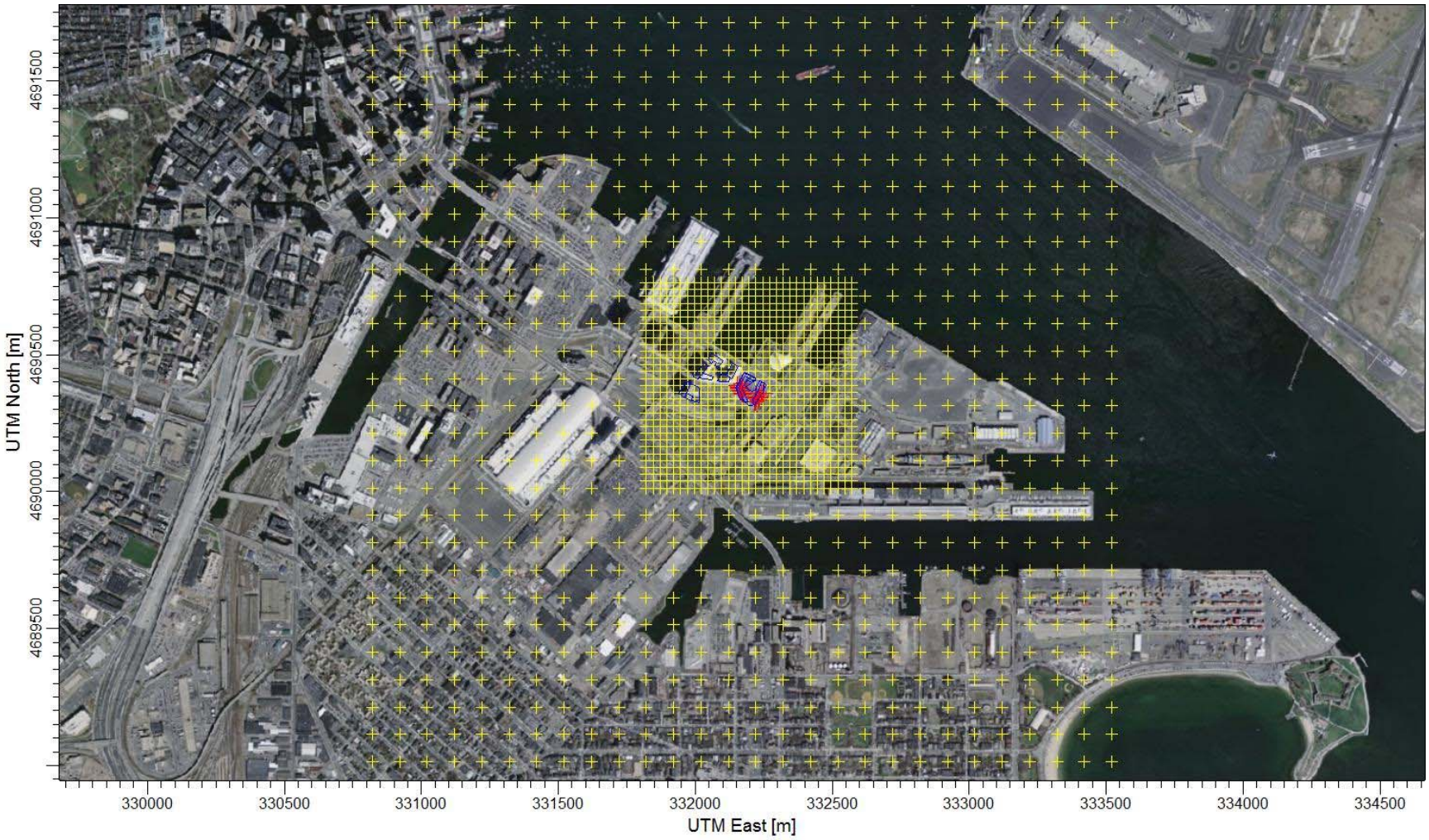
Terrain data were obtained from the US Geological Survey National Map Seamless Server (www.seamless.usgs.gov) according to guidance set forth by the EPA.[12] Source, building, and receptor elevations were processed using the AERMAP processor by way of the Lakes AERMOD View interface. Figure 3.6-3, *Stationary Source and Receptor Locations*, and Figure 3.6-4, *Stationary Source and Receptor Locations (Zoom)*, present the source and receptor locations, as well as the buildings used in the GEP stack height/downwash analysis described below.

Stationary Sources

Stationary sources of air pollution are typically units that combust fuel. In this case, these sources consist of heating units, electrical generating units, etc.

Boilers. The current plans include a number of small condensing boilers for heat and domestic hot water. All units will be natural gas-fired and located in a penthouse mechanical area on the roofs of the buildings. The units are expected to be exhausted through individual stacks. The number and size of the boilers on each building are as follows:

[12] U.S. EPA, AERMOD Implementation Guide, March 19, 2009.

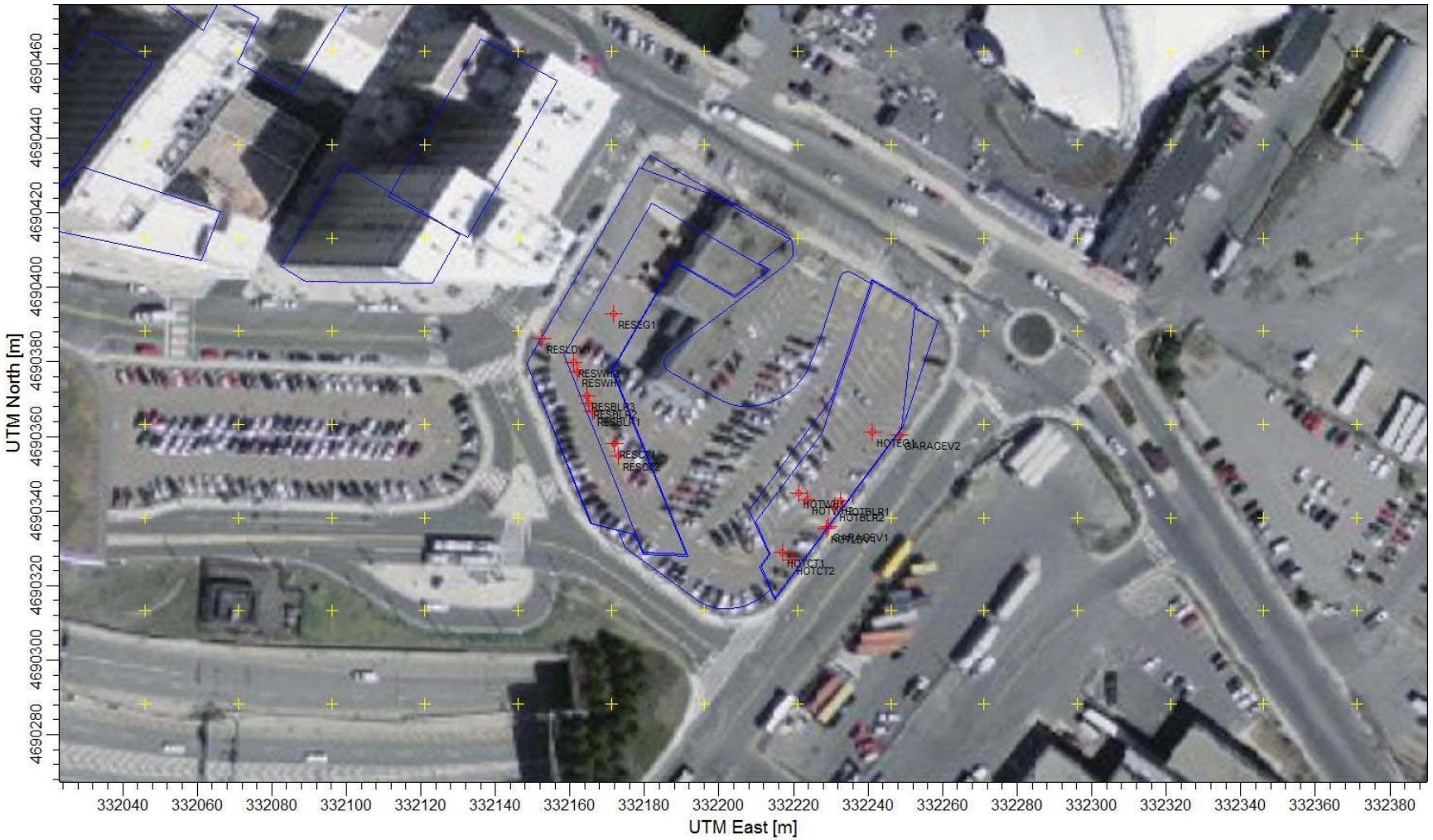


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Figure 3.6-3

Stationary Source & Receptor Locations



Parcel K **Boston, Massachusetts**

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Figure 3.6-4

Stationary Source & Receptor Locations (Zoom)

- Hotel: two (2) water heaters @ 2 MMBtu/hr each and two (2) heating boilers at 3 MMBtu/hr each;

- Residences: two (2) water heaters @ 2 MMBtu/hr each and three (3) heating boilers at 3 MMBtu/hr each.

The boilers will be within the requirements of the MassDEP Environmental Results Program (ERP) since individual estimated heat inputs are within or below the 10 to 40 mmBtu/hour ERP range. However, emissions were conservatively estimated for each boiler based on the MassDEP Boiler ERP program emission limits. Dispersion modeled impacts from the heating units were estimated from exhaust stacks 10 feet above the building roof. For all impacts, the heating equipment is assumed to be in operation 24 hours per day, seven days per week.

Since current plans show all boilers to be below the ERP limits of 10 MMBTU/hour, registration with MassDEP would not be required.

Emergency Generators. Current design plans include emergency generators to be installed on the buildings to be constructed. The units will provide life safety and standby emergency power to the building. The units will be diesel-fired and located in a mechanical area on the roof of the building. The generators are assumed to be designed such that exhaust stacks extend at least 10 feet above the individual building. The number and size of the generator on each building are as follows:

- Hotel: one (1) 800 kilowatt diesel fueled unit.

- Residences: one (1) 800 kilowatt diesel fueled unit.

Typically, the generators will operate for approximately one hour each month for testing and general maintenance. The ERP regulation applies to new emergency generators greater than 37 kW. The regulation is similar to the boiler ERP in that new engines are subject to emission standards, recordkeeping, certification, and compliance with the MassDEP noise policy. Since the generator maximum rating capacity is greater than the ERP limit of 37 kW, it will be subject to the new ERP program. Per the ERP, the generator owner will limit operation of the generator to less than 300 hours per year and submit a certification form to MassDEP within 60 days of installation.

Emissions were estimated for the emergency generators based on vendor supplied data. Comparable equipment was assumed where not provided by the architects or design engineers. The generator is assumed to operate 300 of 8,760 hours per year in the modeling for annual averaging times.

Cooling Towers. Current plans call for cooling towers to be installed on the buildings to be constructed. These units will remove the excess heat generated by the building's mechanical equipment. All units will be located on the roofs of the buildings. The number and size of the cooling towers on each building are as follows:

- Hotel: two (2) 200-ton single celled cooling towers.
- Residences: two (2) 350-ton single celled cooling towers.

Only emissions of particulate matter are assumed to be produced by the cooling tower cells. The cooling towers are assumed to operate at 100% capacity for 8,760 hours per year. Emissions of all other pollutants from the cooling towers are expected to be negligible.

Emissions and exhaust parameters were based on vendor supplied data and/or engineering judgment.

Loading Dock Exhausts. Two loading docks with mechanical ventilation will be part of the proposed buildings. Carbon monoxide monitors will be installed within enclosed areas idling vehicles to insure that levels of CO do not exceed health standards. Monitors will be used to control abatement ventilation when necessary.

Emissions from the loading docks were calculated using MOBILE6.2 and an estimate of the total idling time permitted under Massachusetts law (90 MGL Section 16A). It was conservatively assumed that the docks would be 100% utilized from 24 hours per day/7 days per week and that trucks would idle for 5 minutes per hour, the Massachusetts legal limit.

To provide a conservative assumption for emissions from the loading docks, an emission rate from MOBILE6.2 of 2.5 miles per hour was conservatively assumed for the build year of 2018. As is accepted, the 2.5 mph emission rate in g/mile is multiplied by 2.5 miles per hour to get an idling emission rate in mass/time. The higher of the summer or winter factors were used, depending on pollutant. Additionally, emission factors were weighted such that only factors for heavy duty gasoline and heavy duty diesel vehicle classes (MOBILE6.2 designations HDGV and HDDV) were used for dock emissions.

High velocity air intake louvers and the dock entry will supply make-up air for the dock's ventilation systems. Based on mechanical estimates, a ventilation air requirement of 3,000 cubic feet per minute per vent was used. A single vent is expected to be exiting horizontally at 10 feet above the sidewalk grade and is assumed to be 24 square feet in area. It is expected that there will be a total of 2 loading docks for the Project.

Parking Garage Exhausts. A single three-level 640-space garage underground parking garage is planned for the Project. Carbon monoxide monitors will be installed within the garages to insure that levels of CO do not exceed health standards and will be used to control abatement ventilation when necessary.

Emissions from the parking garage were calculated using MOBILE6.2 and an estimate of the total miles traveled within the garages during the AM and PM peak hours. Estimates of vehicle turnover by usage were provided by the transportation consultant. The total vehicle miles traveled (VMT) are calculated by multiplying the average distance a car would travel in the garage by the number of cars entering and leaving the garage.

To provide a conservative assumption for emissions from the garages, an emission rate from MOBILE6.2 of 10 miles per hour was assumed for the 2018 conditions. The higher of the summer or winter factors were used, depending on pollutant. Additionally, emission factors were weighted such that only factors for light duty gasoline and diesel vehicle classes (MOBILE6.2 designations LDGV, LDGT, LDDV, and MCY) were used for garage emissions.

Based on the above, the emission rates from the garage vents can be calculated as follows:

(Mobile 6.2 emission factor in grams/mile) X (garage VMT/hour) X (1 hour/3600 seconds) = grams/second

High velocity air intake louvers and the main garage entry will supply make-up air for the garage's ventilation systems. Total ventilation air requirements, as well as sizes, numbers, and locations of vents were provided by the mechanical design engineers. Vents are assumed to be exiting horizontally at 10 feet above sidewalk grade.

Detailed calculations, assumptions, and exhaust parameters for all stationary sources are presented in Appendix D, Air Quality.

GEP Stack Height Analysis

A Good Engineering Practice (GEP) stack height evaluation of the facility has been conducted in accordance with the EPA revised Guidelines for Determination of Good Engineering Practice Stack Height (EPA, 1985). A GEP stack is sufficiently high to avoid aerodynamic downwash effects from nearby buildings or structures. As defined by the EPA guidelines, the formula for computing GEP stack height for stacks constructed after January 12, 1979 is:

$$H_{GEP} = H_b + 1.5L$$

where H_{GEP} = GEP stack height,

H_b = Height of adjacent or nearby structures,

L = Lesser of height or maximum projected width of adjacent or nearby building (*i.e.*, the critical dimension), and nearby is within 5L of the stack from downwind (trailing edge) of the building.

The GEP formula was applied to each input building. Facility grade is approximately at mean sea level. The U.S. EPA Building Profile Input Program Prime Version (BPIP-Prime) was run to confirm the GEP height and to calculate direction-specific building dimensions for use in AERMOD.

The point sources subject to building influences are the boiler stacks, dock vents, the cooling towers, and the emergency generator stacks.

The proposed boiler stacks, the cooling towers, dock vents, and emergency generator stacks are all below GEP height; therefore, building downwash effects were considered in the air quality modeling. The AERMOD model determines when and if to include downwash in its calculations. In addition, if downwash applies, the AERMOD downwash algorithm will be used to estimate concentrations in the building cavity areas.

3.6.3 Air Quality Analyses Results

The following sections describe the results of the mesoscale, microscale and stationary source air quality modeling of the Project.

3.6.3.1 Mesoscale Analysis

The results of the mesoscale analysis are presented in Tables 3.6-3 and 3.6-4.

As shown in Table 3.6-3, the analysis indicates a decrease in total emissions from the 2012 existing conditions to the 2018 and "No-Action" conditions. This decrease in total emissions, even with the modest increases in traffic vehicle miles traveled (VMT) and delay times, is attributable to anticipated improvements in vehicle engine and emissions technologies, which are expected to reduce the per-vehicle emission rates.

Table 3.6-3 Regional Mesoscale (Indirect) Emissions Analysis Summary (No Action)

Pollutant	*VOC (lbs/day)*	*VOC (tons/yr)*	*NOx (lbs/day)*	*NOx (tons/yr)*
2012 Existing	9.3	1.4	16.6	2.6
2018 No-Action	8.1	1.3	9.5	1.5
Difference	-1.2 -13%	-0.2 -13%	-7.2 -43%	-1.1 -43%

As shown in Table 3.6-4, the 2018 Build condition exhibits a slight increase of NOx and VOC emissions compared to 2018 No-Action conditions. This is due to a slight increase in vehicular traffic, as well as the introduction of an additional intersection; specifically Massport Haul Road and the Project site Driveway. This results in increases of approximately 7 percent VOC emissions and 6 percent NOx emissions.

Table 3.6-4 Regional Mesoscale (Indirect) Emissions Analysis Summary (Alternative A)

Pollutant	*VOC (lbs/day)*	*VOC (tons/yr)*	*NOx (lbs/day)*	*NOx (tons/yr)*
2018 No-Action	8.1	1.3	9.5	1.5
2018 Build	8.6	1.3	10.0	1.6
Difference	0.5 7%	0.1 7%	0.5 6%	0.1 6%

The Proponent has identified and reviewed reasonable and feasible reduction and mitigation measures to address traffic congestion and the resulting increase in emissions associated with the 2018 Build scenario. Section 2.0 provides a description of the TDM program that will be implemented to reduce Project-related vehicle trips. The Proponent is committed to implementing transportation management improvements to minimize potential impacts to the transportation system, including signal improvements at area intersections, encouraging alternative modes of travel, rideshare programs, and telecommuting.

Proposed transportation-related mitigation measures are further described in Section 2.0. Further reductions in delay can be achieved by optimizing signal phasing, lane configurations, or both. Reductions in delay correlate to reductions in vehicle idle time. Since VOC emissions are highest at low engine RPM, further reductions in idle time would result in further reductions of VOC emissions. Slight decreases in NOx emissions would also be realized.

3.6.3.2 Microscale Analysis

The results of the maximum one-hour predicted CO concentrations from CAL3QHC are provided in Tables 3.6-5 through 3.6-7 for the 2012 Existing and the 2018 No-Action and Build scenarios. Note that the eight-hour CAL3QHC average concentrations are conservatively calculated by multiplying the maximum one-hour concentrations by a factor of 0.7.[13]

[13] U.S. EPA, Screening Procedures for Estimating the Air Quality Impact of Stationary Sources; EPA-454/R-92-019, October 1992

Table 3.6-5 Summary of Microscale Modeling Analysis (Existing 2012)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
1-Hour					
1. Congress Street and D Street	AM	1.4	1.9	3.3	35
	PM	1.4	1.9	3.3	35
2/3. Seaport Boulevard, Northern Avenue and D Street (NB & SB)	AM	0.8	1.9	2.7	35
	PM	0.8	1.9	2.7	35
8-Hour					
1. Congress Street and D Street	AM	1.0	1.5	2.5	9
	PM	1.0	1.5	2.5	9
2/3. Seaport Boulevard, Northern Avenue and D Street (NB & SB)	AM	0.6	1.5	2.1	9
	PM	0.6	1.5	2.1	9

Table 3.6-6 Summary of Microscale Modeling Analysis (No-Action 2018)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
1-Hour					
1. Congress Street and D Street	AM	1.1	1.9	3.0	35
	PM	1.4	1.9	3.3	35
2/3. Seaport Boulevard, Northern Avenue and D Street (NB & SB)	AM	0.7	1.9	2.6	35
	PM	0.7	1.9	2.6	35
8-Hour					
1. Congress Street and D Street	AM	0.8	1.5	2.3	9
	PM	1.0	1.5	2.5	9
2/3. Seaport Boulevard, Northern Avenue and D Street (NB & SB)	AM	0.6	1.5	2.1	9
	PM	0.5	1.5	2.0	9

Table 3.6-7 Summary of Microscale Modeling Analysis (Build 2018)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
1-Hour					
1. Congress Street and D Street	AM	1.1	1.9	3.0	35
	PM	1.4	1.9	3.3	35
2/3. Seaport Boulevard, Northern Avenue and D Street (NB & SB)	AM	0.8	1.9	2.7	35
	PM	0.7	1.9	2.6	35
8-Hour					
1. Congress Street and D Street	AM	0.8	1.5	2.3	9
	PM	1.0	1.5	2.5	9
2/3. Seaport Boulevard, Northern Avenue and D Street (NB & SB)	AM	0.6	1.5	2.1	9
	PM	0.5	1.5	2.0	9

The results of the one-hour and eight-hour maximum modeled CO ground-level concentrations from CAL3QHC were added to EPA supplied background levels for comparison to the NAAQS. These values represent the highest potential concentrations at the intersection as they are predicted during the simultaneous occurrence of "defined" worst case meteorology. The highest one-hour traffic-related concentration predicted in the area of the Project, for the modeled conditions (1.4 ppm) plus background (1.9 ppm) is 3.3 ppm for the existing morning and afternoon peak hour cases at the intersection of Congress Street and D Street. The highest eight-hour traffic-related concentration predicted in the area of the Project for the modeled conditions (1.0 ppm) plus background (1.5 ppm) is 2.5 ppm for at the same location and scenario. Both concentrations are well below the one-hour NAAQS of 35 ppm and the eight-hour NAAQS of 9 ppm.

It can be expected that any mitigation measures implemented to improve traffic flow at any of the modeled intersections would result in further improved air quality.

3.6.3.3 Stationary Source Analysis

In addition to the microscale analysis, a cumulative impact analysis was also conducted for comparison to the NAAQS for CO, SO_2, NOx, PM-10, and PM-2.5. This analysis addressed emissions from the Project's heating boilers, emergency generators, cooling towers, and the loading dock and garage vents.

Worst case maximum predicted impacts from the above source groups were added to monitored background values obtained from MassDEP and then compared to the NAAQS.

Table 3.6-8 presents the cumulative modeling results for the stationary sources plus monitored background values. The total impacts when combined with background are below the NAAQS for all pollutants and averaging periods.

Table 3.6-8 Summary of NAAQS Stationary Source Modeling Analysis

Pollutant	Averaging Time	Max Modeled Conc. ($\mu g/m^3$)	Modeled Year	Background Concentration ($\mu g/m^3$)	Total Conc. ($\mu g/m^3$)	Standard ($\mu g/m^3$)	% Of Standard
SO_2	1 HR (1)	0.31	2008-2012	127.4	127.7	196	65%
	3 HR (2)	0.23	2012	88.4	88.6	1300	7%
	24 HR (2)	0.11	2009	31.5	31.6	365	9%
	ANN. (3)	0.02	2011	6.1	6.2	80	8%
PM-10	24 HR (4)	1.55	2011	41.0	42.5	150	28%
	ANN. (3)	0.25	2011	16.8	17.0	50	34%
PM-2.5	24 HR (5)	1.60	2008-2012	23.2	24.8	35	71%
	ANN. (6)	0.22	2008-2012	9.9	10.2	15	68%
NO_2	1 HR (7)	11.05	2008-2012	140.8	151.9	188	81%
	ANN. (3)	1.44	2011	38.3	39.7	100	40%
CO	1 HR (2)	931.15	2012	2166.0	3097.1	40000	8%
	8 HR (2)	155.20	2010	1710.0	1865.2	10000	19%

Notes:

(1) Maximum 4th-Highest Maximum Daily 1-Hr Concentration Averaged Over 5 Years

(2) Highest 2nd-High Concentration Over 5 Years

(3) Highest Annual Concentration Over 5 Years

(4) Highest 6th-High Concentration Over 5 Years

(5) Maximum 1st-Highest 24-Hour Concentration Averaged Over 5 Years

(6) Maximum Annual Concentration Averaged Over 5 Years

(7) Maximum 8th Highest Maximum Daily 1-hour Concentrations Averaged Over 5 Years.

When adding the high-second highest AERMOD-predicted one-hour CO concentrations from the stationary sources to the traffic-generated impacts for the 2018 Build case, the one-hour modeled concentration from stationary sources (931 $\mu g/m^3$, 0.82 ppm), moving vehicles (1.4 ppm), plus background (1.9 ppm) is 4.1 ppm. The total future build concentration includes the highest second-high predicted concentrations from AERMOD for the parking and loading dock exhaust vents, the heating boilers, and the emergency generators. This combined value is also well below the one-hour NAAQS standard of 35 ppm.

Similarly, when adding the high-second highest AERMOD-predicted eight-hour CO concentrations from the stationary sources to the traffic-generated impacts for the future build case, the eight-hour modeled concentration from stationary sources (155 $\mu g/m^3$, 0.14 ppm), moving vehicles (1.0 ppm) plus background (1.5 ppm) is 2.6 ppm. These values are also below the eight-hour NAAQS standard of 9.0 ppm.

This is a highly conservative estimate, since the added values are irrespective of time and space (i.e., the modeled and background concentrations occur at different times and at different locations).

3.6.4 Conclusions

The following sections summarize describe the results of the mesoscale, microscale and stationary source air quality modeling of the Project.

3.6.4.1 Mesoscale Analysis

Mesoscale analysis results show increases of about 2.5% in VOC and 5.1% in NOx emissions for the 2018 Build conditions relative to the 2018 No-Action condition. Traffic increases are the direct contributor to emissions increases from No Action to Build conditions. However, anticipated engine improvements will reduce emissions from 2012 baseline levels, even with the traffic increases.

Reduced intersection delay times would also result in a general increase in traffic speed along roadway links. In general, NOx emission rates decrease from idle to 30 mph. Therefore, any reduction in idling time and corresponding increase in speed up to the 30 mph limit would decrease NOx emissions. Since future changes in traffic speeds are speculative, exact reductions in emissions are not quantified.

In addition to the above, implementation of any future mitigation measures not yet determined or discussed in Section 2.0 may further reduce emissions. Through discussions with the regional transportation agency, it is anticipated that additional mitigation measures will be implemented to alleviate traffic congestion and improve flow, and thereby reduce pollutant emissions.

3.6.4.2 Microscale Analysis

Results of the microscale analysis show that all predicted CO concentrations are well below 1-hour and 8-hour NAAQS. Therefore, it can be concluded that there are no adverse air quality impacts resulting from increased traffic in the area.

3.6.4.3 Stationary Sources

Using conservative estimates, the CO concentrations at the nearest receptors for impacts from the intersections, combined with stationary sources and monitored background values, are well under the CO NAAQS thresholds. In addition, maximum cumulative impacts from the heating boilers, garage vents, cooling towers, and emergency generators plus monitored background values are also below the NAAQS thresholds for SO_2, NOx, PM-10, and PM-2.5.

3.6.5 Permitting of Stationary Sources

It's expected that the majority of stationary sources (boilers, engines, etc.) would either be exempt or be subject to the MassDEP Environmental Results Program (ERP). However, if at a later time the Project opts to integrate larger sources (such as combined heat and power [CHP]), other air quality regulations may apply if total emissions exceed thresholds for other air pollution control requirements, including Massachusetts minor source preconstruction approvals (NMCPA), New Source Review (NSR), Operating Permits, and Prevention of Significant Deterioration (PSD).

Boilers. Projects typically include a number of small condensing boilers for heat and domestic hot water. Such units are often natural gas-fired and located in a penthouse mechanical area on the roofs of the buildings. The units are typically exhausted through individual stacks.

The Project boilers will likely be within the requirements of the ERP since individual estimated heat inputs would be within or below the 10 to 40 mmBtu/hour ERP range. Assuming the boilers are below the ERP limits of 10 MMBTU/hour, registration with MassDEP would not be required.

Emergency Generators. Emergency generators are required to provide life safety and standby emergency power to the buildings. The units are often diesel-fired and located in a mechanical area on the roofs of the buildings. The generators are required to be designed such that exhaust stacks extend at least 10 feet above the individual building roof height above ground level.

Typically, generators will operate for approximately one hour each month for testing and general maintenance. The ERP regulation applies to new emergency generators greater than 37 kW. The regulation is similar to the boiler ERP in that new engines are subject to emission standards, recordkeeping, certification, and compliance with the MassDEP noise policy. Since the Project generators maximum rating capacities are likely to be greater than the ERP limit of 37 kW, they will be subject to the new ERP program. Per the ERP, the generator owner will limit operation of the generator to less than 300 hours per year and submit a certification form to MassDEP within 60 days of installation.

Loading Dock Exhausts. Loading docks with mechanical ventilation will likely be part of the proposed buildings. Carbon monoxide monitors will be installed within enclosed areas with idling vehicles to insure that levels of CO do not exceed health standards. Monitors will be used to control abatement ventilation when necessary.

Parking Garage Exhausts. According to local building codes and best construction practices, carbon monoxide monitors will be installed within any underground levels in the parking garages to insure that levels of CO do not exceed health standards and to control abatement ventilation when necessary. Compliance will be certified by local inspection authorities.

3.7 Water Quality / Stormwater Management

The protection of site groundwater and nearby surface waters is discussed in Sections 3.8, 3.9 and 3.11, below. Site stormwater management is detailed in Section 7.3.

3.8 Flood Hazard Zones / Wetlands

The existing Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the Project site indicates that it is located outside of a designated flood zone (FIRM, City of Boston, Community-Panel Number 25025C0081G, Effective Date September 25, 2009). However, a "preliminary" revised floodplain map for the site area was recently released by FEMA which shows the site as lying within the 100-year flood zone (FIRM, Suffolk County, Massachusetts; Panel 0081J, Map Number 25025C0081J, Map Revised, Preliminary November 15, 2013). As discussed in Section 3.14, *Sustainable Design*, and Section 3.15, *Climate Adaptability*, the design of the site and buildings will recognize and account for the site's location proximate to the harbor and within this newly designated flood zone, as well as the potential impacts of sea level rise.

The site is fully developed as a surface grade paved parking lot and does not contain any wetland resource areas other than the potential flood zone referenced above.

The northwestern-most sidewalk corner of the site is located approximately 100 feet from the seawall opposite Northern Avenue. Although manmade, seawalls are defined as a form of coastal bank and are regulated as such under the Massachusetts Wetlands Protection Act (WPA). Under the WPA regulations seawalls are generally deemed significant to storm damage prevention and flood control and work on or within the 100-foot "buffer zone" of such structures must not affect the structure's ability to provide those functions. Pending site survey, work on the northwestern-most corner of the Project site sidewalk/and or the Northern Avenue curb may require the filing of a Notice of Intent with the Boston Conservation Commission and a demonstration that any such work will not impair the function of the coastal bank.

Although the site is not currently mapped as lying within a regulated flood zone, adoption of the new flood zone boundaries would necessitate the Project filing a Notice of Intent with the Boston Conservation Commission. Because the site is located within the coastal zone, compensatory flood storage would not be required. However, as it relates to the issue of wetlands protection, the Project would need to demonstrate that construction would not exacerbate flooding, or result in impacts to other wetland resource areas.

3.9 Geotechnical / Groundwater Impacts

The following sections summarize the subsurface soil and groundwater conditions at the Project site, the planned sub-grade construction activities, and mitigation measures designed to protect adjacent lands and structures during foundation and below-grade construction activities.

3.9.1 Subsurface Soil and Bedrock Conditions

A review of previous Central Artery/Tunnel (CA/T) project borings and the recent borings conducted by GZA GeoEnvironmental, Inc. indicates that the subsurface geological conditions at the Project site generally consist of approximately 120 feet of unconsolidated sediment composed, in descending order of depth, of approximately 25 to 30 feet of fill material, 5 to 14 feet of organic soils, 70 feet of silty clay and 10 to 15 feet of glaciomarine/glacial till over bedrock. The sediments of the upper portion of the fill are generally more granular in nature, while the sediments comprising the lower portion of the fill are generally more cohesive. The top of the silty clay unit was encountered approximately 31 to 39 feet below ground surface in three recent borings performed at the site by GZA, which is consistent with borings completed for the adjacent CA/T project. These depths correspond approximately to elevations -15 to -23 feet. The top 15 feet (or more) of the clay is very stiff to stiff, becoming softer with depth. As indicated above, the previous CA/T borings indicate the top of bedrock at approximately 110 to 120 feet below ground surface.

3.9.2 Groundwater Conditions

Groundwater levels were recently measured at approximately 9 feet below ground surface in an on-site well. This is consistent with other findings in the area, and with the hydrologic setting of the site. Groundwater levels can be expected to fluctuate several feet in response to seasonal meteorological conditions, and are likely influenced to some minor degree by tide levels in the harbor several hundred feet to the east.

The site is not within a City of Boston Groundwater Conservation Overlay District.

3.9.3 Proposed Construction and Foundation Methodology and Considerations

Current design plans call for the buildings to be supported by a mat foundation with load bearing on the upper stiff to very stiff clay unit. A heavily reinforced concrete mat foundation design is efficient where the slab needs to resist hydraulic uplift and building loads are relatively high from a multi-story building, as the loads need to be spread out to limit bearing pressures and thus reduce settlement. As currently designed the lowest slab level will be set at 34 feet below ground surface. Therefore excavations to a depth of 38 to 40 feet will be required to construct the mat foundation. As noted above, the top of the clay unit was encountered at 31 to 39 feet below ground surface in the recent borings. Hence, limited over-excavation of organic soils may be required in localized areas depending on final proposed bottom of mat elevation and variation in the top of organic stratum. During excavation, all soils will be managed for off-site disposal in accordance the current regulations and policies of Massport and MassDEP.

Temporary lateral earth support will be required for construction of the proposed building. It is anticipated that slurry wall construction will be utilized for both temporary support and the final basement walls. Internal cross-lot bracing and/or rakers will be required.

Groundwater levels will be maintained both during construction and after construction to limit potential impacts on adjacent utilities and structures. During construction, the earth support system will serve as a groundwater cut-off, thus reducing the need for dewatering flow during excavation. To the degree any groundwater dewatering is required during construction, it will be done so in accordance with applicable U.S. EPA, MWRA, BWSC and MassDEP regulations. A temporary construction dewatering permit will be obtained prior to discharging of dewatering effluent from the site if required. Testing of the effluent will be conducted prior to and during discharge to confirm compliance with permit requirements. Groundwater levels will not be impacted following construction as no long term pumping will be necessary.

The CA/T project I-90 harbor tunnel abuts the southern corner of the Project site and will require protection during construction. To this end, the Proponent will work closely with the Massachusetts Department of Transportation (MassDOT) in developing a construction program that maintains the safety and competence of the tunnel. The portion of I-90 immediately adjacent to the site was constructed as a cut-and-cover tunnel, while the portion approximately 80 feet south of the site was constructed as a boat section with an open top to the depressed roadway. Based on current understanding of the tunnel elevation, excavation for the new building will not extend below the level of the tunnel. The proposed building will be designed such that support of the tunnel wall is maintained and the Project does not impart loads on the tunnel for which the tunnel is not designed.

Finally, a temporary tieback easement from the CA/T project extends onto the western side of the site. According to a "Grant of Temporary Easement by Massachusetts Port Authority to Commonwealth of Massachusetts Department of Highways" dated March 31, 1993, steel

tiebacks installed in the easement area were to remain in place after construction was completed, as is typically the case. Construction procedures will need to account for potential tiebacks that will be encountered during excavation.

3.9.4 Potential Impacts during Below-Grade Construction

In general, potential impacts during excavation and foundation construction include temporary lowering of area groundwater levels, ground vibrations, noise, and ground movements outside of the excavation. The foundation design and construction will be conducted to control and limit potential adverse impacts, especially to adjacent structures and to groundwater levels.

3.9.5 Mitigation Measures

Significant mitigation measures will be incorporated into the design and construction of the Project to limit potential adverse impacts to immediately adjacent areas, including the following:

- The Project team will conduct studies, prepare designs and specifications, and monitor the contractor's performance for conformance to the Project's contract documents with specific attention to protecting nearby structures and facilities, and preventing groundwater lowering. Selection and design of the excavation support system will be made with careful attention to mitigating adverse temporary and long-term effects outside the site.

- Performance criteria will be established in the Project specifications for the lateral excavation support system with respect to movements, water-tightness and the construction sequence of the below grade portion of the work. The contractor will be required to plan, employ, and modify as necessary, construction methods and take all necessary steps during the work to protect nearby buildings and other facilities.

- Geotechnical instrumentation will be installed and monitored before and during the below grade portion of the work to observe the performance of the excavation, adjacent buildings and structures, and area groundwater levels.

3.10 Solid and Hazardous Waste Materials

Waste generated by the built Project will be significantly reduced by the implementation of recycling and other waste management programs to be implemented throughout the Project and tailored to the specifics of the various Project components. Meanwhile, the Project site has been investigated for the presence of hazardous materials and known releases have been mitigated. The following sections include an estimation of the solid waste volumes to be associated with the Project and the status of the Project site under the Massachusetts Contingency Plan (MCP).

3.10.1 Operation Solid and Hazardous Waste

The Project will generate solid waste typical of hotel, office and residential developments. Table 3.10-1 includes a break-out of the anticipated waste volumes by program use. Based on the waste generation rates identified therein, the Project could be anticipated to generate approximately 499 tons per year. However, as also noted below, all aspects of the Project program will include pro-active recycling components designed to dramatically lower these waste generation rates.

Table 3.10-1 Solid Waste Generation

Use	Program	Generation Rate	Solid Waste (tons per year)
Residential	380 bedrooms	4 lbs/bedroom/day	277.4
Hotel	247 bedrooms	2 lbs/bedroom/day	90.2
Office	16,500 sf	1.3 tons/1,000 sf/year	21.5
Retail/Restaurant	20,000 sf	5.5 tons/1,000 sf/year	110.0
Total Solid Waste Generation			**499.1**

Solid waste generated by the Project is expected to be typical of other residential/mixed use projects and will include wastepaper, cardboard, glass, and bottles. A portion of the waste will be recycled as described below. The remainder of the waste will be compacted and removed by a waste hauler contracted by building management. With the exception of "household hazardous wastes" typical of residential development (for example, cleaning fluids and paint), the Project will not generate hazardous waste.

Additional waste will be generated by the general public enjoying the Project's open spaces and at the Project perimeter. Trash receptacles will be provided in these public areas in locations that will not impede pedestrian circulation. Building management will ensure that these receptacles are emptied daily and will inspect the site for strewn trash daily.

3.10.2 Recycling During Operation

Recycling by residents, retail and office tenants and hotel guests will be required, coordinated, and comprehensive. To encourage recycling, the Proponent will implement a recycling program throughout the Project. This will include space for recycling on each floor, while the loading/receiving area will include space for the storage and pick-up of recyclable materials. Recyclable materials will include newspaper, cardboard, glass, cans, and plastics.

Building management will also provide residential tenants with the facilities and services necessary to recycle materials such as light bulbs, batteries, and paint cans. The residential recycling program will be conducted in accordance with the City of Boston's recycling regulations.

The hotel operator will be required to implement internal recycling programs, including guest towel programs, common space recycling containers, maintenance staff recycling training, and low-water use practices. Similarly, in compliance with the Massachusetts Food Waste Ban regulations being promulgated by MassDEP, restaurant operators will be required to implement waste food reduction and food waste segregation programs.

3.10.3 Hazardous Materials – Compliance with the Massachusetts Contingency Plan

A number of environmental studies have been performed at the Project site under the auspices of the MCP. These studies included report by Simmons Environmental Services, Inc. dated May 1996 entitled "Class A-2 Response Action Outcome Statement Report" (RAO). The Simmons RAO report addressed a petroleum release in the northwest portion of the parking lot, identified as RTN 3-13579 in the MassDEP database.

According to the RAO, the release site was defined as a 40-foot wide by 60-foot long by 10-foot deep zone with petroleum contaminated soil associated with an abandoned 500 gallon underground storage tank used to store No. 2 heating oil. Remedial activities consisted of excavation/off-site disposal of petroleum impacted soil and pumping/off-site disposal of groundwater. Post-excavation sampling indicated residual levels of petroleum constituents in both soils and groundwater that were below the then-applicable GW-2 and GW-3 Method 1 cleanup standards. The report concluded that "…a Permanent Solution has been achieved…and one or more Activity and Use Limitations are not required to maintain a level of No Significant Risk" at the release site.

In 2012, as part of a site geotechnical boring program, three soil samples were collected from within the proposed basement area and analyzed for a typical suite of disposal parameters. Low levels of certain semi-volatile organic compound (VOCs), arsenic, chromium, mercury, lead and total petroleum hydrocarbons (TPH) were detected in the soil samples. However, none of the constituents detected exceeded applicable Reportable Concentrations (RCs) outlined in the MCP. The test results indicated that the soil analyzed meets criteria for re-use at an in-state landfill.

As part of the recent subsurface explorations of the site, one groundwater sample was collected from an on-site monitoring well. Low levels of certain metals and the VOC methyl tert-butyl ether (MTBE, a constituent of gasoline) were detected in the groundwater sample. However, none of the constituents detected exceeded applicable RCs.

Additional soil and groundwater chemical testing will be required prior to construction to characterize soils and groundwater for disposal and/or for obtaining construction dewatering permits. If the additional testing encounters a reporting condition, a Licensed Site Professional (LSP) will be engaged and MassDEP will be notified and the appropriate studies performed as required under the MCP. Off-site soils disposal will be managed and documented per Massport and MCP requirements. Material Shipping Records, Bills of Lading and/or other records will be used as appropriate for tracking soil disposal.

3.11 Noise Assessment

A sound level assessment of the Parcel K Project conducted by Epsilon Associates, Inc. (Epsilon) included a baseline sound monitoring program to measure existing sound levels in the vicinity of the proposed Project, computer modeling to predict operational sound levels from mechanical equipment associated with the Project, and a comparison of future Project sound levels to applicable noise regulations, including the City of Boston Zoning District Noise Standards and the MassDEP Noise Policy.

This analysis, which is consistent with BRA requirements for noise studies, indicates that predicted noise levels from the Project with appropriate noise controls will comply with both state and local regulations.

3.11.1 Noise Terminology

There are several ways in which sound (noise) levels are measured and quantified, all of which use the logarithmic decibel (dB) scale. The following information defines the noise terminology used in this analysis.

The decibel scale is logarithmic to accommodate the wide range of sound intensities observed in the environment. A property of the decibel scale is that the sound pressure levels of two distinct sounds are not purely additive. For example, if a sound of 50 dB is added to another sound of 50 dB, the total is only a three-decibel increase (53 dB), not a doubling (100 dB). Thus, every three-decibel change in sound level represents a doubling or halving of sound energy. Related to this is the fact that a change in sound level of less than three dB is generally imperceptible to the human ear.

Another property of the decibel scale is that if one source of noise is 10 dB (or more) louder than another source, then the total combined sound level is simply that of the louder source (i.e. the quieter source contributes negligibly to the overall sound level). For example, a source of sound at 60 dB plus another source at 47 dB is 60 dB.

The sound level meter used to measure noise is a standardized instrument.[14] It contains "weighting networks" to adjust the frequency response of the instrument to approximate that of the human ear under various conditions. One network is the A-weighting network (there are also B- and C-weighting networks), which most closely approximates how the human ear responds to sound as a function of frequency, and is the accepted scale used for community sound level measurements. Sounds are frequently reported as detected with the A-weighting network of the sound level meter, in dBA. A-weighted sound levels emphasize the middle frequencies (*i.e.,* middle pitched – around 1,000 Hertz sounds), and de-emphasize lower- and higher-frequencies.

Because the sounds in the environment vary with time, they cannot simply be represented with a single number. In fact, there are several methods used for quantifying variable sounds which are commonly reported in community noise assessments, as defined below.

- L_{eq}, the equivalent level, in dBA, is the level of a hypothetical steady sound that would have the same energy (*i.e.,* the same time-averaged mean square sound pressure) as the actual fluctuating sound observed.

- L_{90} is the sound level, in dBA, exceeded 90 percent of the time in a given measurement period. The L_{90}, or residual sound level, is close to the lowest sound level observed when there are no obvious nearby intermittent noise sources.

- L_{50} is the median sound level, in dBA, exceeded 50 percent of the time in a given measurement period.

- L_{10} is the sound level, in dBA, exceeded only 10 percent of the time in a given measurement period. The L_{10}, or intrusive sound level, is close to the maximum sound level observed due to occasional louder intermittent noises, like those from passing motor vehicles.

- L_{max} is the maximum instantaneous sound level observed in a given measurement period.

By employing various noise metrics it is possible to separate prevailing, steady sounds (the L_{90}) from occasional louder sounds (L_{10}) in the noise environment. This analysis treats all noise sources from the Project as though the emissions will be steady and continuous, described most accurately by the L_{90} exceedance level.

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[14] *American National Standard Specification for Sound Level Meters*, ANSI S1.4-1983, published by the Standards Secretariat of the Acoustical Society of America, Melville, NY.

In the design of noise controls, which do not function quite like the human ear, it is important to understand the frequency spectrum of the noise source of interest. The spectra of noises are usually stated in terms of octave-band sound pressure levels, in dB, with the octave frequency bands being those established by standard. To facilitate the noise-control design process, the estimates of noise levels in this analysis are also presented in terms of octave-band sound pressure levels.

3.11.2 Noise Regulations and Criteria

The primary set of regulations relating to the potential increase in noise levels is the City of Boston Zoning District Noise Standards (City of Boston Code – Ordinances: Section 16–26 Unreasonable Noise and City of Boston Air Pollution Control Commission Regulations for the Control of Noise in the City of Boston). Results of the baseline ambient sound level survey and the modeled Project sound levels were compared to the City of Boston Zoning District Noise Standards. Separate regulations within the Standards provide criteria to control different types of noise. Regulation 2 is applicable to the effects of the proposed Project, as completed, and is considered in this noise study. Table 3.11-1 includes the Zoning District Standards.

Table 3.11-1 City of Boston Zoning District Noise Standards, Maximum Allowable Sound Pressure Levels

Octave-band Center Frequency (Hz)	Residential Zoning District		Residential-Industrial Zoning District		Business Zoning District	Industrial Zoning District
	Daytime (dB)	All Other Times (dB)	Daytime (dB)	All Other Times (dB)	Anytime (dB)	Anytime (dB)
32	76	68	79	72	79	83
63	75	67	78	71	78	82
125	69	61	73	65	73	77
250	62	52	68	57	68	73
500	56	46	62	51	62	67
1000	50	40	56	45	56	61
2000	45	33	51	39	51	57
4000	40	28	47	34	47	53
8000	38	26	44	32	44	50
A-Weighted (dBA)	**60**	**50**	**65**	**55**	**65**	**70**

Notes: Noise standards are extracted from Regulation 2.5, City of Boston Air Pollution Control Commission, "Regulations for the Control of Noise in the City of Boston", adopted December 17, 1976.

All standards apply at the property line of the receiving property.

dB and dBA based on a reference sound pressure of 20 micropascals.

'Daytime' refers to the period between 7:00 AM and 6:00 PM daily, excluding Sunday.

Additionally, MassDEP has the authority to regulate noise under 310 CMR 7.10, which is part of the Commonwealth's air pollution control regulations. Per 310 CMR 7.10, "unnecessary" noise is considered an air contaminant and thus prohibited. MassDEP administers these regulations through Noise Policy DAQC 90-001, which limits a source to a 10-dBA increase above the L_{90} ambient sound level measured at the project property line and at the nearest residences. The MassDEP policy further prohibits "pure tone" conditions where the sound pressure level in one octave-band is three dB or more greater than the sound levels in each of two adjacent bands.

3.11.3 Existing Conditions

A background noise level survey was conducted to characterize the existing "baseline" acoustical environment in the vicinity of Parcel K, as it is located within the Massport Commonwealth Flats Development Area (CFDA) of Boston, Massachusetts. Existing noise sources in the vicinity of the Project currently include vehicular traffic along local roadways (including trucks, buses, and MBTA Silver Line vehicles), birds, wind noise, aircraft flyovers, pedestrian conversation and foot traffic, mechanical equipment located on the surrounding buildings; industrial loading/unloading activities; and the general noises of the City.

3.11.3.1 Noise Monitoring Methodology

Sound level measurements were conducted on Friday, January 18, 2013 during both daytime (12:30 PM to 2:00 PM) and nighttime hours (12:00 AM to 1:30 AM). Since noise impacts from the Project on the community are highest when background noise levels are the lowest, the study was designed to measure community noise levels under conditions typical of a "quiet period" for the area. Daytime measurements were scheduled to avoid peak traffic conditions. All measurements were 20 minutes in duration.

Sound levels were measured at publicly accessible locations at a height of five feet (1.5 meters) above ground level, under low wind conditions, and with dry roadway surfaces. Wind speed measurements were made with a Davis Instruments TurboMeter electronic wind speed indicator, and temperature and humidity measurements were made using a General Tools digital psychrometer. Unofficial observations about meteorology or land use in the community were made solely to characterize the existing sound levels in the area and to estimate the noise sensitivity at properties near the proposed Project.

3.11.3.2 Noise Monitoring Locations

The selection of the noise monitoring locations was based upon a review of zoning and land-use in the Project area at the time. Two noise monitoring locations were selected as representative sites to obtain a sampling of the ambient baseline noise environment. These measurement locations are depicted on Figure 3.11-1 and described below.

- **Location ST-1** was located in the industrial area along Seafood Way between the Harpoon Brewery and the Globe Fish Company (New Boston Seafood Center). Daytime noise sources at this location included heavy truck traffic, loading dock activities, and HVAC equipment. At night, sound levels were influenced primarily by HVAC equipment, idling trucks, and distant vehicle traffic. This location was selected to represent sound levels in the industrial area to the east and southeast of the Project.

- **Location ST-2** was located along Trilling Way in front of the Park Lane Seaport Apartment complex, immediately across from the western Project property line (currently a parking lot). Daytime and nighttime noise sources at this location consisted of car, bus, and truck traffic on local roads including I-90, passing pedestrian conversations, loading dock activities from the nearby industrial buildings, and Silver Line transit noise from the SL2 MBTA stop. This location was selected to represent sound levels at the Project property line, at the nearest residential receptor to the west of the Project, and at the commercial structures to the north of the Project, including the Bank of America Pavilion.

3.11.3.3 Noise Monitoring Equipment

A Larson Davis Model 831 sound level meter equipped with a PRM831 Type I Preamplifier, a 377B20 half-inch microphone, and manufacturer-provided windscreen was used to collect background sound pressure level data. This instrumentation meets the "Type 1 - Precision" requirements set forth in American National Standards Institute (ANSI) S1.4 for acoustical measuring devices. The measurement equipment was calibrated in the field before and after the surveys with a Larson Davis CAL200 acoustical calibrator which meets the standards of IEC 942 Class 1L and ANSI S1.40-1984. Statistical descriptors (L_{eq}, L_{90}, etc.) were calculated for each 20-minute sampling period, with octave-band sound levels corresponding to the same data set processed for the broadband levels.

3.11.3.4 Measured Background Noise Levels

Baseline (measured background) noise monitoring results are presented in Table 3.11-2, and summarized below:

- The daytime residual background (L_{90} dBA) measurements ranged from 56 to 65 dBA;

- The nighttime residual background (L_{90} dBA) measurements ranged from 48 to 58 dBA;

- The daytime equivalent level (L_{eq} dBA) measurements ranged from 64 to 71 dBA;

- The nighttime equivalent level (L_{eq} dBA) measurements ranged from 56 to 60 dBA;

3.11.4 Future Conditions

The primary sources of continuous sound exterior to the mixed use/hotel and residential apartment complex Project will include ventilation, cooling, and emergency power noise sources, the majority of which will be rooftop in nature, with the exception being several exhaust fans related to parking garage ventilation.

3.11.4.1 Overview of Potential Project Noise Sources

Four cooling towers and four energy recover units (ERUs) will be located on the roofs of the proposed buildings (two each per building), while six garage ventilation fans will be exhausted horizontally through the southern façade of the proposed apartment building along Massport Haul Road. Other secondary noise sources, including domestic hot water heaters, boilers, and pumps will be located within rooftop penthouses and were not considered in this analysis to contribute significantly to the overall sound level. No credit was taken for shielding due to the louvered screening walls.

Two emergency diesel generators will be located at roof level (one per building) in a dedicated weather-proof, sound-attenuating enclosure, exhausted vertically. It is assumed that these generators will only operate during the day for brief, routine testing when background sound levels will be higher, or during an emergency interruption of the electrical grid when other rooftop mechanical equipment will not be operating.

Mitigation will be applied to multiple sources as needed, to ensure compliance with the applicable noise regulations. The noise control features assumed in this analysis, as described in Table 3.11-3, included generator enclosures and critical-grade generator exhaust silencers. To further limit impacts, the required periodic routine testing of the emergency generators should and will be scheduled during daytime hours when background sound levels will be highest.

A tabular summary of the modeled mechanical equipment proposed for the Project is presented below in Table 3.11-4a. Sound power level data for each unit, as provided by the manufacturer or calculated from provided sound pressure level data, is presented in Table 3.11-4b. Sound power levels of those units for which data was not provided were assumed based on data for similar or representative equipment. The approximate locations of the mechanical equipment were provided by the Project team in a preliminary roof plan.

3.11.4.2 Noise Modeling Methodology

Noise impacts from mechanical equipment associated with the Project were predicted using Cadna/A noise calculation software (DataKustik Corporation, 2005). This software, which uses the ISO 9613-2 international standard for sound propagation (Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation), offers a

refined set of computations accounting for local topography, ground attenuation, drop-off with distance, barrier shielding, diffraction around building edges, reflection off building facades, and atmospheric absorption of sound from multiple noise sources.

An initial analysis considered all of the mechanical equipment without the emergency generators running, to simulate typical nighttime operating conditions at nearby receptors. A second analysis combined the mechanical equipment and the emergency generators, to reflect worse-case daytime conditions during brief, routine, testing of the generators.

3.11.4.3 Noise Modeling Results

In the first modeling scenario, the analysis of sound levels at night considered all of the mechanical equipment without the emergency generators running, to simulate typical nighttime operating conditions at nearby receptors. In the second modeling scenario, the analysis combined sound emissions from the mechanical equipment and the emergency generators, to reflect worse-case conditions during brief, routine, daytime testing of the generators when ambient levels are higher. Six modeling locations with a height of 1.5 meters above-grade were included in both analyses, consisting of nearby residential, business and industrial locations, and were evaluated against the applicable daytime or nighttime background sound levels and noise limits. Figure 3.11-1 shows the locations of each modeled receptor as well as the monitoring locations selected for background measurements.

In both scenarios, the predicted future sound levels (Project + Background) are well below MassDEP criteria of 10dBA over the measured background L_{90} sound levels at all sensitive receptor locations. This evaluation, with and without emergency generators, is presented in Tables 3.11-5a and 3.11-5b, respectively. The Project's mechanical equipment is not expected to create or exacerbate any "pure-tone" conditions as defined by MassDEP when combined with existing background sound levels at these locations. Predicted sound levels combining Project and background sources are shown with and without emergency generators in Tables 3.11-6a and 3.11-6b, respectively. Additionally, modeled sound levels from Project equipment are within the most stringent broadband and octave-band residential zoning limits for the City of Boston at the closest residential receptors and also meet the business and industrial limits where applicable. This evaluation is presented with and without emergency generators in Tables 3.11-7a and 3.11-7b, respectively.

3.11.5 Interior Noise

The preservation and enhancement of the surrounding working port has been Massport's priority throughout the planning of all CFDA development, including Parcel K. Several mitigation measures have been included within the Project that serve to further the goal of preserving the port by limiting the potential noise impacts of airplanes and trucks on future occupants of the residential apartment and hotel buildings. These measures include the following:

- Residential use will be limited to rentals and conversion to any equity form of ownership (condominiums or cooperatives) and lease terms over two years will be prohibited. These conditions will be identified in the ground lease between Massport and the Proponent.

- Ground floor residential use is not proposed and will be prohibited, with the exception of a lobby area related to residential apartment units on the upper floors.

- Building construction and design requirements that specifically address the transfer of noise from adjacent streets to interior spaces will be required as part of Massport's design approvals, and incorporated into the Project. These design elements include sound-reducing windows and wall materials and insulation that reduce the transfer of noise to interior spaces.

- Active retail/public uses will be located on the ground floor along major streets, while the rental housing and hotel entry areas will be located within the urban court and/or on Congress Street, away from Northern Avenue and Massport Haul Road.

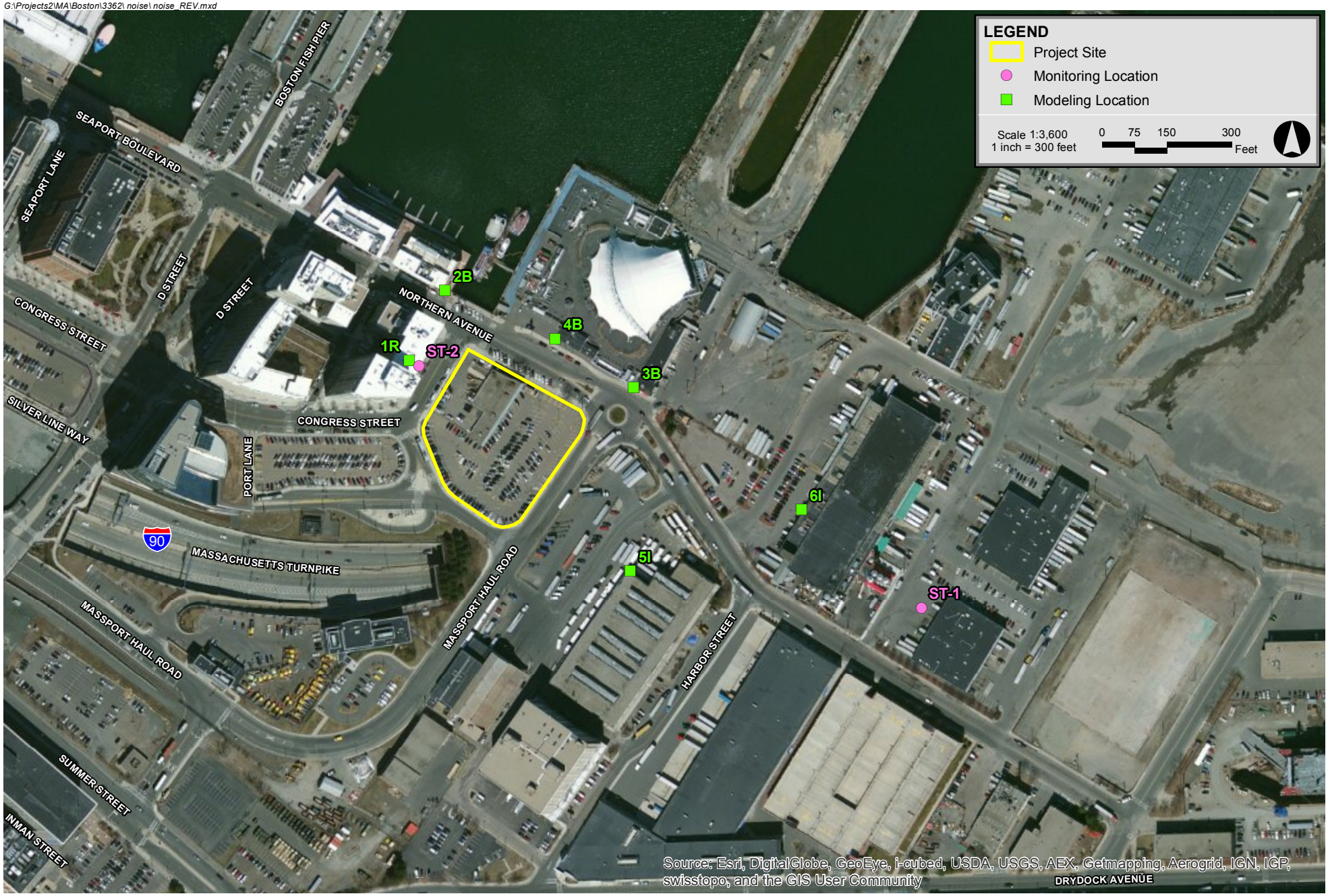
- Massport approval of the form of apartment lease will be required. Massport will require the apartment lease form to include, at a minimum, an acknowledgement by the tenant that the apartment is located in the vicinity of the industrial port, and proximate to established truck routes and Logan International Airport.

Long-haul trucking associated with the port principally takes place Monday through Friday, during the typical workday. During that time, the residential apartment and hotel buildings will typically have a smaller occupancy. As a result, port cargo truck noise impacts on residents and guests may inherently be limited.

As noted above, building construction and design elements that specifically reduce the transfer of noise from adjacent streets to interior spaces will be incorporated into the Project's design, including the use of precast concrete panels as wall material, sound reducing windows, and joining elements that are specially designed to maximize noise attenuation. Since relatively quiet interior noise levels will be an important element in promoting the hotel and residential apartment space to the marketplace, it will be in the Proponent's own interest to ensure the appropriate sound level attenuation architectural features are incorporated in the final design of the Project.

Vehicular traffic, including truck traffic, also contributes to noise levels. As noted above, in order to address this potential impact, the Project will prohibit residential living space on the ground floor, require acknowledgement by tenants that the apartment is near a working port area, limit lease term to two years, and include appropriate design and construction features.

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Parcel K Boston, Massachusetts

Epsilon Associates Inc.

Figure 3.11-1

Noise Monitoring and Modeling Locations

Finally, it should be noted that these same requirements have proven successful at the residences in the adjacent Park Lane Seaport Apartments, and in the course of their occupancy Massport has not received a single residential complaint concerning noise.

3.11.6 Conclusions

Baseline noise levels were measured in the vicinity of the proposed Project and were compared to predicted noise levels based on information provided by the manufacturers of representative mechanical equipment or estimated from the equipment's capacity. With appropriate mitigation (listed below), the Project is not expected to introduce significant outdoor mechanical equipment noise into the surrounding community.

The recommended mitigation efforts included in the analysis are as follows:

- The emergency generators should be fitted with a critical-grade exhaust silencer and sound-attenuating enclosure, similar to that specified in Tables 3.11-3 and 3.11-4b.

- Routine testing of the generators should be scheduled during daytime hours only when background sound levels are higher.

Results of this analysis indicate that noise levels from the Project at the nearest receptors will be equal to or below the City of Boston Noise Zoning requirements based on land-use, and will comply with all MassDEP A-weighted and tonal noise limits. The results in Section 3.11.4.3 indicate that the proposed Project can operate without significant impact on the existing acoustical environment.

At this time, the mechanical equipment and noise controls are conceptual in nature and, during the final design phase of the Project, will be specified to meet the applicable City of Boston and MassDEP noise limits. Additional mitigation may include the selection of quieter units, acoustical louvers, screening walls, mufflers, or equipment enclosures, as needed.

Table 3.11-2 Summary of Measured Background Noise Levels

Location	Period	Start Time	LA_{eq}	L_{max}	LA_{10}	LA_{50}	LA_{90}	L_{90} Sound Pressure Level by Octave-Band								
								32 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
			dBA	dBA	dBA	dBA	dBA	dB	dB	dB	dB	dB	dB	dB	dB	dB
ST-1	Day	1:17 PM	71	93	74	68	65	70	70	68	64	61	60	56	49	41
ST-2	Day	12:50 PM	64	81	67	60	56	66	65	60	55	53	52	46	38	31
ST-1	Night	12:02 AM	60	67	61	60	58	62	60	60	59	57	53	48	39	31
ST-2	Night	12:32 AM	56	75	59	51	48	58	55	53	49	45	44	35	24	18

Weather Conditions:

	Date	Temp	RH	Sky	Wind
Daytime	Friday, January 18, 2013	30ºF	25%	Sunny	2-7 mph WSW
Nighttime	Friday, January 18, 2013	30ºF	40%	Overcast	2-9 mph N

Monitoring Equipment Used:

	Manufacturer	Model	S/N
Sound Level Meter	Larson Davis	LD831	2154
Microphone	Larson Davis	377B20	112245
Preamp	Larson Davis	PRM831	016477
Calibrator	Larson Davis	CAL200	7147

Table 3.11-3 Attenuation Values Used for Noise Modeling (dB)

Noise Control	Noise Source	Noise Reduction (dB) per Octave-band Center Frequency (Hz)								
		32	63	125	250	500	1000	2000	4000	8000
Exhaust Silencer[1]	Emergency Diesel Generator Exhaust	-	20	35	35	27	20	20	22	22

Notes: Assumed JB Series Critical Grade Silencer (JB-18)

Table 3.11-4a Modeled Noise Sources (Project Mechanical Equipment)

Noise Source	Quantity	Location	Size/Capacity per Unit
Cooling Tower	4	Hotel Roof at 110 ft AGL (x2) Apartment Roof at 122 ft AGL (x2)	200 - 350 Ton
Energy Recovery Unit	4	Hotel Roof at 110 ft AGL (x2) Apartment Roof at 120 ft AGL (x2)	8400 - 9000 CFM
Garage Exhaust Fan	6	Eastern Façade of Hotel Building – 10 ft AGL	33,000 CFM
Emergency Generator	2	Hotel Roof at 110 ft AGL (x1) Apartment Roof at 120 ft AGL (x1)	800 kW

Table 3.11-4b Modeled Sound Power Levels per Unit

Noise Source	Broadband	32 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
	dBA	dB	dB	dB	dB	dB	dB	dB	dB	dB
Cooling Tower[1]	92	96	96	93	92	89	87	82	79	73
Energy Recovery Unit[2]	87	88	88	89	89	83	82	76	71	65
Garage Exhaust Fan[3]	93	89	89	93	94	91	88	85	78	68
Emergency Generator - Mechanical (Enclosed)[4]	102	114	114	112	103	100	93	89	89	83
Emergency Generator - Exhaust (Unsilenced)[5]	118	82	82	108	118	114	113	112	103	84

Notes:

1. Marley Model NC8405NLN2, single-cell induced draft cooling tower with quiet fan
2. Comefri Model ATZAF 20-20 T1, 9,000 CFM, Total Lw at Free Outlet
3. Cook Model 365QMX, 33,000 cfm, 36.5" impeller, inlet + outlet sound power level
4. Caterpillar Diesel Generator Set (SR4B Generator/C27 TA Engine), 800 kW, SA Canopy
5. Caterpillar Diesel Generator Set (SR4B Generator/C27 TA Engine), 800 kW, Open Exhaust

Table 3.11-5a MassDEP Compliance Evaluation (*With* Emergency Generators)

Receptor Description	Receptor ID	Land Use	Representative Background ID	Evaluation Period	Measured Background Noise Level	Modeled Project-Only Noise Level	Combined Project + Background Noise Level	Project Impact[1]	Meets MassDEP Noise Policy?
					dBA	dBA	dBA	dBA	
Park Lane Seaport Apartments	1R	Residential	ST-2	Day	56	45	57	0	YES
Legal Harborside	2B	Business	ST-2	Day	56	49	57	1	YES
Yankee Lobster	3B	Business	ST-2	Day	56	59	61	4	YES
Bank of America Pavilion	4B	Business	ST-2	Day	56	49	57	1	YES
Boston Freight Terminals	5I	Industrial	ST-1	Day	65	60	66	1	YES
Harpoon Brewery	6I	Industrial	ST-1	Day	65	56	65	0	YES

Table 3.11-5b MassDEP Compliance Evaluation (*Without* Emergency Generators)

Receptor Description	Receptor ID	Land Use	Representative Background ID	Evaluation Period	Measured Background Noise Level	Modeled Project-Only Noise Level	Combined Project + Background Noise Level	Project Impact[1]	Meets MassDEP Noise Policy?
					dBA	dBA	dBA	dBA	
Park Lane Seaport Apartments	1R	Residential	ST-2	Night	48	33	48	0	YES
Legal Harborside	2B	Business	ST-2	Day	56	32	56	0	YES
Yankee Lobster	3B	Business	ST-2	Day	56	58	60	4	YES
Bank of America Pavilion	4B	Business	ST-2	Day	56	46	57	0	YES
Boston Freight Terminals	5I	Industrial	ST-1	Night	58	59	61	3	YES
Harpoon Brewery	6I	Industrial	ST-1	Night	58	54	60	1	YES

1. Calculation of increase over background performed using data rounded to nearest whole decibel

Table 3.11-6a MassDEP "Pure Tone" Evaluation: Combined Project + Background Levels (*With* Emergency Generators)

Receptor Description	Receptor ID	Land Use	Period	dBA	32 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
					dB	dB	dB	dB	dB	dB	dB	dB	dB
Park Lane Seaport Apartments	1R	Residential	Day	57	68	67	62	56	53	52	46	38	31
Legal Harborside	2B	Business	Day	57	67	67	62	56	53	52	46	39	31
Yankee Lobster	3B	Business	Day	61	69	68	65	61	58	56	51	43	31
Bank of America Pavilion	4B	Business	Day	57	68	67	62	56	54	53	47	39	31
Boston Freight Terminals	5I	Industrial	Day	66	72	72	70	66	63	61	57	50	42
Harpoon Brewery	6I	Industrial	Day	65	70	71	69	65	62	60	56	50	41

Table 3.11-6b MassDEP "Pure Tone" Evaluation: Combined Project + Background Levels (*Without* Emergency Generators)

Receptor Description	Receptor ID	Land Use	Period	dBA	32 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
					dB	dB	dB	dB	dB	dB	dB	dB	dB
Park Lane Seaport Apartments	1R	Residential	Night	48	58	56	53	49	46	44	35	24	18
Legal Harborside	2B	Business	Day	56	66	65	60	55	53	52	46	38	31
Yankee Lobster	3B	Business	Day	60	66	66	62	61	58	55	51	43	31
Bank of America Pavilion	4B	Business	Day	57	66	66	60	56	53	52	46	38	31
Boston Freight Terminals	5I	Industrial	Night	61	63	61	63	62	60	56	52	43	31
Harpoon Brewery	6I	Industrial	Night	60	62	60	61	60	58	54	50	40	31

Table 3.11-7a City of Boston Compliance Evaluation: Project-Only Modeling Results (*With* Emergency Generators)

Receptor Description	Receptor ID	Land Use	Period	dBA	32 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
					dB	dB	dB	dB	dB	dB	dB	dB	dB
Park Lane Seaport Apartments	1R	Residential	Day	45	63	61	56	46	42	37	34	26	11
Legal Harborside	2B	Business	Day	49	60	62	59	49	46	42	38	30	9
Yankee Lobster	3B	Business	Day	59	66	65	63	60	56	53	50	41	25
Bank of America Pavilion	4B	Business	Day	49	63	61	57	50	46	44	40	31	12
Boston Freight Terminals	5I	Industrial	Day	60	67	67	66	61	58	55	51	43	26
Harpoon Brewery	6I	Industrial	Day	56	62	64	62	57	53	50	46	36	12
City of Boston Noise Limits	Residential		Day	60	76	75	69	62	56	50	45	40	38
			Night	50	68	67	61	52	46	40	33	28	26
	Residential/Industrial		Day	65	79	78	73	68	62	56	51	47	44
			Night	55	72	71	65	57	51	45	39	34	32
	Business		Day	65	79	78	73	68	62	56	51	47	44
			Night	65	79	78	73	68	62	56	51	47	44
	Industrial		Day	70	83	82	77	73	67	61	57	53	50
			Night	70	83	82	77	73	67	61	57	53	50

Table 3.11-7b City of Boston Compliance Evaluation: Project-Only Modeling Results (*Without* Emergency Generators)

Receptor Description	Receptor ID	Land Use	Period	dBA	32 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
					dB	dB	dB	dB	dB	dB	dB	dB	dB
Park Lane Seaport Apartments	1R	Residential	Night	33	45	43	39	36	31	27	22	14	0
Legal Harborside	2B	Business	Day	32	42	40	36	33	27	29	23	14	0
Yankee Lobster	3B	Business	Day	58	55	55	58	59	56	53	49	41	24
Bank of America Pavilion	4B	Business	Day	46	51	50	48	48	43	41	35	28	9
Boston Freight Terminals	5I	Industrial	Night	59	55	55	59	59	56	54	50	41	23
Harpoon Brewery	6I	Industrial	Night	54	50	52	54	55	52	49	44	33	8
City of Boston Noise Limits	Residential		Day	60	76	75	69	62	56	50	45	40	38
			Night	50	68	67	61	52	46	40	33	28	26
	Residential/Industrial		Day	65	79	78	73	68	62	56	51	47	44
			Night	55	72	71	65	57	51	45	39	34	32
	Business		Day	65	79	78	73	68	62	56	51	47	44
			Night	65	79	78	73	68	62	56	51	47	44
	Industrial		Day	70	83	82	77	73	67	61	57	53	50
			Night	70	83	82	77	73	67	61	57	53	50

3.12 Construction Impacts

3.12.1 Introduction

A Construction Management Plan (CMP) in compliance with Massport requirements and the City's Construction Management Program will be submitted to Massport and the BTD once final plans are developed and the construction schedule is fixed. The construction contractor will be required to comply with the details and conditions of the approved CMP.

Proper pre-planning with Massport, the City and neighborhood will be essential to the successful construction of the Project. Construction methodologies that insure public safety and protect nearby residences and businesses will be employed. Techniques such as barricades, walkways, and signage will be used. The CMP will include routing plans for trucking and deliveries, plans for the protection of existing utilities, and control of noise and dust.

Periodic meetings will also be held with abutters and neighborhood representatives to describe the ongoing work and to discuss measures that will be taken to minimize impacts on the community.

During the construction phase of the Project, the Proponent will provide the name, telephone number and address of a contact person to communicate with on issues related to the construction. The construction contact will be a person whose responsibility it is to respond to the questions/comments/complaints of the abutters and residents of the neighborhoods.

3.12.2 Construction Methodology/Public Safety

Construction methodologies that ensure public safety and protect nearby commercial and residential tenants will be employed. Techniques such as barricades and signage will be used. Construction management and scheduling will minimize impacts on the surrounding environment and will include plans for construction worker commuting and parking, routing plans for trucking and deliveries, and the control of noise and dust.

It may be necessary to occasionally occupy pedestrian walkways and parking lanes on the surrounding streets. As the design of the Project progresses, the Proponent will meet with Massport, the BTD, and the MBTA, as necessary, to discuss the specific location of barricades, the need for lane closures, pedestrian walkways, and truck queuing areas. Secure fencing, signage, and covered walkways and, if required, the suspension of the use of certain sidewalks during the most hazardous periods of overhead work activity during the construction of the superstructure, may be employed to ensure the safety and efficiency of all pedestrian and vehicular traffic flows. In addition, sidewalk areas and walkways near construction activities will be well marked and lighted to protect pedestrians and ensure their safety. Public safety for pedestrians on abutting sidewalks will also include covered pedestrian walkways when appropriate. If required by Massport, police details will be

provided to facilitate traffic flow. These measures will be incorporated into the CMP which will be submitted to Massport and the BTD for approval prior to the commencement of construction work.

3.12.3 Construction Schedule

Site work is anticipated to commence in fourth quarter of 2014. It is anticipated that the Project will be completed eighteen to twenty-four months thereafter.

Typical construction hours will be from 7:00 AM to 6:00 PM, Monday through Friday, with most shifts ordinarily ending at 3:30 PM. No substantial sound-generating activity will occur before 7:00 AM. If longer hours, additional shifts, or Saturday work is required, the construction manager will place a work permit request to Massport in advance. Notification should occur during normal business hours, Monday through Friday. It is noted that some activities such as finishing activities could run beyond 6:00 PM to ensure the structural integrity of the finished product (i.e. certain components must be completed in a single pour, and placement of concrete cannot be interrupted).

3.12.4 Construction Staging/Access

Access to the site and construction staging areas will be provided in the CMP.

Although specific construction and staging details have not been finalized, the Proponent and its construction management consultant will work to ensure that staging areas will be located to minimize impacts to pedestrian and vehicular flow. Secure fencing and barricades will be used to isolate construction areas from pedestrian traffic adjacent to the site. Construction procedures will be designed to meet all Occupational Safety and Health Administration (OSHA) safety standards for specific site construction activities.

3.12.5 Construction Mitigation

The Proponent will follow Massport, City and MassDEP guidelines which will direct the evaluation and mitigation of construction impacts. As part of this process, the Proponent and construction team will evaluate and comply with the Commonwealth's Clean Air Construction Initiative.

A CMP will be submitted to Massport and the BTD for review and approval prior to issuance of a Building Permit. The CMP will include detailed information on specific construction mitigation measures and construction methodologies to minimize impacts to abutters and the local community. The CMP will also define truck routes which will help in minimizing the impact of trucks on neighborhood streets.

"Don't Dump - Drains to Boston Harbor" plaques will be permanently installed at storm drains that are replaced or installed by the redevelopment.

3.12.6 Construction Employment and Worker Transportation

The number of workers required during the construction period will vary. It is anticipated that approximately 900 construction jobs will be created over the period of construction. The Proponent will make reasonable good-faith efforts to have at least 50% of the total employee work hours filled by Boston residents, at least 25% of total employee work hours filled by minorities and at least 10% of the total employee work hours filled by women. The Proponent will enter into a jobs agreement with the City of Boston.

To reduce vehicle trips to and from the construction site, minimal construction worker parking will be available at the site and all workers will be strongly encouraged to use public transportation and ridesharing options. The general contractor will work aggressively to ensure that construction workers are well informed of the public transportation options serving the area. Space will be made available on-site for workers' supplies and tools so they do not have to be transported to and from the site each day.

3.12.7 Construction Truck Routes and Deliveries

Truck traffic will vary throughout the construction period, depending on the activity. The construction team will manage deliveries to the site during morning and afternoon peak hours in a manner that minimizes disruption to traffic flow on adjacent streets. Construction truck routes to and from the site for contractor personnel, supplies, materials, and removal of excavations required for the development will be coordinated with Massport and the BTD. Traffic logistics and routing will be planned to minimize community impacts. Truck access during construction will be determined by Massport and the BTD as part of the CMP. These routes will be mandated as a part of all subcontractors' contracts for the development. The construction team will provide subcontractors and vendors with "Construction Vehicle" and "Delivery Truck" route brochures in advance of construction activity.

"No Idling" signs will be included at the construction loading, delivery, pick-up and drop-off areas.

3.12.8 Construction Air Quality

Short-term air quality impacts from fugitive dust may be expected during excavation and the early phases of construction. Plans for controlling fugitive dust during excavation and construction include mechanical street sweeping, wetting portions of the site during periods of high wind, and careful removal of soil and debris by covered trucks. The construction contract will provide for a number of strictly enforced measures to be used by contractors to reduce potential emissions and minimize impacts, pursuant to Article 80 guidelines. These measures are expected to include:

- Using wetting agents on areas of exposed soil on a scheduled basis;

- Using covered trucks;
- Minimizing spoils on the construction site;
- Monitoring of actual construction practices to ensure that unnecessary transfers and mechanical disturbances of loose materials are minimized;
- Minimizing storage of debris on the site; and
- Routine street and sidewalk cleaning with water to minimize dust accumulations.

3.12.9 Construction Noise

The Proponent is committed to mitigating noise impacts from the construction of the Project. Increased community sound levels, however, are an inherent consequence of construction activities. Construction work will comply with the requirements of the City of Boston Noise Ordinance. Every reasonable effort will be made to minimize the noise impact of construction activities.

Mitigation measures are expected to include:

- Instituting a proactive program to ensure compliance with the City of Boston noise limitation policy;
- Using appropriate mufflers on all equipment and ongoing maintenance of intake and exhaust mufflers;
- Muffling enclosures on continuously running equipment, such as air compressors and welding generators;
- Replacing specific construction operations and techniques by less noisy ones where feasible;
- Selecting the quietest of alternative items of equipment where feasible;
- Scheduling equipment operations to keep average noise levels low, to synchronize the noisiest operations with times of highest ambient levels, and to maintain relatively uniform noise levels;
- Turning off idling equipment; and
- Locating noisy equipment at locations that protect sensitive locations by shielding or distance.

3.12.10 Construction Vibration

All means and methods for performing work at the site will be evaluated for potential vibration impacts on adjoining property, utilities, and adjacent existing structures. Acceptable vibration criteria will be established prior to construction, and vibration will be monitored, if required, during construction to ensure compliance with the agreed-upon standard and/or pre-construction conditions.

3.12.11 Construction Waste

The Proponent will take an active role with regard to the reprocessing and recycling of construction waste. As called out in Section 3.14, Sustainable Design, the Project will divert at least 75% of construction waste from landfills during construction. The disposal contract will include specific requirements that will ensure that construction procedures allow for the necessary segregation, reprocessing, reuse and recycling of materials when possible. For those materials that cannot be recycled, solid waste will be transported in covered trucks to an approved solid waste facility, per MassDEP Regulations for Solid Waste Facilities, 310 CMR 16.00 and in compliance with Massport requirements. This requirement will be specified in the disposal contract. Construction will be conducted so that materials that may be recycled are segregated from those materials not recyclable to enable disposal at an approved solid waste facility.

3.12.12 Protection of Utilities

Existing public and private infrastructure located within the public right-of-way will be protected during construction. The installation of proposed utilities within the public way will be in accordance with Massport, MWRA, BWSC, Dig Safe, and the governing utility company requirements. All necessary permits will be obtained before the commencement of the specific utility installation. Specific methods for constructing proposed utilities where they are near to, or connect with, existing water, sewer and drain facilities will be reviewed by BWSC as part of its site plan review process.

3.12.13 Rodent Control

A rodent extermination certificate will be filed with each building permit application. Rodent inspection monitoring and treatment will be carried out before, during, and at the completion of all construction work in compliance with the Massport requirements. Rodent extermination prior to work start-up will consist of treatment of areas throughout the site. During the construction process, regular service visits will be made.

3.13 Wildlife Habitat

The site is currently developed and, as such, the redevelopment will not impact wildlife or wildlife habitats. The Massachusetts Natural Heritage and Endangered Species Program Natural Heritage Atlas (13th Edition, Effective October 1, 2008) indicates that the site does not lie within a Priority Habitat of Rare Species or within an Estimated Habitat of Rare Wildlife.

3.14 Sustainable Design

The Parcel K Project Team is committed to the advancement of sustainable and environmentally conscious design and construction. The Proponent will seek a rating of "LEED Silver" through the design, construction, and implementation of key sustainable strategies, consistent with the policies of Massport and the City of Boston.

As part of the Schematic Design phase, the Project Team has identified a number of sustainable strategies within the LEED for New Construction rating system that will be developed and refined during the design of the Project. As the Project is in the early design process, some of these strategies are expected to evolve and change with the design of the building. Ultimately, the Project Team will meet the Massport Sustainable Design Guidelines and Standards, the City of Boston Green Building Standard, the Massachusetts LEED Plus requirements, and the Stretch Code requirements for the Project. An overview of the LEED points the development will be seeking within each category is described below, and a checklist itemizing the points within each category is included in Appendix E, LEED Checklist.

3.14.1 Sustainable Sites

The proposed development will replace an impervious surface parking lot with two buildings organized around a central urban court. Portions of the urban court and sidewalk will have pervious conditions, with the possibility of a green roof on one or more of the buildings, thus improving upon the existing state of the site to handle stormwater. In addition, the design team is looking at locations for stormceptors, which would remove 80% of the average annual TSS, achieving Credit 6.2, Stormwater Design, Quality Control for LEED. Section 7.3.4 outlines additional details of the Project's stormwater design and control.

The Project seeks to reduce the use of vehicular transportation by providing alternative transportation options to residents, hotel guests, and visitors. The site is adjacent to the MBTA Silver Line bus stop, allowing easy access to public transportation. Other alternative transportation measures include pedestrian friendly paths and bicycle storage. Meanwhile, 5% of the underground parking garage spaces will be designated for low-emitting and fuel-efficient vehicles. The Project's mix of uses (retail, office, restaurant, residential apartment, and hotel) complements and enhances the existing uses in the area, ultimately creating a

more walkable pedestrian environment. Section 2.3.2 outlines the Project's alternative transportation measures, which the Proponent will implement to seek a LEED Innovation in Design credit. Reducing the heat island effect, which has been categorized as a regional priority for Boston, will be achieved through the use of high albedo materials on sidewalks, roof surfaces, and the courtyard terrace.

3.14.2 Water Efficiency

The Project will reduce water usage by designing the streetscape, urban court, and courtyard terrace landscaping to minimize demand for water by a minimum of 50%. This will be accomplished with non-invasive native plants which require low or no irrigation and are known for their ability to withstand adverse conditions. The Project will also specify plumbing fixtures in the buildings to achieve a minimum 30% reduction in water-use through low-flow water-closets, low-flow showers, and low-flow sinks. The Project Team will also study and consider the implementation of rainwater harvesting, designed to capture runoff from both the building roofs and the courtyard terrace impervious surfaces, and to be circulated for reuse.

3.14.3 Energy and Atmosphere

The Project Team plans to optimize energy efficiency through an integrated approach to the building's envelope design and building systems. As part of the schematic design phase, the buildings' orientation, massing, and materials have been designed so as to address, as much as possible, optimal solar orientation, daylighting, and potential heat gain and loss. For example, to minimize heat gain during the warmer months, the north side of the building is clad in a higher percentage of glazing than the eastern and southern facades. Similarly, the building massing has been shaped to maximize daylight in the central urban court and courtyard terrace spaces for three out of four seasons. These measures will reduce the energy load of the building and be combined with energy-efficient building systems to create a reduced energy use. The energy-efficient systems to be implemented will include Energy Star equipment and appliances within the residential apartment units, energy-efficient elevators, room occupancy sensors for lighting, radiant heat in the lobby areas, and demand-controlled ventilation in the parking garage. In addition, non-HCFC air-conditioning refrigerant will be selected and tested to ensure the proper performance and minimize contributions to ozone depletion and global warming. The Project will purchase renewable energy certificates for a percentage of the electricity use to reduce greenhouse gas emissions produced by the building's energy consumption.

An energy model was constructed during the schematic design phase to test design assumptions, which demonstrated a 22% site energy savings for the residential apartment building and a 28% site energy savings for the hotel. During subsequent design phases, the Project Team will refine the energy model of both buildings to continue to exceed ASHRAE

Standard 90.1-2007 site energy by at least 20% in the final design as required in the Mass LEED Plus standard, as well as reduce the energy cost savings by a minimum of 14% as outlined by the LEED rating system.

Commissioning will be performed based on the LEED Enhanced Commissioning requirements to ensure the building systems are operating in accordance with the design goals. The Project Team will also explore developing a measurement and verification plan to both monitor the performance of these systems over the life of the buildings and ensure the energy savings are being achieved post-occupancy.

3.14.4 Materials and Resources

The Project will exemplify responsible waste management practices by diverting at least 75% of construction waste from landfills during construction, as well as reducing post-occupancy waste by providing a designated room on each floor for residents to dispose of their recyclables. The Project Team will seek to reduce construction waste generation to a level below the industry norm through investigating local options for recycling and reusing construction waste and documenting the diversion rate during the construction process. For additional detail regarding waste management, refer to section 3.10.2, *Recycling During Operation*, and 3.12.11, *Construction Waste*. Sustainable materials that are recycled, salvaged, responsibly harvested, and locally sourced will be incorporated as much as reasonably possible within the building's design. Building component materials will be evaluated not only by their material content, but by their embodied energy, maintenance, and durability, as well.

3.14.5 Indoor Environmental Quality

The Project is deeply committed to designing an indoor environment that provides a healthy quality of life for the building residents, tenants, guests, and staff. Low-emitting materials will be chosen for the Project, including adhesives, paints, and flooring. The Project will also develop a construction Indoor Air Quality Management plan during construction and prior to occupancy to insure good air quality for incoming occupants. Green housekeeping practices will be deployed to support a healthy indoor air quality after building occupancy. Building spaces will be designed to meet appropriate human comfort levels and allow for individual control of the lighting and thermal environment. Finally, as discussed in Section 3.11.5, Interior Noise, the Project will include sound insulation and building features designed to limit the impact of exterior noise on interior spaces.

3.15 Climate Adaptability

The Parcel K design team has adopted and is examining a range of strategies to address rising sea levels, potential storm surges and climate change within the buildings' design and overall site design. The objectives of this effort are to minimize flood damage risk to the extent feasible within the existing physical boundary constraints of the site, to provide

design features that will support the rapid re-occupation of the building following a storm, and to provide for basic needs such as safety, drinking water, and habitable temperature for building occupants. Designing for the rapid re-occupation of the building has been characterized by others to be "designing for resilience."

The proposed design draws on the anticipated and recent building code changes underway in New York in response to Superstorm Sandy, while also taking into account the storm surge predictions for South Boston, as outlined in Boston's "Preparing for the Rising Tide" report.

Exactly what elevation should be used as the design flood elevation for Parcel K is the subject of some uncertainty. Future flood tides in Boston Harbor will result from a combination of the gradual rise in average sea level, the specific characteristics of future storm events, and the timing of the storms relative to the tidal cycle. As of the date of this filing, two versions of FEMA maps have been released and are under consideration. The 2009 FEMA maps established a 100-year flood elevation of 9.0 feet NAVD-88 (15.46 feet Boston City Base - BCB). More recently, the November 15, 2013 "Preliminary" FEMA maps have raised the estimated 100-year flood elevation of the site to 13.0 feet NAVD-88 (19.46 feet BCB), representing a 4.0 foot increase at the Parcel K site.

Due to the release of the Preliminary FEMA maps only days before this document was completed, it is not possible to completely redesign the measures incorporated within the design of the Project based on the November 2013 draft FEMA maps. However, the Proponent will work actively to address the higher flood elevation over the upcoming months, designing the building to be responsive to this change in elevation. The original design assumptions were based on the 2009 FEMA maps and the storm surge scenarios outlined in Boston's "Preparing for the Rising Tide" report. These assumptions are noted below:

The derivation of the Parcel K design flood elevation is as follows:

- FEMA (2009) 1% flood elevation = 9.0 feet NAVD = 15.46 feet BCB
- Assume a 0.75 foot rise in average sea level during life of the Project
- Adjusted 1% storm elevation with sea level rise allowance = 16.21feet BCB
- Minimum first floor elevation = 16.30 feet BCB (retail and lobby spaces along Northern Avenue) to 18.00 feet BCB (mechanical rooms housing critical building systems along Silver Line Way)

3.15.1 Anticipated Sea Rise and Storm Surge Scenarios

The *Preparing for the Rising Tide* report issued in February 2013 by The Boston Harbor Association examined coastal flooding in Boston for three potential scenarios of sea level rise and storm surge flooding. These scenarios are described below along with their potential impact on the Project.

Scenario 1: MHHW (mean higher high water) + 2.5 feet or 7.3 feet NAVD88 / 13.76 feet (BCB). This scenario estimates the flooding that occurred during mid-day high tide on October 29, 2012 due to Superstorm Sandy. This resulted in minor flooding of streets and buildings near Boston's waterfront and would have no impact on the Project.

Scenario 2: MHHW + 5 feet or 9.8 feet NAVD88 / 16.26 feet BCB. This scenario estimates the current 100-year storm surge at high tide or the potential flooding that would have occurred in Boston if Superstorm Sandy's maximum storm surge had occurred at mid-day high tide on October 29, 2012. This elevation is also the approximate high-tide level in 2100, if sea level were to rise by 5 feet. This flooding scenario would have minimal impact on the Project, using the proposed design elevations of 16.30 feet BCB to 18.00 feet for the ground floor. Some flooding of the surrounding sidewalks could be anticipated.

Scenario 3: MHHW + 7.5 feet or 12.3 feet NAVD88 / 18.76 feet BCB. This scenario approximates the 100-year storm surge at high tide if sea levels are 2.5 feet higher. This flooding scenario would have more impact on the Project. The ground floor retail and lobby spaces, proposed at 16.30 feet BCB, would be approximately 2.5 feet below the calculated high water mark. The surrounding street and sidewalk grades limit how much the Proponent can raise the publicly accessible ground floor elevations. One way to address this is to design these spaces to anticipate flooding while also erecting temporary barriers outside the building, prior to a 100-year storm event. The ground floor elevation of the mechanical spaces, set at 18.00 feet BCB along the southern edge of the site at Silver Line Way, would be 0.76 feet below the predicted high water mark. To address this, the Proponent plans on elevating all critical equipment above this elevation, as described in more detail in the following pages.

3.15.2 Building Design

The following sections summarize how predicted sea level rise and potential storm surges have been incorporated in the site and building design.

3.15.2.1 Ground Floor Uses and Finish Floor Elevations

The finish floor elevations of the retail spaces, residential lobby, and hotel lobby are set at 16.30 feet BCB and need to stay close to the surrounding site grades, currently set at 15.50 feet BCB along Northern Avenue. While the ground floor elevation is only required to be set at 15.46 feet BCB, to meet the 2009 FEMA data, the Proponent has anticipated the need for a higher ground floor elevation to address storm surges and rising tides and is proposing

to set the ground floor 0.84 feet to 1.54 feet higher than the minimums currently required. The large retail space/flex office space adjacent to Starboard Lane is proposed to be set at a slightly higher elevation of 16.50 feet, or 17.00 feet BCB, due to the surrounding site conditions. To negotiate the change in grade between the street and ground floor, some 5% sloped sidewalks are anticipated up against the building to provide access to the entrances. A lower sidewalk is envisioned at street level to maintain accessibility and the required cross-slopes around the entire site. As the design of the buildings is refined and final flood elevations determined, the site design and ground floor elevations will be adjusted accordingly. The Proponent will also explore erecting temporary water barriers during a 100-year storm event to maximize resiliency.

3.15.2.2 Minimizing Water Flow/Seepage Pathways

When seeking to minimize flood intrusion within a building, all potential flow paths for water to enter a structure, including the below grade garage, need to be identified and addressed. Potential flow paths can include various air ducts to vent equipment or spaces, or access doors or hatches that are intended to provide access for maintenance. In order to minimize the risk of flow through such pathways, the Project will be designed to meet the criteria that no access pathways, other than pedestrian doorways and the entrance to the garage, will be constructed below elevation 18.0 feet BCB. The Proponent will coordinate with the utility companies to ensure the surrounding manholes do not increase the building's vulnerability to flooding and will install backwater valves to minimize damage to below-grade parking levels and prevent floodwater from entering the building through the sewer.

3.15.2.3 Site Design

Paving and landscaping will be designed for minor, short-term flooding. Sidewalks will be sloped toward tree pits and planted areas to capture stormwater during short rainstorms and minimize localized flooding. The size of the tree pits and structural soil below the sidewalk will be sized as large as possible to absorb rainwater. Salt tolerant trees and plants will be used on site.

3.15.2.4 Flood Flow Control at Garage Entrance

The crest elevation at the garage entrance will be 16.50 BCB. A trench drain will be included in the garage ramp to intercept leakage through the stop logs. The trench drain will drain to the garage seepage control drains and pumps. Those pumps will be connected to circuits powered by the buildings' emergency generator. As the design progresses the Proponent will explore whether storm gates should be integrated into the Project at the garage entry to offer further protection from flooding.

3.15.2.5 Elevation of Electrical Equipment and Feeds to Outlets

The onsite transfer switches and switch gear will be installed within the building in rooms where the floor elevation is set at 18.00 feet BCB. This equipment will be elevated above the finish floor, by at least 2 feet to keep the equipment clear of the 100-year storm surge at high tide (Scenario 3) and above the higher 100-year flood elevation estimated by the November 2013 Preliminary FEMA maps. The fuel oil storage tank will be located on the ground floor, at elevation 18.0 feet BCB as well. All electric wall outlets in the building will be above elevation 18.0 feet BCB, and all conduits leading to the electrical outlets on the first floor will be fed from above and not through the floor slab.

3.15.2.6 Elevation of Communications Equipment

The onsite routers or switch gear associated with the phone system, the internet connection, and the cable TV system will be installed within the building in rooms where the floor elevation is 18.0 feet BCB. All communication system wall outlets in the building will be above elevation 18.0 feet BCB, and all conduits leading to the communication outlets on the first floor will be fed from above and not through the floor slab.

3.15.2.7 Use of Water Resistant Building Materials

Sheet rock wall board, when saturated with water, becomes a major problem following a flood event. The interior walls on the first floor of the building will be constructed of water-resistant materials below elevation 19.5 feet.

3.15.2.8 Critical Equipment Connected to Emergency Generator

The storm conditions associated with a severe tidal surge are likely to result in failure of the power grid serving this portion of Boston. The building will be equipped with an emergency generator for circuits that serve equipment critical for a rapid recovery from a storm event.

3.15.2.9 Essential Safety

To ensure the basic needs of occupants remaining in the building immediately after a storm, the Proponent will address the need for drinking water, backup fire safety communication, and maintaining habitable temperatures without power in the design of Parcel K. Common area faucets, with water supplied directly through pressure off the public main, will be installed so residents can access water if pumps are offline. An analogue and wireless connection within the central alarm reporting system with backup phone and data connections will provide redundancy for fire safety communication. To maintain habitable temperatures without power, insulation and air sealing for the building's walls, windows and roof will be examined to maintain a habitable interior temperature when heating or cooling systems are down. In addition, while current code prohibits windows from opening more than 4.5 inches, limiting their cooling potential when building power is

down, there are window options being developed that could address both child safety and overheating of interiors during blackouts. The Proponent will explore these options as the design progresses.

The Proponent acknowledges that protecting the development and the greater South Boston area is dependent on multiple agencies and individual developments working together. As strategies and regulations are identified and developed over the next year, and as other off-site proposals are developed, the Proponent anticipates adjusting the design strategies for Parcel K to incorporate the most appropriate design solutions for resiliency.

3.15.3 Climate Change Preparedness Questionnaire

The Proponent understands that the City of Boston is especially interested in the adaptability of the City to long-term climate change. The Proponent shares this interest and concern. The Proponent has prepared and submitted the BRA's on-line "Climate Change Preparedness Questionnaire," and has included a copy of the completed questionnaire as Appendix G of this Expanded PNF. As per above, the Project design is preliminary in nature and, hence, the questionnaire responses are also preliminary and may be updated as the Project design progresses.

Section 4.0

Urban Design

4.0 URBAN DESIGN

The Proponent proposes to develop Parcel K as a mixed-use neighborhood, comprised of a residential apartment building with approximately 304 rental apartments; a hotel with approximately 247 rooms; an underground parking garage with capacity for approximately 640 vehicles; public open spaces; and a mix of restaurant, retail, and flex office spaces activating the streetscape. The design as proposed fosters relationships between the different program elements and site context, creating a diverse and dynamic mix of spaces that will engage the surrounding urban environment.

Located at the intersection of the Seaport District, Boston Harbor, and the Boston Marine Industrial Park and sited within the Innovation District, the Project will complete the surrounding urban fabric by extending an active street edge along both Northern Avenue and Congress Street, strengthening the connections along the existing pedestrian and street network.

4.1 Urban Design Objectives

The design of the Project has been informed by the goals of the *Northern Avenue WDP*, the Innovation District, and the BRA's South Boston Waterfront Public Realm Plan to enhance the waterfront and pedestrian streetscape as a vibrant destination, for Boston residents, workers and visitors.

The design of the Project embodies key urban design objectives which include:

- Creating a vibrant, mixed-use development through an interactive and pedestrian-friendly streetscape that will diversify and energize the district. The Project will strengthen the pedestrian experience at street level through the design of active street edges, architectural focal points, and view corridors through and around the Project site.

- Articulating the massing and materials to create a neighborhood of distinct buildings. This will create a pedestrian-scaled environment that complements the lower rise development of Liberty Wharf to the north; the entrance to the Marine Industrial Park to the east; and the high rise residential, hotel, and office to the west.

- Crafting unique, yet contextual façades and public amenity spaces to promote and invite pedestrians to gather, interact, and engage with each other and the City.

- Creating new, publicly accessible urban open spaces to complement the existing network of open spaces and proposed Project uses and strengthen the connection to the Boston Harbor. These spaces will foster varied scales of activity and support a wide range of uses.

- Enhancing a visual and pedestrian connection to the water from the MBTA Silver Line Way stop while maintaining a vital link to Boston's extensive public transit system.

4.2 Massing and Orientation

As designed, the residential apartment building is oriented along the northwest and southwest perimeter of the site, while the hotel anchors the eastern edge of the site and functions as a visual terminus to the Innovation District. Flex office space, the residential lobby, restaurants, and cafes activate the streetscape between the MBTA Silver Line station and the hotel lobby at the end of Northern Avenue.

Along Northern Avenue, the courtyard terrace level façades of the residential apartment building are set back from the ground level retail below and the eight floors of residences above, forming a dynamic building massing and providing generous spaces at the courtyard terrace level for outdoor dining. Pronounced roof overhangs define outdoor spaces at both the courtyard terrace and upper levels, which form a series of overlapping public and private spaces visible from the street below. These multiple plane delineations, coupled with the curvilinear spaces at the street and courtyard terrace levels, help create a visual lightness in the massing. An urban court, located between the two buildings and setback from Northern Avenue, is a central focal point for the development, organizing pedestrian and vehicular activities.

The building's services (loading and MEP spaces) are located and accessed from Massport Haul Road and Silver Line Way. A new interior street, designed as an extension of Park Lane, connects the southern edge of the urban court with Congress Street and provides access to the hotel and residential lobbies along with the parking garage below.

4.3 Open Spaces

The Project has been designed to foster a synergy amongst the different uses and occupants of the site through the creation of public spaces that facilitate visual and physical connections, cross-collaboration, and a diversity of programmed activities.

An urban court, open to the sky and accessible at grade from both Northern Avenue and Congress Street, is positioned at the center of the Project and is envisioned as the primary entrance to the development. The buildings surrounding the urban court include a vibrant mix of retail shops, restaurants, flex-offices, and entry lobbies for the hotel and residential apartment buildings. The urban court will organize the flow of vehicular traffic within the site and the use of warm materials, landscape, and appropriately scaled elements will cultivate a welcoming and pedestrian-friendly space.

In addition, an elevated outdoor courtyard terrace between the residential apartment and hotel buildings fosters social connections between these different site uses. The courtyard terrace is envisioned as a series of shared spaces for the residents, hotel guests, office workers, and the public. The courtyard terrace includes the following spaces:

- Shared Yards: A mix of micro-units and studio apartments surround the courtyard terrace. Directly outside these residences are a series of shared "yards", creating a communal space that can facilitate events or impromptu gatherings between residents and their neighbors. These yards also help create the perception of a larger residential apartment unit by extending the interior space seamlessly to the exterior through large picture windows.

- Back porch: The interior residential apartment amenity spaces open onto the courtyard terrace, providing for communal dining, BBQ areas, and casual seating.

- Lawn: A green lawn, shared amongst the different uses and anchoring the center of the courtyard terrace, will support a variety of programmed and impromptu activities, such as sunbathing, lunchtime picnics, and volleyball games. The lawn is oriented to receive the maximum amount of sunlight during the day and is sheltered from winds through the surrounding plantings to maximize comfort throughout most of the year.

- Event space: The hotel's pool and function rooms activate the eastern perimeter and will extend into the southeast quadrant of the courtyard terrace for larger outdoor gatherings, such as weddings, meetings, and social events.

- Dining terraces: Elevated dining spaces for two restaurants will overlook Northern Avenue, providing 180 degree views of the waterfront. These spaces have been designed to complement and visually extend the elevated dining spaces of Liberty Wharf, and will accommodate outdoor seating for the restaurants.

4.4 Building Heights

As established by Massport's planning for the CFDA and the *Northern Avenue WDP* area, the building heights are limited to reduce the impact on the waterfront while maximizing public street level views and pedestrian access to the water. The maximum building height allowed within the *Northern Avenue WDP* area is 130 feet; the proposed building heights for the Project are between approximately 120 feet for the residential apartment building and 125 feet for the hotel, excluding mechanical penthouse space. In addition, the residential apartment building is set back approximately seven feet at the top floor along Northern Avenue to minimize the shadow impacts while creating outdoor balcony spaces for residents. Similarly, the top floor of hotel rooms and the "sky bar" (an outdoor deck and

bar/restaurant opportunity for the hotel) is set back from Northern Avenue and is volumetrically integrated with the screening of the mechanical penthouse equipment above to create a focal point for the hotel from the Northern Avenue approach.

The Proponent has designed the proposed building heights to be consistent with both the Federal Aviation Administration (FAA) Terminal Instrumentation Procedures (TERPS) and the Boston - Logan International Airport Composite of Critical Airspace Surfaces map for this area, with the top of penthouse elevations set under the maximum allowable heights. The Proponent will obtain a Determination of No Hazard to Air Navigation from the FAA.

4.5 Materials

Both the residential apartment and hotel buildings have been designed as distinct, yet compatible, building forms through the careful articulation of materials, giving each of the buildings a unique address and ultimately creating a well-designed urban community.

4.5.1 Northern Avenue

The upper levels of the Northern Avenue residential apartment building façade are expressed predominantly in glass with dark mullions to take advantage of water views and evoke an industrial loft feel. A terracotta colored masonry or precast façade with large storefront windows is proposed on the ground floor, contributing to the pedestrian-friendly streetscape experience. The hotel façade is envisioned as a mix of transparent and spandrel glass panels at the upper levels, with a lighter colored masonry base at the ground and mezzanine levels. Both buildings use a different, yet complementary, palette of materials to create a varied and visually interesting urban environment.

4.5.2 Massport Haul Road

The Massport Haul Road façade of the hotel is composed as an arrangement of transparent and spandrel blue glass panels capped with a sleek minimalist roof edge profile. The top floor of guestrooms is setback from the Haul Road, providing an outdoor roof terrace for the "sky bar" at the corner of Northern Avenue and Haul Road. The street and courtyard terrace levels of hotel; lobby, function rooms, pool, and retail/restaurant spaces are clad in a lightly toned precast or masonry helping to create a pedestrian scaled horizontal datum. This datum curves along the length of the streetscape, drawing people into the hotel lobby and urban court.

4.5.3 Congress Street

The Congress Street residential elevation is comprised of a mix of glass, precast and/or metal panels to acknowledge the adjacent urban context. A series of window bays break up the building massing and provide residents more direct views to the water beyond. Overall, the façade is articulated as a horizontal composition elevated above the courtyard terrace level, continuing the major datum lines expressed on the Northern Avenue façade.

4.5.4 Courtyard Terrace and Urban Court Façades

Surrounding the courtyard terrace, the residential apartment building façade is expressed with a mix of precast panels and a regular arrangement of punched window openings. The micro-units and studios are located at the second and third levels and will have floor-to-ceiling glass to make the smaller units feel larger and to maximize the visual connections to the courtyard terrace. The upper floors of the residential apartment building feature generously-sized windows to encourage the residents to occupy the perimeter of the courtyard terrace and create an active, vertical neighborhood. The façade on the residential apartment building is envisioned as a field of warm-toned precast or metal panels with intermediate scorelines and subtle color shifts to simulate the visual and tactile qualities of terracotta tile.

The hotel's courtyard terrace façade is designed as a more solid boundary with vertically proportioned openings to reflect the smaller scale rhythm of the guest rooms. Depending on the hotel flag, Juliet balconies could be introduced on this façade to connect guests to the courtyard terrace and city beyond. Within the urban court, a series of undulating curved walls are accentuated with horizontal bands of terracotta colored precast or masonry, defining a consistent datum at the pedestrian scale. The curved walls extend up to the courtyard terrace level, creating a dynamic two-story volume comprised of tall storefront windows which frame views out to the water from the interior public spaces of the hotel. The hotel function spaces, located at the mezzanine level, are designed to open up onto the urban court and courtyard terrace.

Section 5.0

Tidelands

5.0 TIDELANDS

5.1 Introduction

The Parcel K Project site consists of an approximately 2.38-acre parcel located within the Massport Commonwealth Flats Development Area (CFDA) and, more specifically, partially within the *Northern Avenue WDP* area of the CFDA. The Parcel K Project includes an 11-story 304-unit residential apartment building located on the western side of the parcel and a 10-story, 247-room Hotel on the eastern side of the parcel, with a central, ground-level urban court and second-level courtyard terrace with openings to the north and south linking the two structures. Additionally, the Project includes approximately 20,000 square feet of retail/restaurant space and 16,500 square feet of flex/innovation office space interspersed within the two buildings.

The entire Parcel K Project site is located within filled tidelands and is therefore subject to the Waterfront Protection Act, or Chapter 91, and its accompanying regulations at 310 CMR 9.00. However, as discussed below, only a portion of the parcel lies within the area subject to licensing under Chapter 91 (see Figure 1.3-8). The remainder is deemed "landlocked" and, as such, is not subject to licensing, but may be subject to a Public Benefits Determination by the Secretary of the Office of Energy and Environmental Affairs. The portion of the site subject to Chapter 91 licensing is also subject to the conditions of the August 2001 *Northern Avenue WDP* and the subsequent September 2001 Memorandum of Understanding (MOU) between Massport and MassDEP. The Project's compliance with the conditions of these various plans and regulations is reviewed herein.

5.2 Tidelands History

The land comprising Parcel K and the Northern Avenue WDP area was created by the historic filling of the Commonwealth Flats, a broad area of intertidal mud flats and sand bars located east of the historic Boston shoreline. The Massachusetts Legislature authorized the filling of this area under Chapter 326 of the Acts of 1868, which gave the then administrator of Chapter 91, the Harbor and Land Commission (HLC), specific responsibility to enter into contracts to fill and improve any portion of the Commonwealth Flats. An 1868 plan by the HLC shows areas to be filled, areas to be dredged, a layout of the Reserved Channel, the Commonwealth Piers, and a waterfront roadway system. While contracts authorizing the fill have not been found, historical maps and documents show that the activities were completed by the HLC and subsequent authorities.

On April 30, 1998, in response to Request for Determination of Applicability (RDA) filed with MassDEP by Massport, MassDEP issued a concurring determination that the historic waters encompassing the CFDA, and therefore Parcel K, were legally filled in accordance with Chapter 326 of the Acts of 1868. The Determination similarly concurred with the finding that the CFDA is located on lands formerly located between the Historic High Water Mark and Historic Low Water Mark of Boston Harbor. Such filled tidelands are generally

deemed *Private Tidelands* unless, as is the case here, the tidelands are composed of lands "*held by the Commonwealth … or authority, in trust for the benefit of the public*" (310 CMR 9.02, *Commonwealth Tidelands*), in which case they are deemed *Commonwealth Tidelands*.

5.3 Planning within the Commonwealth Flats Development Area

In March of 1999 Massport initiated public review of plans for the 30-acre CFDA with the submittal of an Expanded Environmental Notification Form (EENF) to the then Executive Office of Environmental Affairs (EOEA – now Executive Office of Energy and Environmental Affairs – EEA). Draft and Final Environmental Impact Reports (DEIR and FEIR) for the CFDA were subsequently submitted to EOEA in January and December of 2000, respectively, and a Certificate finding that the FEIR "adequately and properly" complied with the Massachusetts Environmental Policy Act (MEPA) was issued by the Secretary of Environmental Affairs in January of 2001. Among other topics, these documents initiated discussion of the administration of that portion of the CFDA that lay within the licensing jurisdiction of Chapter 91, and paved the way for the preparation of both the *Northern Avenue WDP* and the MOU between MassDEP and Massport as to the Chapter 91 licensing of certain projects within the CFDA, as reviewed below.

5.3.1 Chapter 91 Jurisdiction

As noted above and in the CFDA EIRs, the entire CFDA lies within filled tidelands. In addition, a portion of the CFDA lies within Chapter 91 licensing boundaries defined by regulation as those filled lands located within 250 feet of the current shoreline and the first public right-of-way, whichever is further (310 CMR 9.02, *Landlocked Tidelands*, and 9.04(4), *Geographic Areas Subject to Jurisdiction*). In the Certificate on the DEIR the Secretary of the EOEA requested that Massport prepare and submit together as a Notice of Project Change both a MOU between Massport and MassDEP relative to development within the Chapter 91 jurisdictional boundaries of the CFDA and a WDP for that area. Such an MOU was specifically called for in the Chapter 91 regulations at 310 CMR 9.03(3), *Activities of the Massachusetts Port Authority*.

On March 16, 2000 Massport submitted a "Chapter 91 Notice of Project Change" for the CFDA to the EOEA MEPA Office that included both a Preliminary *Northern Avenue WDP* and a Draft MOU between Massport and MassDEP. The Chapter 91 Notice of Project Change also included a set of urban design guidelines for the CFDA ("*Commonwealth Flats Urban Design & Public Realm Guidelines*") applicable to all buildings, parks, open spaces sidewalks and roadways within area which were eventually carried forward as an appendix to the Final *Northern Avenue WDP*. Following extensive public review, the Final MOU was published in the *Environmental Monitor* on March 15, 2001, and the *Final Northern Avenue WDP* was approved by MassDEP on September 24, 2001.

5.3.2 Memorandum of Understanding

The Final MOU between Massport and MassDEP was issued March 15, 2001. As called out in Article 2, *General Provisions*, of the MOU, "*the terms and provisions of this MOU shall govern and apply to Projects on the Massport Properties which do not consist solely of water-dependent Industrial Uses, Maritime Project or Accessory Uses.*" The MOU further identified the subject area of the agreement in noting that "*The terms of this MOU shall not apply to structures, projects, or properties owned, operated, developed or leased by Massport on land not contained within the Massport Properties identified on Exhibit A hereto.*" A copy of the MOU Exhibit A with the boundaries of Parcel K outlined is included herein as Figure 5.3-1, *Exhibit A: Massport Properties Subject to the MassDEP-Massport MOU*. As is apparent, the area identified as "*Massport Properties Covered by the DEP-MPA MOU*" and referenced in the MOU extends onto the northwestern portion of Parcel K.

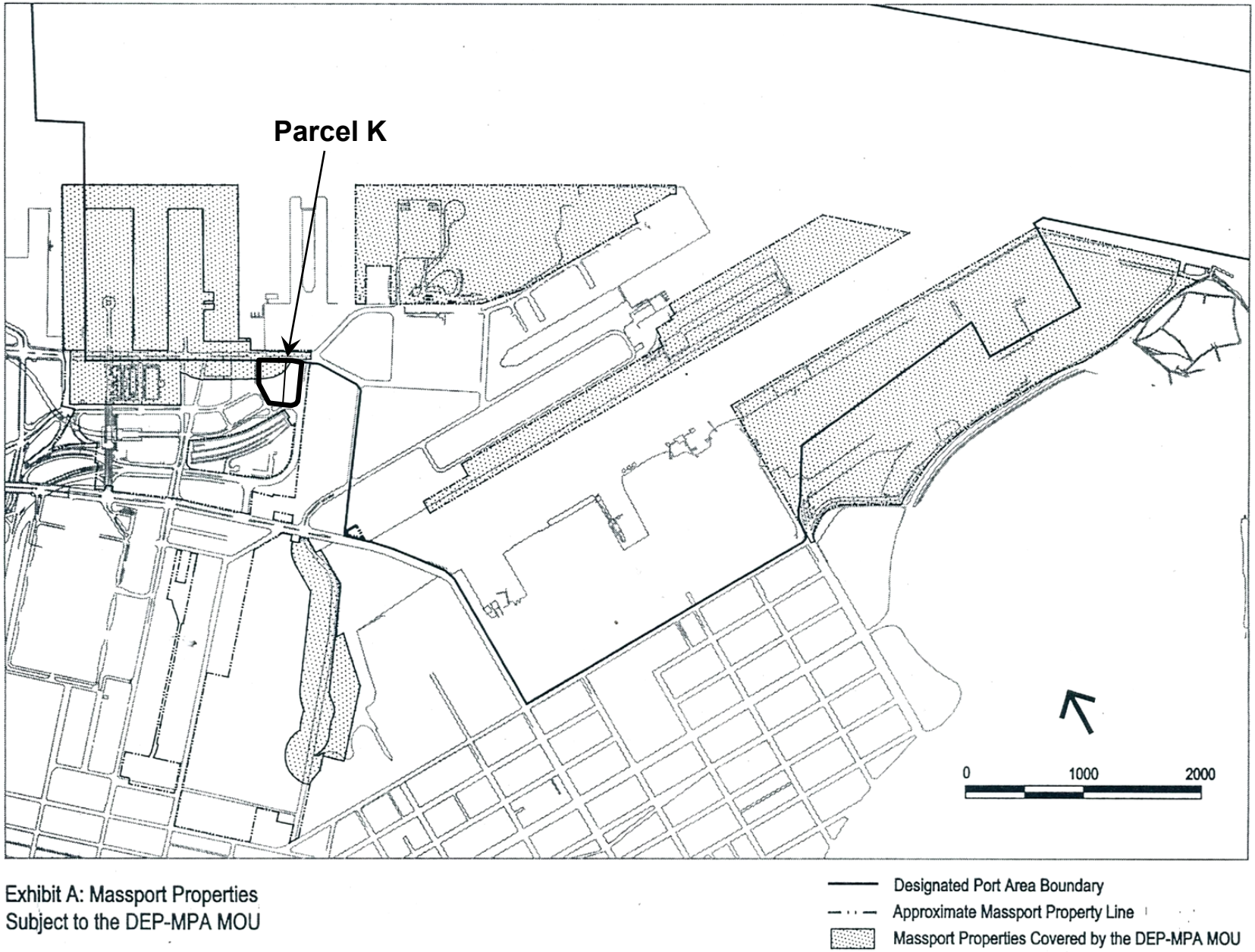
In addition to the area of applicability, the MOU cited "*certain portions of the Massport Properties known as the "Special Planning Area" shown on Exhibit B hereto...*" for which "*Massport may adopt one or more Waterfront Development Plans...*". Relative to Parcel K, the Special Planning Area identified on Exhibit B of the MOU is coincident to that portion of Parcel K within the "*Massport Properties Covered by the DEP-MPA MOU*" shown on Figure 5.3-1. Per the MOU, key components of any WDP for these Special Planning Areas must include a number of items including, but not limited to, a planning analysis, identification of proposed uses, design requirements and offsets.

Finally, for those projects proposed within the Special Planning Areas identified within the MOU, the MOU requires the submittal of a Chapter 91 license application compliant with Chapter 91, the MOU, and the applicable Waterfront Development Plan (WDP).

5.3.3 Final Northern Avenue Waterfront Development Plan

Pursuant to the MOU and the Secretary of EOEA request, Massport prepared and submitted to MassDEP a WDP for the Northern Avenue portion of the CFDA. On August 1, 2001, after several iterations and associated public reviews, the Final *Northern Avenue WDP* was submitted to MassDEP, and on September 24, 2001 the *Northern Avenue WDP* was formally approved by MassDEP.

The *Northern Avenue WDP* provides information on proposed land uses and public realm investments for the CFDA area within Chapter 91 jurisdiction, as well as information on how the proposed uses and investments relate to Chapter 91 and the associated Chapter 91 waterways regulations (310 CMR 9.00). The principal provisions of the WDP address the following issues:



Parcel K **Boston, Massachusetts**

Source: Final Northern Avenue Waterfront Development Plan, August 2001

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Figure 5.3-1

Exhibit A: Massport Properties Subject to the DEP-MPA MOU (from 2001 Northern Avenue WDP)

- Proposed Uses;
- Design Requirements and Approach;
- Dimensional Guidelines Related to Non-Water-Dependent Uses;
- Public Benefits Baseline Requirements for Non-Water-Dependent Uses; and
- Proposed Offsets for the Substitution for Chapter 91 Regulations.

As described in the WDP, "*The Northern Avenue WDP area encompasses approximately 3.3 acres of Massport Property within Chapter 91 jurisdiction along the southern edge of Northern Avenue in South Boston (see Figure 2). The Plan Area is separated from Boston Harbor by Northern Avenue, and therefore is adjacent to but does not include the water's edge. The Plan Area also does not include any part of a Designated Port Area.*" A copy of the above-referenced Figure 2 from the *Northern Avenue WDP* showing both the boundaries of the WDP and the applicable portion of Parcel K is included herein as Figure 5.3-2, *Northern Avenue WDP Area*.

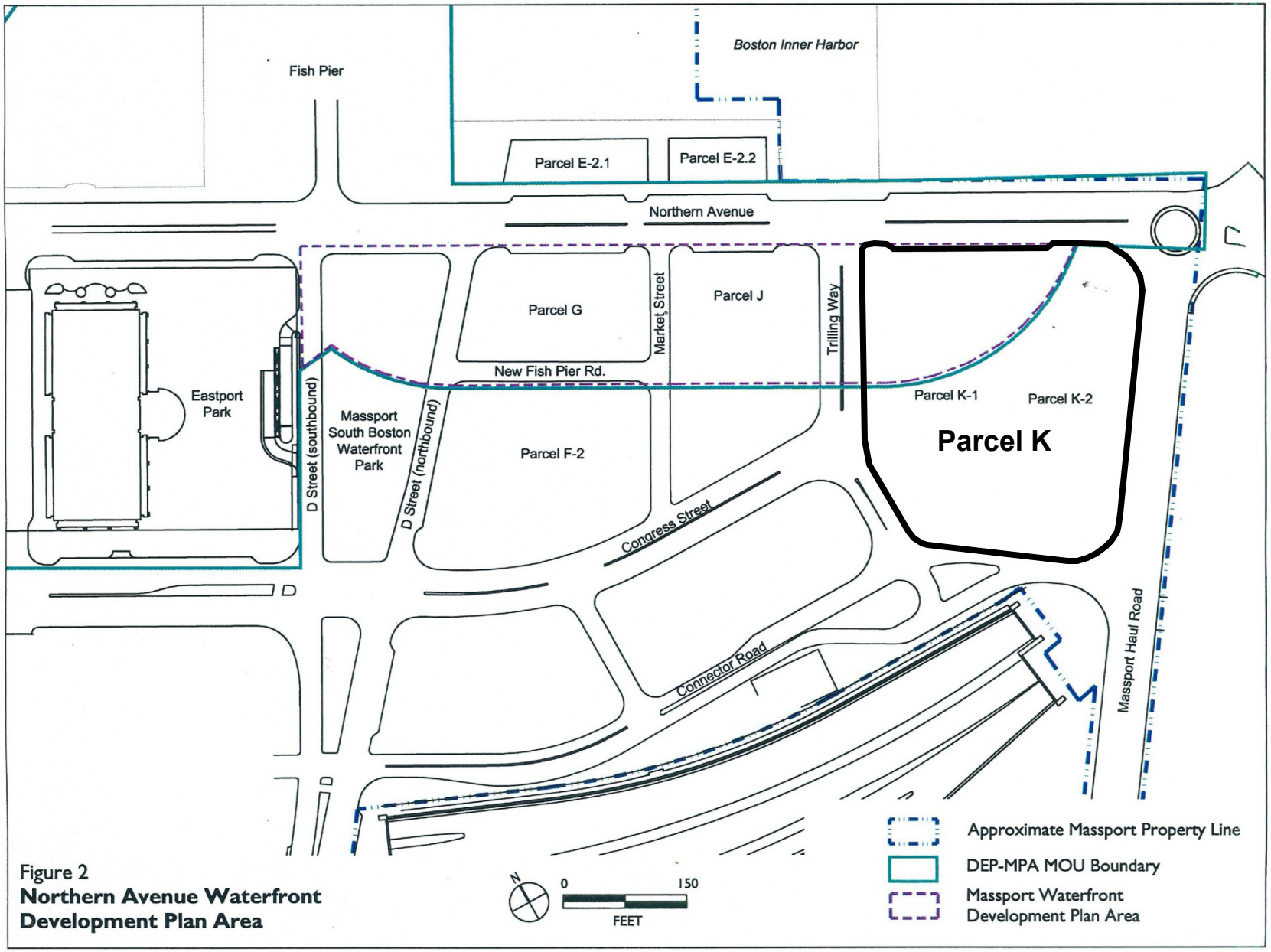
5.4 Consistency with Chapter 91 and the Northern Avenue Waterfront Development Plan

The following sections review the proposed Parcel K Project improvements in relation to the principal provisions of the *Northern Avenue WDP* and the associated Chapter 91 regulations. Of principal interest are the improvements proposed for those portions of Parcel K that lies within the Chapter 91 jurisdictional "*Massport Properties*" and "*Special Planning Areas*" described in the *Northern Avenue WDP* and outlined on Figures 5.3-1 and 5.3-2.

5.4.1 Proposed Uses

The proposed Parcel K Project envisions a mixed-use development project comprised of an 11-story 304-unit residential apartment building located on the western side of the parcel, a 10-story, 247-room boutique Hotel on the eastern side of the parcel, and a mix of flex/innovation office space and retail outlets interspersed among the two buildings. The residential apartment and hotel buildings will be supported by a subsurface garage with a total of approximately 640 spaces distributed over three subsurface levels.

The 2001 *Northern Avenue WDP* envisioned a mix of uses in the area south of Northern Avenue and east of D Street, including but not limited to office, housing, retail, hotel, restaurant, maintenance service, and light industrial. Residential uses were identified as allowable provided such use, and more specifically the traffic associated with such use, would not "*present impacts or limitation to truck routes and industrial activities to the east.*" Toward that end, the WDP envisioned a "*transitional use zone*" along Massport Haul Road encompassing Parcel K that excluded residential housing. However, development in the



Parcel K **Boston, Massachusetts**

Source: Final Northern Avenue Waterfront Development Plan, August 2001

Epsilon ASSOCIATES INC.

Figure 5.3-2

Northern Avenue WDP Area (from 2001 Northern Avenue WDP)

Northern Avenue WDP area in the 12+ years since the issuance of the *Northern Avenue WDP* suggests that the introduction of the mix of uses to the WDP area, including residential, hotel, office and restaurant uses, has been of benefit to the CFDA and the Boston Marine Industrial Park (BMIP) by offering supporting services such as residences, restaurants, and hotels for area workers and businesses. Furthermore, and as discussed in Section 2.0 of this document, truck traffic on the Massport Haul Road has not been significantly affected by the development of the *Northern Avenue WDP* area. Indeed, as also discussed in Section 2.0, the proposed uses on Parcel K will similarly not significantly affect the maritime and industrial use of Massport Haul Road and will actually have less effect than that which would be associated with the uses of Parcel K as envisioned in the CFDA plan and subsequent *Northern Avenue WDP*.

5.4.2 Design Requirements and Approaches

The *Commonwealth Flats Urban Design & Public Realm Guidelines* included with the March 2000 "Chapter 91 Notice of Project Change" referenced above are appended to the *Northern Avenue WDP*. These guidelines establish the guiding principles of building design and public realm improvements throughout the CFDA, including the *Northern Avenue WDP* area, that insure that the public realm is managed and maintained to a high standard. Guideline elements applicable and/or specific to the WDP area include attention to building character, height and massing, maintenance of public access to and views of the water, development of high quality public open spaces and ground-floor building uses, and minimization of shadow, wind and other environmental impacts on the water dependent use zone.

The Chapter 91 regulations similarly establish specific dimensional limits for building design that would apply to those portions of Parcel K within Chapter 91 licensing jurisdiction if the *Northern Avenue WDP* were not in place. These dimensional limits require that certain buildings be set back from the water and that project sites within the Chapter 91 jurisdictional area include 50 percent open space. Building heights are limited to 55 feet within 100 feet of the water edge, but may be increased in height at a rate of one foot for every two feet the building is stepped away from the water edge and beyond 100 feet. As applied to Parcel K, these requirements create a baseline condition against which the Project design has been compared.

Together with the above urban design and public realm guidelines, the *Northern Avenue WDP* sets forth alternative Chapter 91-related guidelines that aggregate open space within the WDP area and that allow buildings to achieve taller heights closer to Northern Avenue. The *Northern Avenue WDP* also adopts public realm improvements that realign streets and improve connections to the water in order to expand public access to the waterfront, ensure vistas along corridors to the water, and provide pedestrian amenities in the waterfront area. These proposals have helped achieve several goals for the area, including development parcels with smaller block sizes, a north-south street orientation with greater access and more views to the water, and an active street wall along Northern Avenue.

The Parcel K Project improvements proposed herein comply with and expand upon the *Northern Avenue WDP* and associated urban design and public realm guidelines for the Chapter 91 area. The two buildings and the urban court and courtyard terrace area complement the smaller block size created by the roadway network and physically open up the Project site, creating a visual and physical link between the waterfront to the north and the larger CFDA and Seaport District to the south. This is reflected in the shadow analyses discussed Section 3.3, whereby the shadow created by the proposed buildings is actually less than that which would be created by a structure on this site built to the full dimensions contemplated by the *Northern Avenue WDP* (see Section 3.3). The Project creates a superior pedestrian environment, substantial public open space areas, and the setting for a potentially wide range of public activities. A detailed description of the design benefits of the Project is provided in Chapter 4, *Urban Design*, of this Expanded PNF.

5.4.3 Dimensional Guidelines Related to Non-Water Dependent Uses

The *Northern Avenue WDP* presents the Chapter 91 dimensional standards for non-water-dependent uses and describes any proposed variances, known as "substitutions". Mitigating "offsets" are required if impacts are greater than what would occur under full application of the regulations. Of the four dimensional standards applicable to the WDP, the *Northern Avenue WDP* proposes substitutions for only one, the building height limitation. However, as regards open space, the *Northern Avenue WDP* "aggregates" the open space requirement for the entire *Northern Avenue WDP* area such that "*Projects under the WDP will meet or exceed this standard within the WPD Area.*" Contributing open space area available to meet this standard is identified in the WDP to include the Massport South Boston Waterfront Park which, to-date, has not been utilized for such purpose. The dimensional standards and the Project's compliance with these standards are summarized below.

5.4.3.1 Facilities of Private Tenancy

The Chapter 91 regulations stipulate that non-water dependent Facilities of Private Tenancy shall not be located on the ground level of any filled tidelands within 100 feet of the shoreline. The *Northern Avenue WDP* retains this standard.

The northwestern-most sidewalk corner of the Parcel K site is located approximately 100 feet from the shoreline opposite Northern Avenue. No portion of the proposed site buildings is located within 100 feet of the shoreline and, hence, the Project meets this standard.

5.4.3.2 Water Dependent Use Zone

The Chapter 91 regulations require that new or expanded buildings for non-water-dependent uses shall not be located within 100 feet of the shoreline (or within 25 percent of the average property depth, whichever is less). The *Northern Avenue WDP* retains this standard.

The northwestern-most sidewalk corner of the Parcel K site is located approximately 100 feet from the shoreline opposite Northern Avenue. No portion of the proposed site buildings is located within 100 feet of the shoreline and, hence, the Project meets this standard.

5.4.3.3 Building Height

The Chapter 91 regulations limit building heights within the water dependent use zone to 55 feet, beyond which the building height may be increased one foot for every two feet of additional distance from the water (a 1:2 slope). Applied to the *Northern Avenue WDP* area, a 55-foot building height would be allowed at the southern side of Northern Avenue, rising to a 130-foot height at the landward limit of the *Northern Avenue WDP* area/Chapter 91 boundary. However, the *Northern Avenue WDP* sets forth a substitution that allows buildings on the south side of Northern Avenue to penetrate the 1:2 slope and establishes a 130-foot height limit. Specifically, the *Northern Avenue WDP* states that "*Different than the Regulations would allow, the WDP allows buildings of 130 feet in height to be placed at any location within the WDP area.*" It should be noted, however, that while the *Northern Avenue WDP* height substitution specifically references "*any location within the WDP area,*" earlier in the document under the heading "Potential Land Uses for the WDP Area" it is suggested that there would be a "*Reduction of maximum allowed building height on Parcel K-2* [the eastern portion of Parcel K] *from 140* [when compared against the CFDA FEIR] *to 100 feet from grade*."

The proposed building heights for the Project are between approximately 120 feet for the residential apartment building and 125 feet for the hotel, excluding mechanical penthouse space. In addition, the residential apartment building is set back approximately seven feet at the top floor along Northern Avenue to minimize the shadow impacts while creating outdoor balcony spaces for residents. Similarly, the top floor of hotel rooms and the "sky bar" (an outdoor deck and bar/restaurant opportunity for the hotel) is set back from Northern Avenue and is volumetrically integrated with the screening of the mechanical penthouse equipment above to create a focal point for the hotel from the Northern Avenue approach.

These heights are within the 130 foot height identified in the substitution language of the *Northern Avenue WDP*, although approximately 205 square feet of the hotel footprint on the eastern, K-2, portion of the site within the Chapter 91 jurisdictional area would exceed the 100-foot height limit identified elsewhere within the *Northern Avenue WDP* (see Figure 1.3-11). As discussed above, the buildings on Parcel K have been designed so as to recognize the transitional location of this parcel as presented in the *Northern Avenue WDP*. Similarly, while the Chapter 91 shadow analysis (see below) indicates that Project's shadow is slightly greater than would be generated by a strictly Chapter 91-compliant structure at this site, it is considerably less than that which would be generated by a building(s) on Parcel K that was complaint with the *Northern Avenue WDP*. Given these factors, and if

deemed necessary, the Proponent anticipates clarifying the allowed height limit on Parcel K through a minor amendment of the *Northern Avenue WDP*.

5.4.3.4 Open Space

The Chapter 91 regulations require one square foot of open space for every square foot of tideland area within the footprint of buildings with non-water dependent uses. This standard defines open space as land located at ground level and having no overhead obstructions or coverings. For Commonwealth Tidelands the regulations add the requirement that these open spaces be public and that only a portion include public ways and/or public parking areas. The *Northern Avenue WDP* specifies that any such ways or parking areas not exceed 35 percent of the total public open space.

While the Chapter 91 regulations generally require that the public open space requirement be met on a parcel by parcel basis, the *Northern Avenue WDP* allowed for the aggregation of open space so as to encourage the creation of larger individual open spaces within the *Northern Avenue WDP* area. This concept is demonstrated in Figures 23 and 24 of the *Northern Avenue WDP*, which are re-produced herein as Figure 5.4-1, *Northern Avenue WDP, Maximum Building Footprints*, and Figure 5.4-2, *Northern Avenue WDP, Proposed Building and Open Space Plan*. As is readily apparent, the "Maximum Building Footprints" envisioned in the *Northern Avenue WDP* for Parcels J, G and K of the *Northern Avenue WDP* area would exceed the 50 percent open space requirement if these parcels were treated individually. However, the area combination of open space lands represented as sidewalks, streets and the portion of the Massport South Boston Waterfront Park within the entire *Northern Avenue WDP* area compensate for the larger footprints on the above individual lots. Specifically, the "Open Spaces Including Sidewalks And New Streets Within WDP Area" outlined in Figure 5.4-2 totals 59,930 square feet, while the area identified as "Proposed Building Footprint Area" totals 58,980 square feet. In actuality, the buildings constructed on Parcels J and G do not occupy the "Maximum Building Footprint" for those parcels as identified in the *Northern Avenue WDP* and shown in Figures 5.4-1 and 5.4-2, nor will the buildings proposed for Parcel K. Hence, the open space requirement of the *Northern Avenue WDP* is not only met, but exceeded.

5.4.4 Public Benefits Baseline Requirements for Non-Water Dependent Projects

The Chapter 91 regulations require that projects with non-water-dependent uses within tideland areas provide public benefits to compensate for dedicating land to non-water-dependent use. The *Northern Avenue WDP* presents both the baseline requirements and alternative public benefits requirements proposed by Massport for the WDP area. According to the MOU, benefits can be provided before, simultaneously, or within 12 months of a project's completion, and can be allocated retrospectively or prospectively if not fully allocated to a particular project.



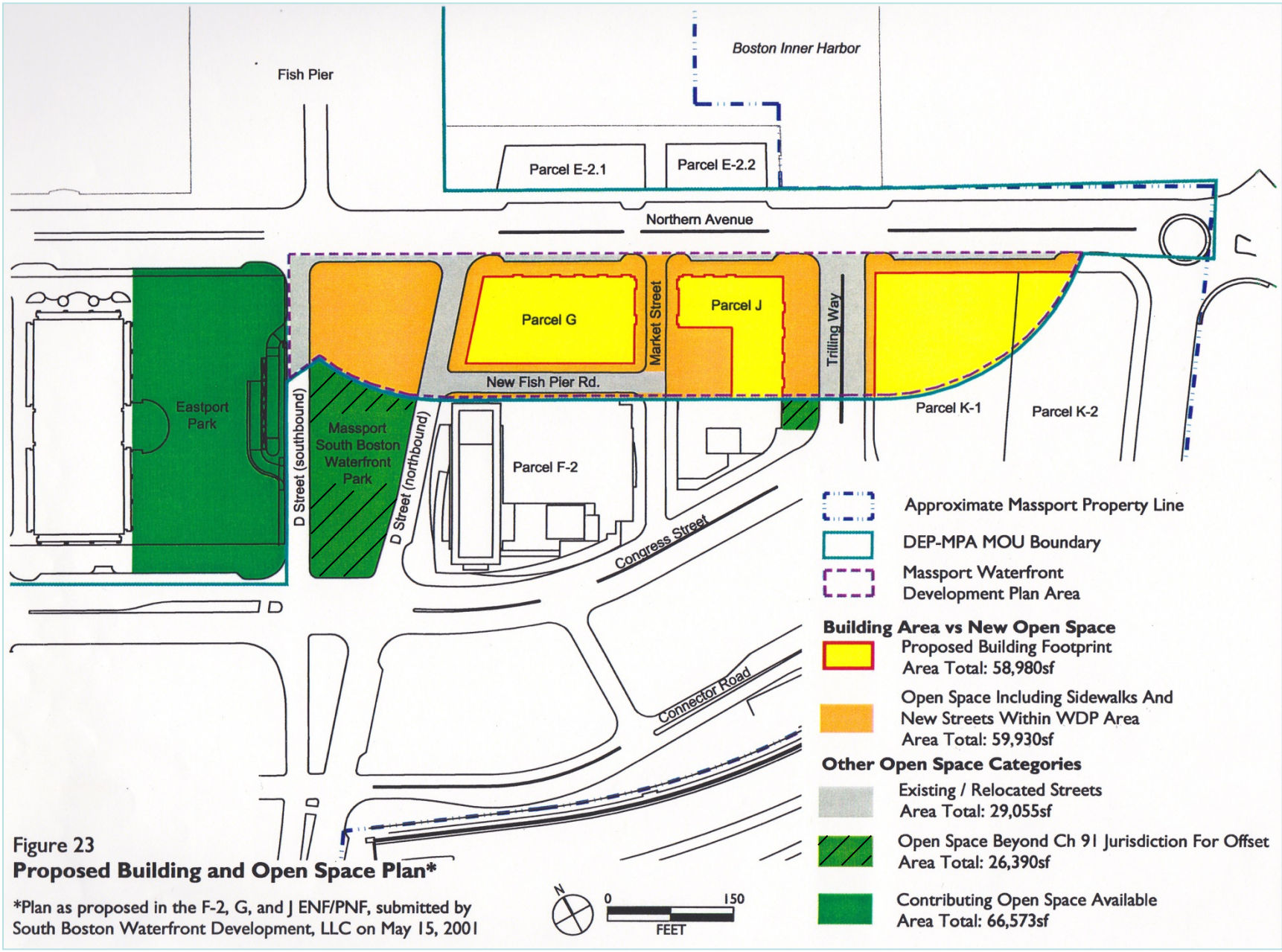
Parcel K Boston, Massachusetts

Source: Final Northern Avenue Waterfront Development Plan, 8/1/2001 (Massachusetts Port Authority)

Epsilon ASSOCIATES INC.

Figure 5.4-1

Northern Avenue WDP, Maximum Building Footprints (Figure 22 from 2001 Northern Avenue WDP)



Parcel K Boston, Massachusetts

Source: Final Northern Avenue Waterfront Development Plan, 8/1/2001 (Massachusetts Port Authority)

Epsilon ASSOCIATES INC.

Figure 5.4-2

Northern Avenue WDP, Proposed Building and Open Space Plan (Figure 23 from 2001 Northern Avenue WDP)

5.4.4.1 Facilities of Public Accommodation

The Chapter 91 regulations limit ground floor uses to facilities of public accommodation (FPA), excepting 25 percent for uses accessory to upper level uses (e.g., lobbies, elevator cores, etc.). The *Northern Avenue WDP* states that this standard will be met and exceeded by allowing no more than 20 percent of the ground floor for accessory uses.

As shown in Figure 1.3-8, virtually the entire building ground floor area within the Chapter 91 jurisdictional area of Parcel K is devoted to retail/restaurant space, hotel restaurant or amenities, or is associated with covered public walkways and traffic ways associated with the hotel and the public parking garage, all of which meet the definition of FPA. The sole area devoted to accessory to upper level uses is the residential lobby located on Congress Street). This latter area represents less than 14 percent of the ground floor footprint, well within the 20 percent standard of the *Northern Avenue WDP*.

5.4.4.2 Exterior Open Spaces

As discussed above, the Chapter 91 regulations require one square foot of open space for every square foot of tideland area within the footprint of buildings with non-water dependent uses. However, the *Northern Avenue WDP* allowed for the aggregation of open space so as to encourage the creation of larger individual open spaces within the Northern Avenue. Specifically, the *Northern Avenue WDP* identified the maximum building footprints that could be established within the Plan area and still leave over 50 percent of the area as public open space. Subsequently, the footprints of the building constructed (Parcels G and J) and those proposed (Parcel K) encompassed/will encompass an area less than the maximum envisioned by the *Northern Avenue WDP,* and will create more public open space than required under the Plan.

5.4.4.3 Public Access to and in the Water-Dependent Use Zone

The Chapter 91 regulations require that pedestrian access to the waterfront not be impeded and that development within Chapter 91 geographic jurisdiction include pedestrian amenities commensurate with the project's proximity to the waterfront. The *Northern Avenue WDP* includes a series of public realm improvements for the length of the Water Dependent Use Zone along Northern Avenue, including sidewalks, public parks, and enhanced streetscape elements. These improvements also include Eastport Park and Massport's South Boston Waterfront Park, both of which are located within, but extend beyond, the *Northern Avenue WDP* area.

The Parcel K Project supports compliance with this requirement by providing streetscape improvements adjacent to all sides of the Project site, and in particular along the full length of the Northern Avenue frontage. In addition, the Project design creates a physical and visual passage between the two site buildings linking the waterfront and the interior of the CFDA and the Seaport District.

5.4.4.4 Management and Maintenance Plan for Public Open Spaces and Facilities

The Chapter 91 regulations require plans addressing the management and maintenance of public open spaces and facilities. The *Northern Avenue WDP* states that Massport will provide or require private parties to provide open space management and maintenance plans. In compliance with this requirement, the Proponent will provide Massport with a Management and Maintenance Plan for open spaces and sidewalks created within the *Northern Avenue WDP* boundary of Parcel K, and which describes the Proponent's commitments pursuant to the ground lease with Massport. Ultimately, this Management and Maintenance Plan will also be submitted to the MassDEP Waterways Regulation Program as a component of the Project's Chapter 91 license application.

In addition to the above, the *Northern Avenue WDP* states that "*developers constructing buildings containing nonwater-dependent uses in the WDP area will be required to make significant monetary or in-kind contributions to Massport in the form of a District Service Fee.*" This fee will fund construction and maintenance of public amenities (such as parks, harborwalks, overlooks, and enhanced streetscape elements) in the *Northern Avenue WDP* area and throughout the CFDA area. In compliance with this requirement, the Proponent will contribute an annual District Service Fee to Massport for the provision and maintenance of public amenities. The commitment will be defined in the ground lease with Massport.

5.4.5 Proposed Offsets for the Substitution for Chapter 91 Regulations

As reviewed in Section 5.4.3.3, above, the *Northern Avenue WDP* sets forth one substitution related to the allowable height of buildings: specifically, the WDP allows building heights to penetrate the 1:2 slope defined in the regulations. The WDP establishes the following public benefits and development limitations to offset the impacts of the building height substitution.

5.4.5.1 Shadow Analysis - Additional Public Open Space Offset

The *Northern Avenue WDP* requires that an additional half foot of public open space be provided for every foot of net new shadow impact on a "Shadow Impact Area" that includes public open space, the Water Dependent Use Zone, and the watersheet within 100 feet of the shoreline, as compared to the Chapter 91 Baseline Condition. The Chapter 91 Baseline Condition is defined as a structure built in full compliance with Chapter 91 setback, open space and height regulatory requirement. In order to make this determination, shadows are to be assessed at 9:00 AM, 12:00 PM, 3:00 PM, and 5:00 PM for October 23rd. Any additional public open space required as a result of this analysis must be located within the boundaries of the *Northern Avenue WDP*, or contiguous to those public open spaces associated with the Northern Avenue WDP and located within Chapter 91 jurisdiction. Contiguous open space is defined as including the portion of the Massport South Boston Waterfront Park located contiguous to but outside the *Northern Avenue WDP* Chapter 91

jurisdictional area and identified as "Open Space Beyond Ch 91 Jurisdiction For Offset" on Figure 5.4-1. As per Figure 5.4-1, the available offset in the Massport South Boston Waterfront Park is 26,390 square feet, none of which has been utilized for other projects.

As noted in Section 3.3, *Shadow Analysis*, the proposed Project will cast significantly less shadow than the baseline massing for Parcel K adopted by the *Northern Avenue WDP*. The massing contemplated therein has a consistent building height of 130 feet for the majority of the Parcel K street frontage along Northern Avenue, with no openings in the street wall at Silver Line Way and Northern Avenue, and no building setbacks. In contrast, a shadow analysis of the site conducted in strict compliance with the Chapter 91 Baseline Condition indicates that the Project will create a limited amount of net new shadow on the Shadow Impact Area.

Table 5.4-1, *Shadow Impact Comparison*, details the shadow impacts for the Chapter 91 Baseline Condition and the proposed Project. This table replicates the format for shadow impact comparison presented as Table 4 of the *Northern Avenue WDP*. As shown, the Project generates approximately 11,692 square feet of net new shadow as compared to the Chapter 91 Baseline Condition. Per the above *Northern Avenue WDP* substitution requirement, the Project will be required to dedicate an additional half foot of public open space for every foot of net new shadow impact on the Shadow Impact Area, or 5,846 square feet. Per the *Northern Avenue WDP*, this area will be compensated for by dedicating 5,846 square feet of the 26,390 square feet of designated off-set allocated and currently unused in the Massport South Boston Waterfront Park.

Table 5.4-1 Shadow Impact Comparison*

Time of Day E.S.T. / E.D.T.	Ch. 91 Baseline Condition	Parcel K Subject to Ch. 91	Net New Shadow
8:00 AM / 9:00 AM	6,688	27,988	21,300
11:00 AM / 12:00 noon	8,462	30,513	22,051
2:00 PM / 3:00 PM	6,760	10,178	10,178
4:00 PM / 5:00 PM**	0	0	0
Cumulative Shadow Impact (sum of four shadow impact times above)	21,910	68,679	46,769
Average Shadow Impact per Period (four shadow impacts averaged)	5,477	17,170	11,692

* From Table 4. "Shadow Impact Comparison," *Northern Avenue WDP*, Section2.6.2, page 31.
** At 5:00 PM the Shadow Impact Area is covered entirely by the in existing shadow associated with the adjacent Park Lane Seaport Apartments buildings. Therefore no net new shadows occur at 5:00 PM.

Figures 5.4-3 through 5.4-6 outline the Shadow Impact Area and illustrate the shadow impacts for both the Chapter 91 Baseline Massing and Proposed Massing at the hours indicated above.

5.4.5.2 Limitation on Building Area Offset

The WDP requires that the "total amount of building square footage within the WDP area as a whole be no more than that which could have been allowed under existing Chapter 91 Regulations…". The Project's compliance with this standard is reviewed in Section 5.4.3.4, above.

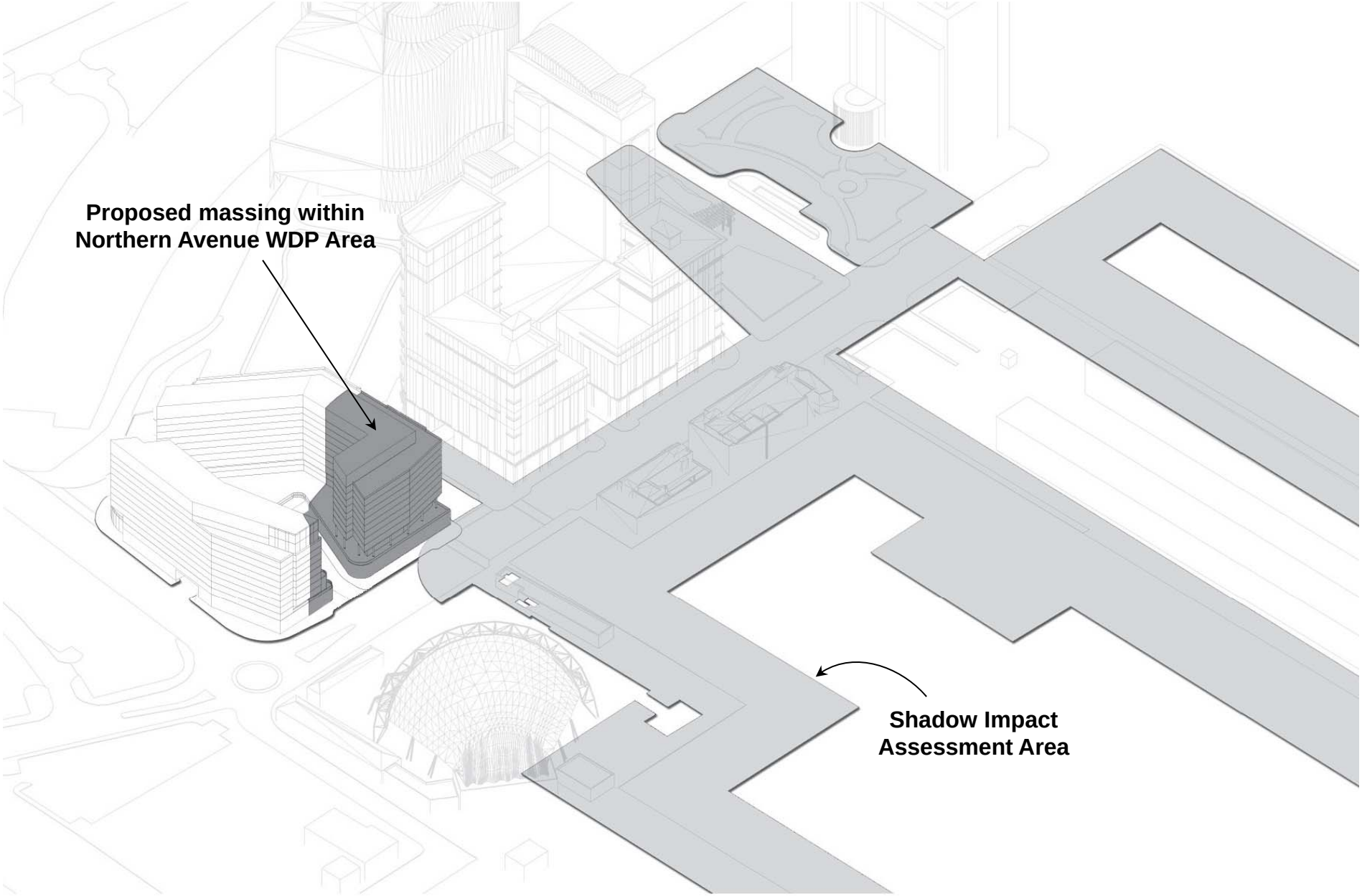
5.4.5.3 Pedestrian Level Wind Analysis Offset

As noted in the *Northern Avenue WDP*, "the WDP area is a naturally windy environment compared to sites further inland." That said, the *Northern Avenue WDP* requires that a quantitative analysis of pedestrian level winds be undertaken for projects within the WDP area and that mitigation be provided for any winds determined to be "Dangerous and Unacceptable" per the Melbourne Criteria for pedestrian level winds (PLW).

A detailed analysis of PLW has been undertaken for the Project and is presented in Section 3.2 of this Expanded PNF. As discussed therein, of the 99 wind assessment locations on or near the Project site, the large majority (82 locations) showed either no change or improvements to the existing wind condition. Importantly, none of the locations indicated a dangerous condition. Several locations do show unacceptable wind gust conditions that will be mitigated in the on-going building and landscape design process.

5.4.6 Implementation

The *Northern Avenue WDP* requires that projects within the WDP area undergo a comprehensive design review process, and to incorporate design review requirements into the ground lease with project proponents. In addition, the WDP indicates that developers should expect to coordinate "additional design review with the BRA through a voluntary design review process." To this end, the Proponent is actively working with Massport on the design elements of the Project, and has initiated the voluntary review of the Project by the BRA through the submittal of this Expanded PNF.



Parcel K **Boston, Massachusetts**

Source: Arrowstreet

Epsilon ASSOCIATES INC.

Figure 5.4-3

Ch.91 Shadow Analysis – Proposed Massing



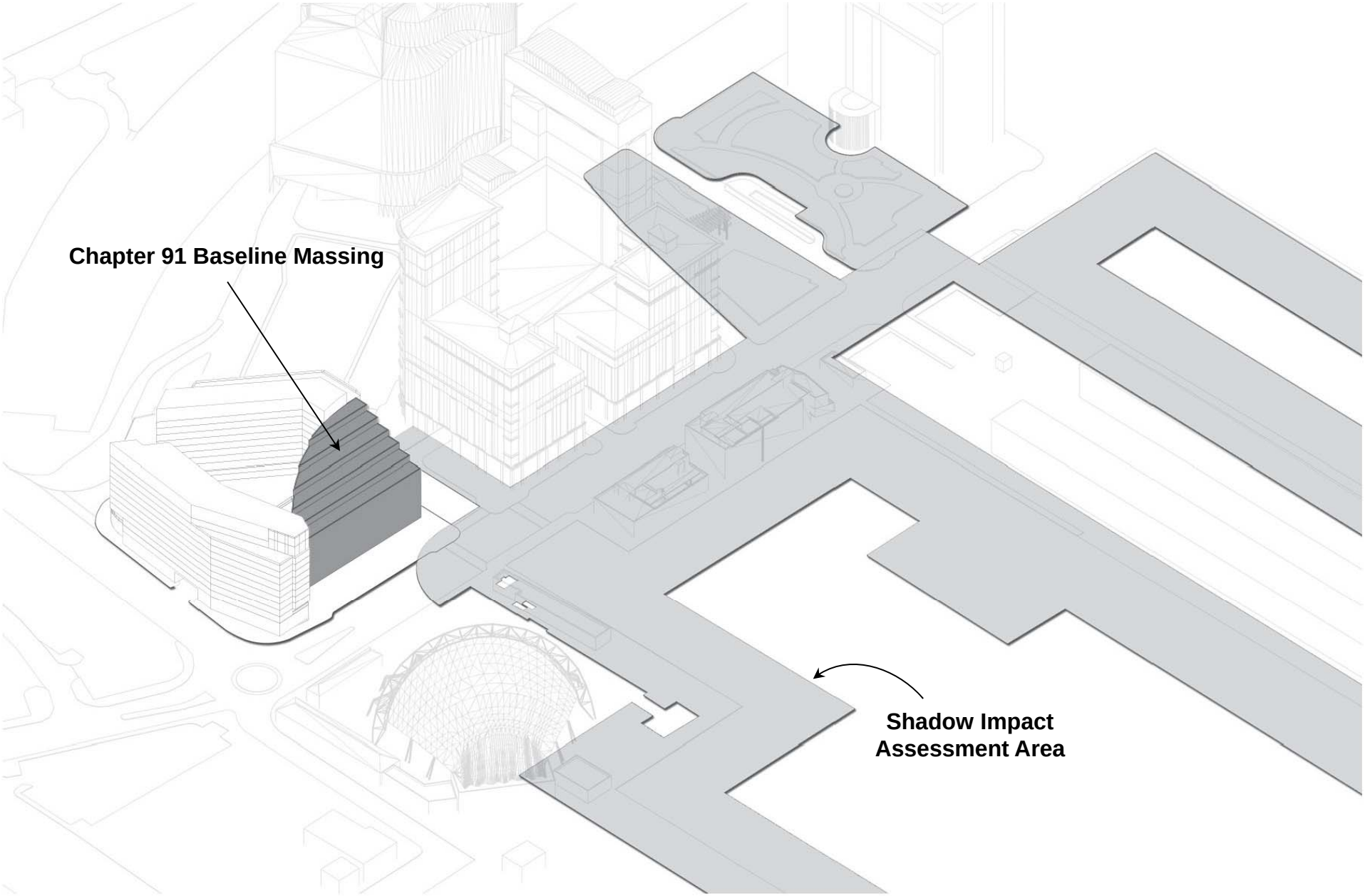
Parcel K Boston, Massachusetts

Source: Arrowstreet

Epsilon ASSOCIATES INC.

Figure 5.4-4

Ch.91 Shadow Analysis, October 23 – Proposed Massing



Parcel K Boston, Massachusetts

Source: Arrowstreet

Epsilon ASSOCIATES INC.

Figure 5.4-5

Ch.91 Shadow Analysis – Baseline Condition



Parcel K Boston, Massachusetts

Source: Arrowstreet

Epsilon ASSOCIATES INC.

Figure 5.4-6

Ch.91 Shadow Analysis, October 23 – Baseline Condition

Section 6.0

Historic and Archaeological Resources

6.0 HISTORIC AND ARCHAEOLOGICAL RESOURCES

6.1 Historic Resources

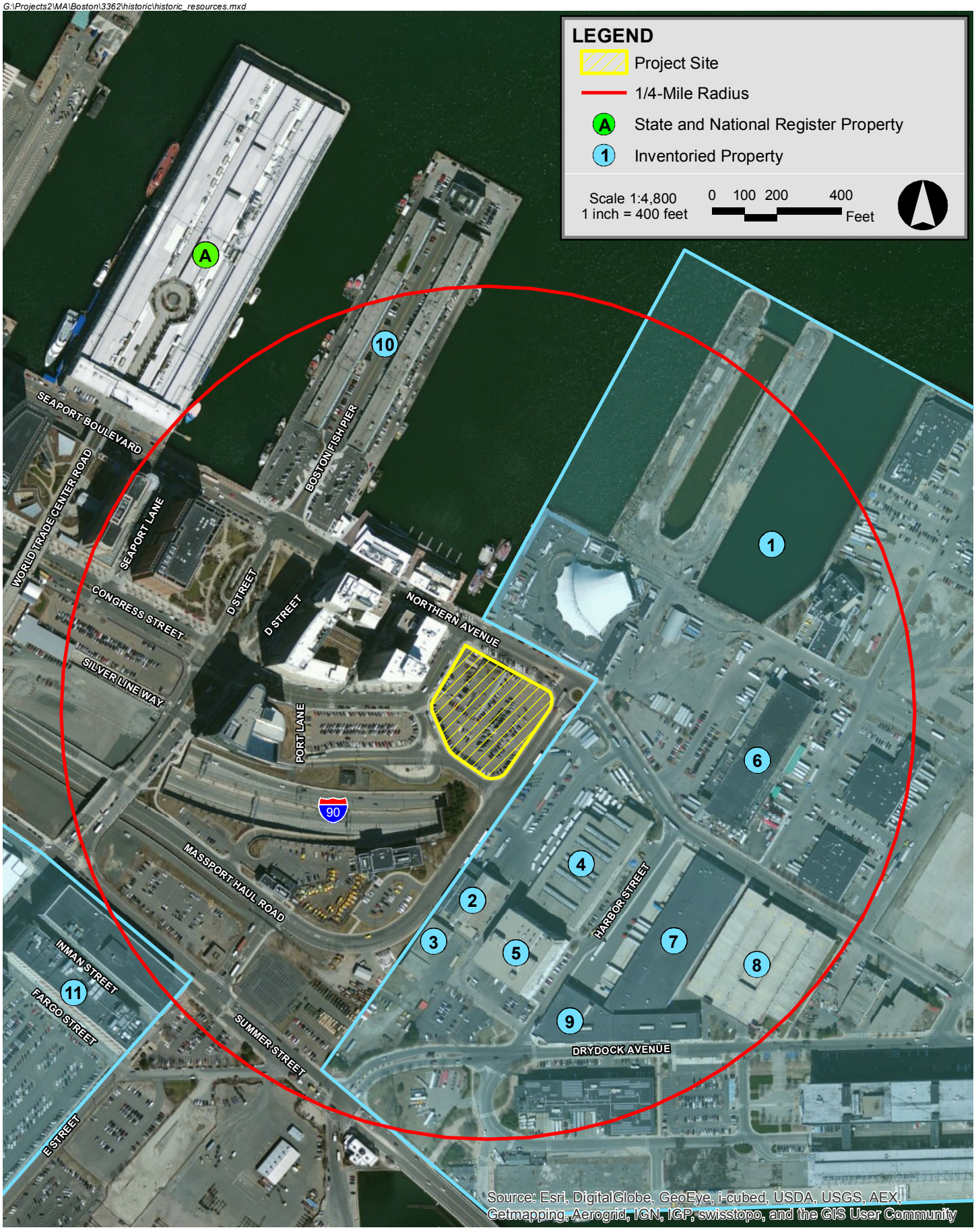
The proposed Project site is a vacant, paved parcel of land that is not listed in the State or National Registers of Historic Places or included in the Inventory of Historic and Archaeological Assets of the Commonwealth (Inventory). The Project site previously included a complex of one and two-story cold storage and fish processing buildings constructed between 1965 and 1976. The buildings on the southern side of the Project site were demolished for the construction of the I-90 Tunnel. The building on the northern side of the Project site was demolished by Massport in 2011.

The proposed Project is located within the vicinity of several historic resources listed in the State and National Registers of Historic Places and Inventory. Historic resources located within a quarter-mile radius of the Project site are listed in Table 6.1-1 and located on Figure 6.1-1, *Historic Resources*.

Table 6.1-1 Historic Resources in the Vicinity of the Project Site

Map No.	Name	Address	Designation
A	Commonwealth Pier Five	200 Seaport Boulevard	State and National Register listed
1	Boston Army Supply Base	South Boston	Inventory (BOS.RT)
2	Building 17	7 Channel Street	Inventory (BOS.12946)
3	Building P-28	11 Channel Street	Inventory (BOS.8062)
4	Building 19	6 Harbor Street	Inventory (BOS.12966)
5	Building 32	12 Channel Street	Inventory (BOS.12947)
6	Building 53, Harpoon Brewing Company	306 Northern Avenue	Inventory (BOS.12970)
7	British World Cargo	15 Dry Dock Avenue	Inventory (BOS.12951)
8	Parking Garage	Dry Dock Avenue	Inventory (BOS.12952)
9	Building 15, Trade Union Bank	10 Dry Dock Avenue	Inventory (BOS.12950)
10	South Boston Fish Pier	Northern Avenue	Inventory (BOS.9252)
11	C Street Area	South Boston	Inventory (BOS.RU)

G:\Projects2\MA\Boston\3362\historic\historic_resources.mxd



Parcel K Boston, Massachusetts

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Figure 6.1-1
Historic Resources

6.2 Impacts to Historic Resources

6.2.1 Visual Impacts

The proposed Project is located immediately adjacent to the Boston Army Supply Base; however, the adjacent parcels are undeveloped and therefore will not be impacted by the proposed new construction. The proposed new construction features two buildings of equal height served by a common vehicular entranceway on the ground floor with an elevated courtyard terrace at the mezzanine level. Parking will be located below grade. The design of the proposed Project is consistent with the nearby Boston Army Supply Base properties. The buildings will feature large window openings accentuated by vertical and horizontal piers and spandrels characteristic of the large-scale buildings in the nearby Boston Army Supply Base. The street level will be activated with ground floor commercial spaces, and outdoor common space will be located at the mezzanine level to maintain the industrial character of the neighborhood when experienced from the public rights-of-way. The overall character of the proposed new construction is consistent with the surrounding historic properties and will have no adverse impact on these resources.

6.2.2 Shadow Impacts

The proposed Project will result in minimal new shadow impacts to the adjacent Boston Army Supply Base; however, these new shadows will be cast on modern structures or vacant land. There will be no new shadow impacts to extant buildings included in the Inventory.

New shadow impacts are limited to fleeting shadow to the north of the Project site within the boundaries of the Boston Army Supply Base at 3:00PM during the Spring Equinox. This new shadow is limited to the undeveloped portion of the Bank of America Pavilion site (BOA Pavilion site). New shadow will be cast on vacant land to the north and east of the Project site at 6:00PM on the Summer Solstice within the Boston Army Supply Base. Minor new shadow is cast on the southern edge of the Boston Army Supply Base immediately to the north of the Project site (BOA Pavilion site) at 3:00PM and at 6:00PM to the northeast at the Autumnal Equinox when much of the area is already in shadow. New shadow will also be created to the north at 12:00PM and 3:00PM at the Winter Solstice within the Boston Army Supply Base within the BOA Pavilion site.

The proposed Project will result in no significant shadow impacts on nearby historic resources.

6.3 Archaeological Resources

The Project site consists of a previously filled land and disturbed land. Due to previous development activities and disturbances, it is unlikely that the site contains significant archaeological resources.

Section 7.0

Infrastructure

7.0 INFRASTRUCTURE

This section provides a description of the existing utility systems in the vicinity of the Project site and evaluates potential impacts to those systems. Appropriate mitigation measures are discussed to address Project-related impacts. The Project is in the early design stages and as a more definitive design evolves the Proponent will coordinate with the various utility companies to ensure full services for the new mixed-use development.

Required Permits/Approvals for the Project may include approvals from the Massachusetts Water Resources Authority (MWRA), Massachusetts Department of Environmental Protection (MassDEP), the U.S. Environmental Protection Agency (USEPA) and the Boston Conservation Commission. A Boston Water and Sewer Commission (BWSC) Site Plan and General Service Application will be required for the proposed new water and sewer connections. In addition, a Stormwater Pollution Prevention Plan (SWPPP) will be submitted specifying best management practices (BMPs) for protecting the Massport stormwater drainage system during construction.

7.1 Sanitary Sewer System

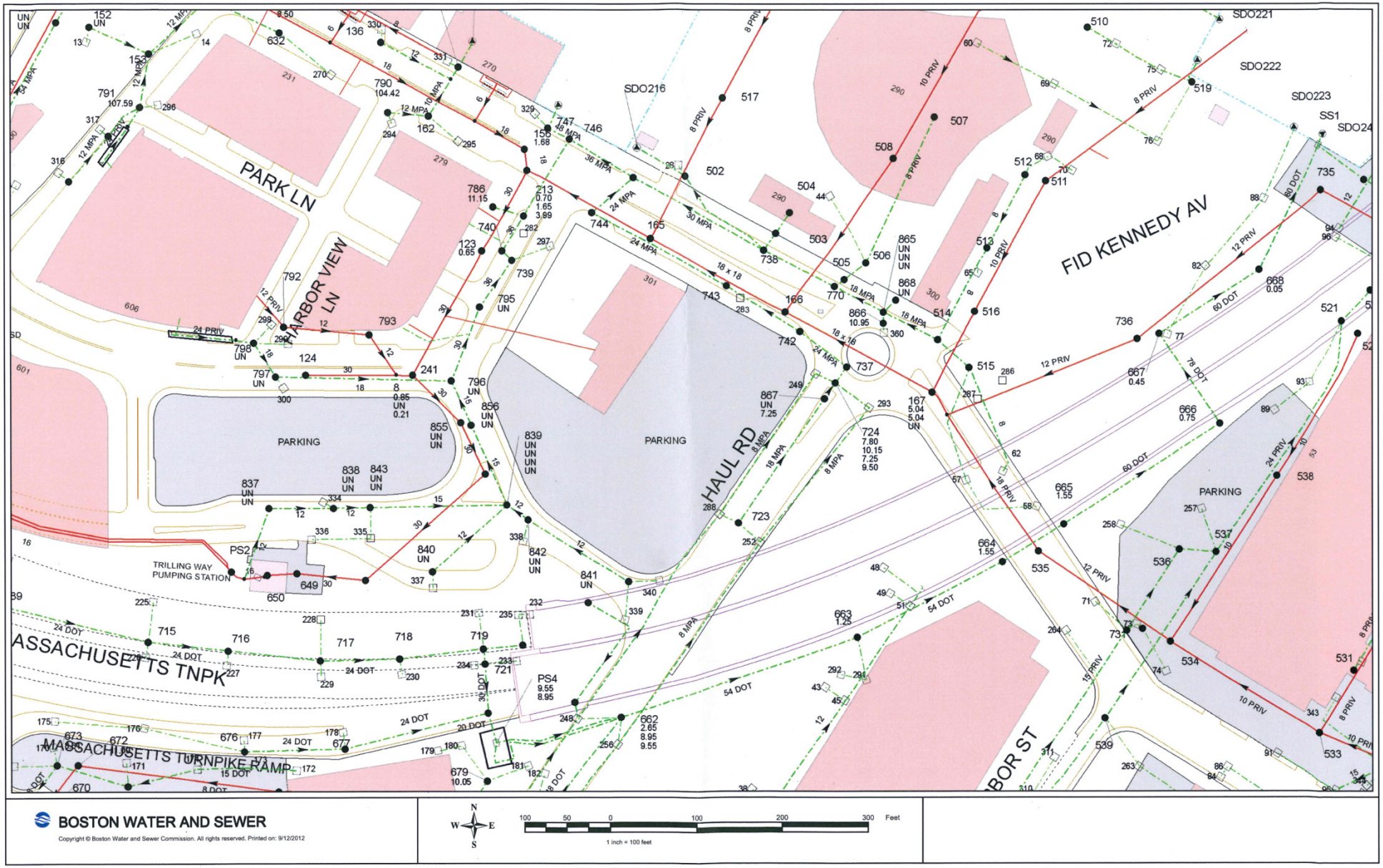
7.1.1 Existing Sanitary Sewer System

In the vicinity of the Project site the BWSC owns, operates, and maintains sewer mains in Northern Avenue, Congress Street and Starboard Lane. These mains range in size from 12 to 30 inches in diameter (see Figure 7.1-1, *Existing Sanitary Sewer System*). The sewer system routes wastewater to the Boston Main Drainage Tunnel for ultimate discharge and treatment at the MWRA Deer Island Treatment Facility. The Deer Island Treatment Facility has a design capacity of 1,200 million gallons per day (mgpd) and currently has an average daily flow of about 250 mgpd.

7.1.2 Estimated Project Wastewater Generation

The Project's sanitary sewage system will likely have multiple connections to the existing sewers in Northern Avenue and Congress Street directly in front of the Project site.

The proposed mixed-use Project includes a 247 room hotel, a 304-unit residential apartment building, retail/restaurant areas, as well as flex office space. Based on the design sewer flows provided in the State Environmental Code, Title 5 -Section 15.203, the Project is estimated to generate approximately 131,958 gallons per day (gpd) of wastewater flow. Calculation of this estimate is shown in Table 7.1-1, Project Wastewater Generation.



Parcel K Boston, Massachusetts

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Figure 7.1-1

Existing Sanitary Sewer System

Table 7.1-1 Project Wastewater Generation

Use	Number	Sewage Generation Rate	Total gpd
Residential	380 bedrooms	110 gpd per bedroom	41,800
Hotel	247 Bedrooms (rooms)	110 gpd per bedroom	27,170
Office	16,500 square feet	75 gpd per 1,000 square feet	1,238
Restaurant(s)	1,235 seats	50 gpd seat*	61,750
Total Estimated Project Sewage Generation			**131,958**

* Includes 35 gpd per seat food service and 15 gpd per seat kitchen flow

7.1.3 Sanitary Sewer Connections

The Project is in the preliminary design stages and a detailed plan of the proposed site utilities has not been developed, however it is anticipated that the Project will connect to the 18-inch sewer main located in Northern Avenue, and to the 30-inch sewer main located in Congress Street and Starboard Lane.

The Proponent will submit a Site Plan to Massport and the BWSC for review and approval. Based on the proposed estimated sanitary flow, a Sewer Connection Permit will be required by MassDEP.

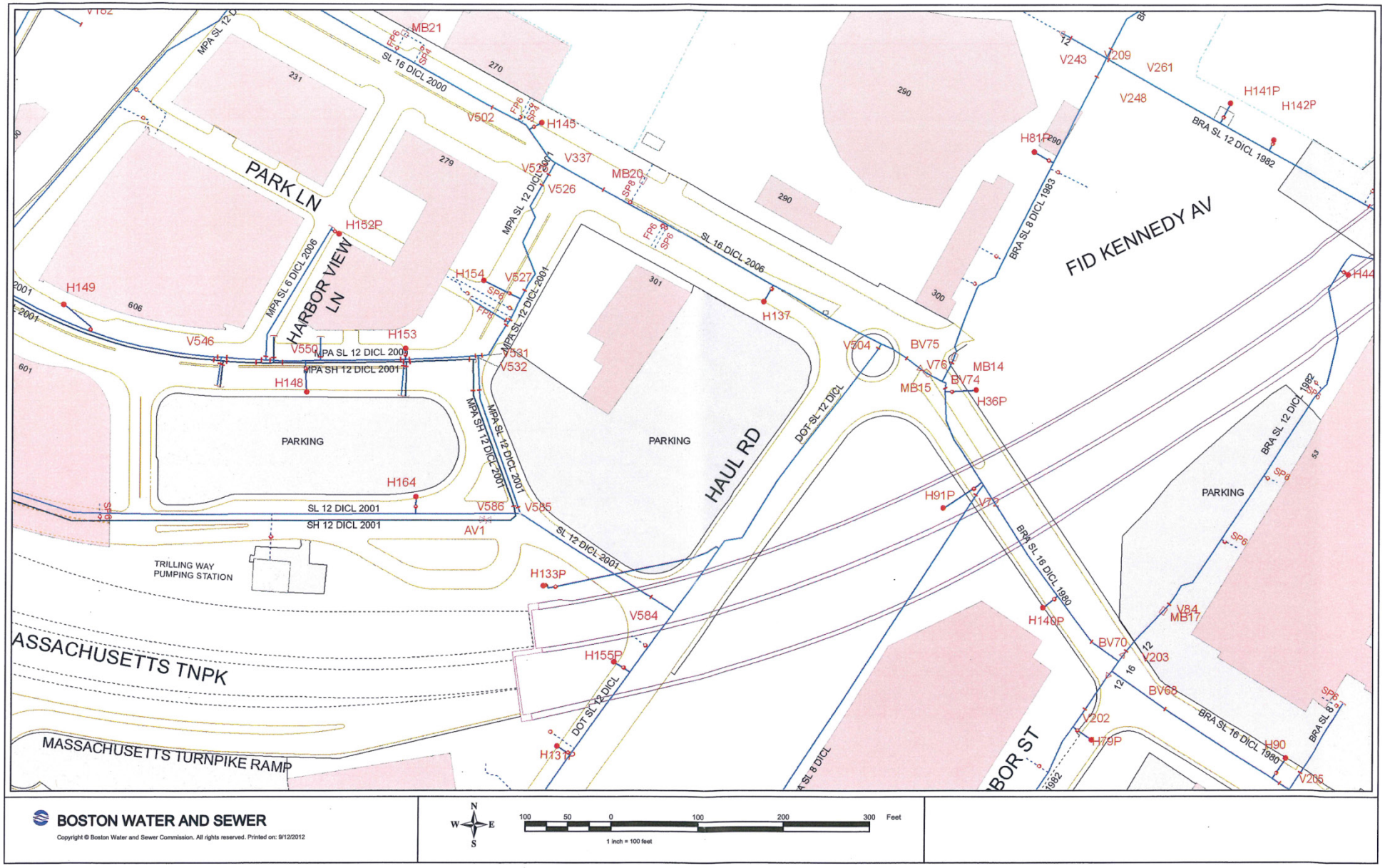
7.1.4 Wastewater Flow Mitigation

To help conserve water and reduce the amount of wastewater generated by the Project, the Project will incorporate the use of water conservation devices such as low-flow toilets and flow-restricting faucets.

7.2 Water Supply System

7.2.1 Existing Water Service

The BWSC and Massport own and maintain water mains in Northern Avenue, Congress Street and Starboard Lane (see Figure 7.2-1, *Existing Water Supply System*). In addition the Massachusetts Department of Transportation (MassDOT) owns and maintains a water main in Massport Haul Road. The BWSC water mains consist of a 16-inch diameter ductile iron cement lined (DICL) pipe installed in 2006 in Northern Avenue and a 12-inch DICL pipe installed in 2001 in Starboard Lane, both part of the City's southern low service zone. The Massport water mains consist of 12-inch diameter DICL pipes in Congress Street and Starboard Lane that were installed in 2001, one being part of the southern low service zone



BOSTON WATER AND SEWER

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N W E S

100 50 0 100 200 300 Feet

1 inch = 100 feet

Parcel K Boston, Massachusetts

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Figure 7.2-1

Existing Water Supply System

and one part of the southern high service zone. Lastly, MassDOT has a 12-inch diameter DICL water main located in the adjacent Massport Haul Road connected to the southern low service zone.

Fire hydrants are located in both Northern Avenue and Congress Street in front of the Project site. Hydrant flow tests for the Project were conducted by the BWSC in October and November of 2012 to determine available water pressure and flow from the 16-inch low service water main in Northern Avenue and the 12-inch low service water main in Congress Street. The Proponent will design appropriate domestic and fire protection lines for the Project in consultation with the Massport Fire Department, BWSC, and the Boston Fire Department during the detailed design phase. The results of the hydrant flow tests are included in Appendix F, Hydrant Flow Test.

7.2.2 Proposed Water Service

It is anticipated that the Project will be serviced via the existing 16-inch BWSC water main in Northern Avenue, the 12-inch Massport water main in Congress Street, and the 12-inch BWSC water main in Starboard Lane. Separate new domestic water and fire protection services will be required. These services will be designed and coordinated with the BWSC and Massport as part of the Site Plan and General Service Application.

7.2.3 Anticipated Water Consumption

The estimated water consumption for the proposed Project is 145,154 gpd. This is based on 110% of the estimated wastewater flow of 131,958 gpd (see Section 7.1.2 above).

The proposed domestic water services will be metered in accordance with BWSC requirements. The meters will be connected to the BWSC automatic meter-reading system with meter interface units, telephone lines and jacks, and outside meter-reading devices provided at each meter.

7.3 Stormwater Drainage System

7.3.1 Existing Stormwater Drainage System

The existing site is about 103,484 square feet or 2.38 acres in area of which 100% is impervious surfaces associated with an active surface parking lot. Redevelopment of the site will trigger the requirement for a National Pollutant Discharge Elimination System (NPDES) Permit from the EPA, as more than an acre of land will be disturbed. Existing on-site storm drainage systems connect to the existing Massport storm drainage systems in Congress Street and Northern Avenue. Storm runoff is conveyed by these BWSC and Massport systems to Boston Harbor (see Figure 7.1-1).

7.3.2 Proposed Stormwater Drainage System

The introduction of the landscaped green space within the proposed site urban court will result in a reduction of the impervious area of the site and, hence, a reduction in site runoff. This reduction in runoff will preclude adverse impacts to the surrounding areas and existing storm drainage systems.

Upon review and approval by Massport the Project's stormwater management systems will be designed in accordance with the BWSC's design standards and the BWSC "Requirements for Site Plans". A Site Plan will be submitted for BWSC approval and a General Service Application will be completed prior to any site drain work. Any drain connections that are terminated as a result of construction will be cut and capped at the main storm drain in the street in accordance with the BWSC standards. A Stormwater Pollution Prevention Plan (SWPPP) will be prepared for use during construction.

7.3.3 Water Quality and Construction Stormwater Management

The Project will not affect the water quality of nearby water bodies. Erosion and sediment control measures will be implemented during construction to preclude the transport of site soils to off-site areas and BWSC storm drain systems. During construction, existing catch basins will be protected with filter fabric, hay bales and/or crushed stone, to provide for sediment removal from runoff. These controls will be inspected and maintained throughout the construction phase until all areas of disturbance have been stabilized through the placement of pavement, structure, or vegetative cover.

Should any site dewatering be required, it will be conducted in accordance with a MWRA and BWSC discharge permit. As discussed below, Project stormwater management systems are being designed so that the Project will be in compliance with all local and state stormwater management policies.

7.3.4 MassDEP Stormwater Management Policy Standards

The MassDEP Stormwater Management Standards, originally adopted as Policy, are, as of January of 2008, included in the Massachusetts Wetland Protection Act regulations and Massachusetts-administered federal Water Quality Certification regulations. These regulations prescribe specific stormwater management standards for development projects, including urban pollutant removal criteria for projects that may impact environmental resource areas. Compliance is achieved through the implementation of Best Management Practices (BMPs) in the stormwater management design. The regulations are administered locally pursuant to MGL Ch. 131, s. 40. Under these regulations, the Parcel K Project is characterized as a redevelopment project and, as such, will comply with all of the stormwater management standards to the maximum extent practicable.

Standard #1: No new stormwater conveyances (e.g., outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

Compliance: The proposed design will comply with this Standard. Site stormwater discharges will be treated prior to connection to the BWSC and Massport systems. There are no wetland resource areas on the Project site.

Standard #2: Stormwater management systems must be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.

Compliance: The Project will comply with this standard. The proposed design will not result in an increase in peak discharge rates under any storm conditions. While the site is currently entirely paved and impervious, the proposed condition includes an urban court green space which will reduce the impervious area of the site and, hence, reduce the volume and rate of runoff from the site.

Standard #3: Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

Compliance: The Project will comply with Standard #4 to the maximum extent practicable. The site is currently entirely paved and impervious. The proposed condition includes an urban court green space which will result in the introduction of recharge, and therefore a net increase in recharge over the current condition.

Standard #4: For new development, stormwater management systems must be designed to remove 80% of the site's average annual post-construction load of Total Suspended Solids (TSS).

Compliance: The Project is a redevelopment project on an urban site and not a new development on an undisturbed green site. As such, and to the extent practicable, the Project's stormwater management system will be designed to remove the site's post-development average annual TSS load.

Standard #5: Stormwater discharges from areas with higher potential pollutant loads will require the use of specific stormwater management BMPs. The use of infiltration without pretreatment is prohibited.

Compliance: Standard #5 is not applicable to the Project. The Project is not associated with Higher Potential Pollutant Loads as defined by the Stormwater Management.

Standard #6: Stormwater discharges to critical areas must utilize certain approved stormwater management BMPs. Critical areas are defined to include Outstanding Resource Waters (ORWs), shellfish beds, swimming beaches, cold-water fisheries and recharge areas for public water supplies.

Compliance: Standard #6 is not applicable to the Project. The Project does not include the discharge of untreated stormwater to critical areas as defined by the Standards.

Standard #7: Redevelopment of previously developed sites must meet the Stormwater Management Regulations to the maximum extent practicable. However, if it is not practicable to meet all the Standards, new stormwater management systems must be designed to improve existing conditions.

Compliance: The proposed redevelopment project will meet the Stormwater Management Standards to the maximum extent practicable and will improve existing conditions.

Standard #8: A plan to control construction related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

Compliance: The Project will comply with this standard. Sedimentation and erosion controls will be incorporated as part of the design of this Project and employed during site construction. In addition, construction activities will be conducted in compliance with the site's NPDES permit and SWPPP.

Standard #9: A long term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.

Compliance: An Operations and Maintenance Plan will be prepared for the Project and the site will be maintained in compliance with this Plan by the Project Owner.

Standard #10: All illicit discharges to the stormwater management system are prohibited.

Compliance: The Project does not include any illicit discharges to the proposed stormwater management system. An Illicit Discharge Compliance Certification will be filed when the Project stormwater management system design is finalized.

7.3.5 City of Boston Groundwater Overlay District

A review of City of Boston Zoning maps indicates that the Project site is not located within a City of Boston Groundwater Conservation Overlay District.

7.3.6 Flood Zones

The existing Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the Project site indicates that it is located outside of a designated flood zone (FIRM, City of Boston, Community-Panel Number 25025C0081G, Effective Date September 25, 2009). However, a "preliminary" revised floodplain map for the site area was recently released by FEMA which shows the site as lying within the 100-year flood zone (FIRM, Suffolk County, Massachusetts; Panel 0081J, Map Number 25025C0081J, Map Revised, Preliminary November 15, 2013). As discussed in Section 3.14, *Sustainable Design*, and Section 3.15, *Climate Adaptability*, the design of the site and buildings will recognize and account for the site's location proximate to the harbor and within this newly designated flood zone, as well as the potential impacts of sea level rise.

7.4 Electrical Systems

NSTAR provides electric service in the City of Boston. New electric services will be required to service the Project. It is anticipated that new underground electric services for the Project will be provided from Northern Avenue and/or Congress Street and Starboard Lane.

The electrical, space heating, and energy systems for the proposed Project have not yet been fully designed. When the design loads are determined, electrical power supply designs will be coordinated with NSTAR. Energy-saving measures will be incorporated into the building designs and Project construction. The Proponent will investigate the installation of energy efficient lighting, heating and cooling systems in the designs for the buildings.

The Proponent will consult with the Massport as to any proposed utility improvement projects planned for this area.

7.5 Telephone Systems

Verizon provides telephone service in the Project area with facilities in Northern Avenue and Congress Street. New telephone services will be required to service the Project. It is anticipated that new underground telephone services for the Project will be provided from Northern Avenue, Congress Street and Starboard Lane.

7.6 Cable Systems

Comcast, Verizon and others provides cable service in the Project area. It is anticipated that cable service to the proposed buildings will be underground from Northern Avenue and/or Congress Street.

7.7 Gas System

Keyspan provides natural gas service in the Project area. Existing gas mains are located in Northern Avenue, Congress Street and Massport Haul Road. It is expected that the required new gas services will be connected to each of these gas mains. The gas demand will be determined during the design phase of the Project.

7.8 Utility Protection During Construction

During construction, infrastructure will be protected using sheeting and shoring, temporary relocations, and construction staging, as required. The Contractor will be required to coordinate all protection measures, temporary supports, and temporary shutdowns of all utilities with the appropriate utility owners and/or agencies. The Contractor will also be required to provide adequate notification to the utility owner prior to any work commencing on their utility. In the event a utility cannot be maintained in service during switch over to a temporary or permanent system, the Contractor will be required to coordinate the shutdown with the utility owners and Project abutters to minimize impacts and inconveniences accordingly.

Section 8.0

Coordination with Other Agencies

8.0 COORDINATION WITH OTHER AGENCIES

8.1 Architectural Access Board Requirements

The Project will voluntarily comply with the requirements of the Architectural Access Board and the standards of the Americans with Disabilities Act.

8.2 Boston Civic Design Commission

The Project will voluntarily comply with the applicable provisions of the Boston Zoning Code. The Expanded PNF will be submitted to the Boston Civic Design Commission as part of the voluntary Article 80 process.

8.3 Massachusetts Environmental Policy Act (MEPA)

The design and use of Parcel K has been the subject of a number of area planning efforts, including MEPA review in association with the Commonwealth Flats Development Area Expanded Environmental Notification Form (March 1, 1999), the Draft Environmental Impact Report (January 3, 2000) and the Final Environmental Impact Reports (December 15, 2000). In the January 29, 2001 Certificate on the Final Environmental Affairs the Secretary of Environmental Affairs (now Energy and Environmental Affairs) established a Special Review Procedure for individual projects within the CFDA that exceeded a mandatory Environmental Impact Report threshold whereby such projects would be presumed to qualify for a streamlined, Single Environmental Impact Report (SEIR) review process under the MEPA regulations. To be eligible for the SEIR review process, the individual project would also need to verify consistency with the approved area-wide and parcel specific criteria, undergo large project review by the BRA, and update project-specific transportation issues.

The Project is subject to a mandatory Environmental Impact Report (EIR) because, based on unadjusted traffic estimates, it will exceed the transportation threshold of the "generation of 3,000 or more New Average Daily Traffic (adt) on roadways providing access to a single location" (CMR 11.03(6)(6)). It is clear, however, from the transportation analysis conducted for the Project presented herein that, when the vehicle trip generation estimates are adjusted for area transit use and pedestrian trips using Boston Transportation Department (BTD) mode splits, the Project would produce only an estimated 1,662 total daily vehicle trips; this adjusted vehicle trip generation estimate is almost one-half the MEPA threshold for requiring an EIR, and is even less than the ENF threshold.

In that the Project does not exceed any other MEPA EIR threshold and has no environmental impact greater than that identified in the CFDA EIRs, the Proponent will file an Expanded Environmental Notification Form (ENF) and a Request for a Waiver of the mandatory EIR with the Secretary of Energy and Environmental Affairs.

8.4 Massachusetts Historical Commission

Because the Project requires state permits, it is subject to reviewed by the Massachusetts Historical Commission (MHC) in accordance with M.G.L., Chapter 9, Sec. 26-27c, as amended by Chapter 254 of the Acts of 1988 (950 CMR 71.00). The Expanded ENF described above will be submitted to the MHC and will serve as a Project Notification Form to initiate the Chapter 254 review process.

8.5 Other Permits and Approvals

Section 1.9 of this Expanded PNF provides an anticipated list of agencies from which permits and approvals for the Project will be sought.

Section 9.0

Project Certification

9.0 PROJECT CERTIFICATION

This form has been circulated to the Boston Redevelopment Authority as required by the Boston Zoning Code, Article 80.

Signature of Proponent's Representative

Terry Conroy Jr.

Parcel K LLC
800 Technology Center Drive
Stoughton, MA 02072
(781) 344-5656

December 16, 2013
Date

Signature of Preparer

Andrew D. Magee

Epsilon Associates, Inc.
3 Clock Tower Place, Suite 250
Maynard, MA 01754
(978) 897-7100

December 16, 2013
Date

Appendix A

Existing Conditions Survey

NOTES

1. THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM AN ON THE GROUND SURVEY AND EXISTING DRAWINGS. BAY COLONY GROUP, INC (SURVEYOR) MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN HEREON COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM INFORMATION AVAILABLE. THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES. CONTRACTORS ARE TO CHECK AND VERIFY THE LOCATION OF UTILITIES PRIOR TO CONSTRUCTION. DIG SAFE PHONE NO. 1-888-344-7233

2. ELEVATIONS, IN FEET, ARE REFERRED TO THE CITY OF BOSTON DATUM. HORIZONTAL DATUM IS BASED ON NORTH AMERICAN DATUM 1983 (NAD 83).

3. CONTOUR INTERVAL: 1 FOOT

4. ALL CURBING IS VERTICAL GRANITE CURB UNLESS OTHERWISE NOTED.

5. TOPOGRAPHIC SURVEY OF PARCEL K CONDUCTED BY BAY COLONY GROUP INC. ON JULY 16-17, 2012. PARCEL K IS BOUNDED BY THE FACE OF CURB AT THE GUTTER LINE PER PLAN ENTITLED, "MASSACHUSETTS PORT AUTHORITY BOSTON, MA SOUTH BOSTON PROPERTIES PARCEL K LEASE PLAN AT SEAPORT DISTRICT, SOUTH BOSTON", PREPARED B: MASSPORT SURVEY UNIT LOGAN AIRPORT E. BOSTON, MA 02129, DATED: 1/9/09.

6. LOCATION OF PARCEL K, ALL RIGHT OF WAYS AND EASEMENTS, ALL UTILITIES, STRUCTURES AND PLANIMETRIC FEATURES (OTHER THAN THOSE LOCATED WITHIN THE LIMITS OF PARCEL K) ARE AS DEPICTED ON A PLAN ENTITLED, "EXISTING CONDITIONS PLAN OF LAND MASSPORT PARCELS K-1 AND K-2 NORTHERN AVENUE, STARBOARD STREET AND CONGRESS STREET BOSTON, MASSACHUSETTS", PREPARED BY: CUOCO & CORMIER ENGINEERING ASSOCIATES, INC. 170 MAIN STREET - UNIT 112 TEWKSBURY, MA. 01876, DATED: DECEMBER 12, 2008. THE SURVEYOR DOES NOT WARRANT OR GUARANTEE THAT THE LOCATION OF PARCEL K, RIGHT OF WAYS, EASEMENTS, UTILITIES, STRUCTURES AND PLANIMETRIC FEATURES SHOWN ON THE PREVIOUSLY MENTIONED PLAN ARE LOCATED AS ACCURATELY AS POSSIBLE FROM INFORMATION AVAILABLE.

NO.	DATE	DESCRIPTION
3	05-10-2013	ADDED INVERT INFORMATION AND ADDITIONAL IMPROVEMENTS LOCATED IN FIELD
2	09-20-2012	ADDED MARKED UTILITY LINES LOCATED 9/17/12
1	09-10-2012	ADDED UTILITY PIPE TYPE & SIZE INFORMATION

KEY:

HYDRANT	STONE WALL
WATER GATE	ELECTRIC HAND HOLE
WATER SERVICE	UTILITY POLE
GAS GATE	LIGHT
DRAIN MANHOLE	CONC BOLLARD
CATCH BASIN	GUY WIRE
SEWER MANHOLE	SIGN
EXISTING WELL	SLOPED GRANITE CURB
UNDERGROUND TELE.	SLOPED METAL CURB
UNDERGROUND SEWER	VERTICAL CONCRETE CURB
UNDERGROUND GAS	REINFORCED CONCRETE PIPE
UNDERGROUND ELEC.	CORRUGATED PLASTIC PIPE
UNDERGROUND WATER	MAILBOX
CONCRETE BOUND WITH DRILLHOLE (CB/DH)	TREE
STONE BOUND WITH DRILLHOLE (SB/DH)	PINE TREE
SOLID WHITE EDGE LINE (SWEL)	SOLID WHITE LANE LINE (SWLL)
SOLID YELLOW EDGE LINE (SYEL)	DASHED WHITE LANE LINE (DWLL)

SCALE 1" = 20'

PROJECT:

301 Northern Avenue
Boston, MA

CLIENT:

Conroy Development Corporation
800 Technology Center Drive
Stoughton, MA 02072

Bay Colony Group, Inc.
Professional Civil Engineers & Professional Land Surveyors

FOUR SCHOOL STREET
P.O. BOX 9136
FOXBOROUGH, MA 02035
508-543-3939

STAMP

COMMONWEALTH OF MASSACHUSETTS
RICHARD J. LESLIE
No. 38384
REGISTERED PROFESSIONAL LAND SURVEYOR

DRAWING TITLE

Existing Conditions Plan

SCALE: 1" = 20'

July 26, 2012 | SHEET NUMBER 1

11-0108-EX

Appendix B

Traffic Impact and Access Study (TIAS)

TRAFFIC IMPACT AND ACCESS STUDY

PROPOSED MIXED-USE DEVELOPMENT ON PARCEL K
BOSTON, MASSACHUSETTS

Prepared for:

CONROY DEVELOPMENT
Stoughton, MA

October 2013

Prepared by:

VANASSE & ASSOCIATES, INC.
10 New England Business Center Drive
Suite 314
Andover, MA 01810
(978) 474-8800

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INTRODUCTION

Vanasse & Associates, Inc. (VAI) has conducted a Traffic Impact and Access Study (TIAS) in order to determine the potential impacts on the transportation infrastructure associated with the proposed construction of a mixed-use development to be located on Parcel K at the southwest corner of the intersection of Northern Avenue and Massport Haul Road in Boston, Massachusetts (hereafter referred to as the "Project"). This study presents a comprehensive assessment of the transportation infrastructure serving the Project site with respect to: i) access requirements; ii) potential off-site improvements; and iii) safety considerations; and identifies and analyzes existing and future traffic conditions both with and without the Project along Seaport Boulevard/Northern Avenue and Congress Street, and at the intersections of Congress Street at D Street; Seaport Boulevard and Northern Avenue at D Street; Northern Avenue at Congress Street; Northern Avenue at Massport Haul Road; and Congress Street at Park Lane.

PROJECT DESCRIPTION

The Project will entail the development of 480,243± square feet (sf) of mixed-use space consisting of 304 residential units, a 247-room hotel, 16,200± sf of office space and 24,985± sf of restaurant and retail space, together with an approximately 640-space below-grade parking garage to be situated on Parcel K located on the southwest corner of the intersection of Northern Avenue at Massport Haul Road in the South Boston area of Boston, Massachusetts. The Project site is generally bounded by Northern Avenue to the north; Massport Haul Road to the east; commercial properties and the Massachusetts Bay Transportation Authority (MBTA) Silver Line connector road to the south; and Congress Street to the east. At present, the Project site is occupied by a parking lot and associated appurtenances that will be removed in conjunction with the Project. Access to the Project site will be provided by way of two (2) new driveways as follows: a full access driveway that will intersect the east side of Congress Street opposite Park Lane and a right-turn entrance only driveway that will intersect the south side of Northern Avenue approximately 150 feet east of Congress Street. An additional access drive for service and delivery vehicles is proposed along the west side of the Massport Haul Road, south of Northern Avenue. Figure 1 depicts the Project site in relation to the existing roadway network.

The Project will enter into a Transportation Access Plan Agreement (TAPA) from the Boston Transportation Department (BTD).

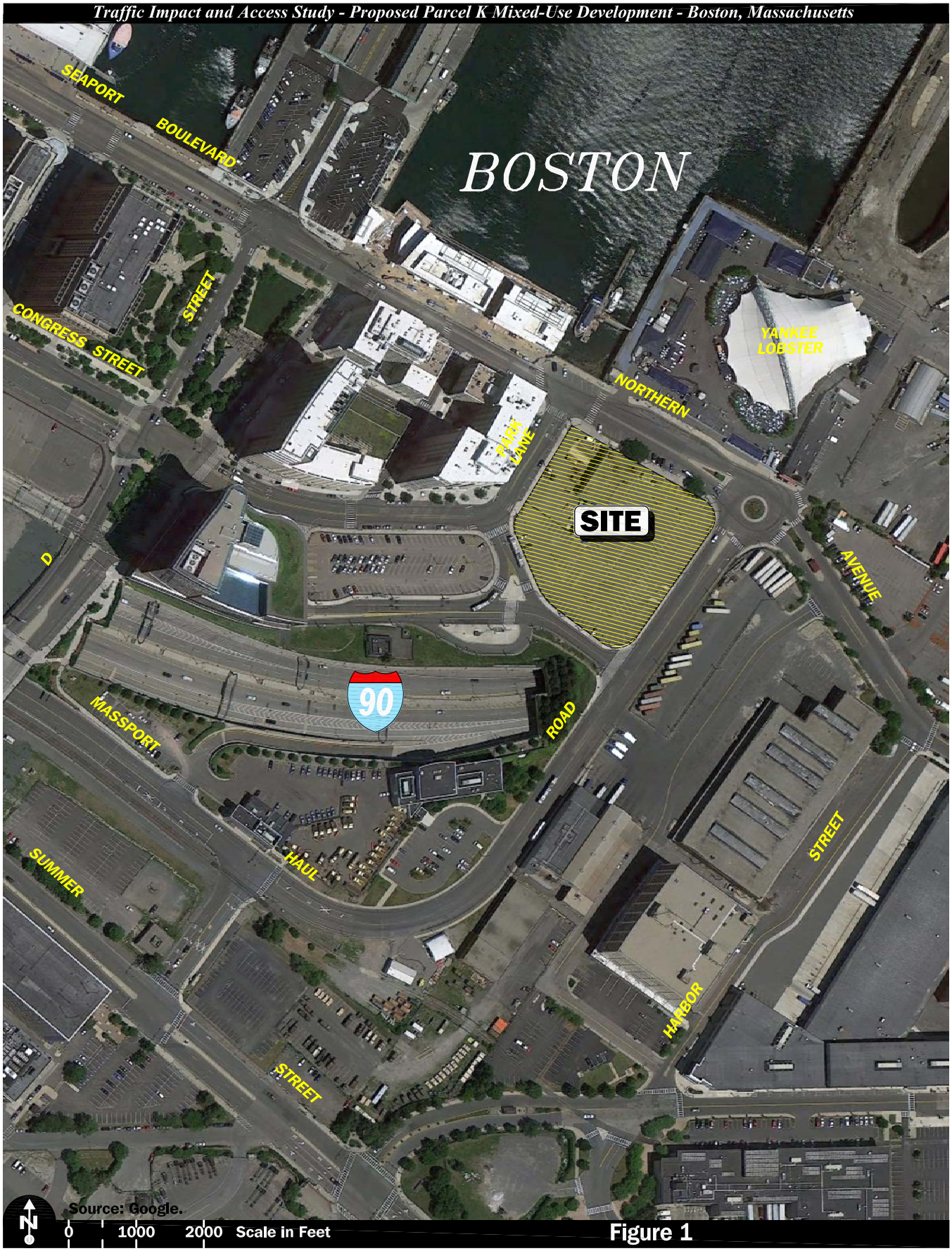


Figure 1

Site Location Map

Vanasse & Associates, Inc.
Transportation Engineers & Planners

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STUDY METHODOLOGY

This study was prepared in consultation with the Massachusetts Port Authority (Massport), the City of Boston and the Massachusetts Department of Transportation (MassDOT); was performed in general accordance with the Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs (EEA)/MassDOT Guidelines for Environmental Impact Report/Environmental Impact Statement Traffic Impact Assessments (TIAs); was conducted pursuant to the standards of the Traffic Engineering and Transportation Planning professions for the preparation of such reports; and was conducted in three distinct stages.

The first stage involved an assessment of existing conditions in the study area and included an inventory of roadway geometrics, pedestrian and bicycle facilities, and public transportation services; observations of traffic flow; and a review and analysis of motor vehicle crash data.

In the second stage of the study, future traffic conditions were projected and analyzed. Specific travel demand forecasts for the Project were assessed along with future traffic demands due to expected traffic growth independent of the Project. A five-year time horizon from the current year (2013) was selected for analyses consistent with state guidelines for the preparation of TIAs. The traffic analysis conducted in stage two identifies existing or projected future roadway capacity, traffic safety, and site access issues.

The third stage of the study presents and evaluates measures that are designed to address existing and projected impacts on the transportation infrastructure, if any, and provides specific recommendations for improvements where necessary to accommodate the Project.

EXISTING CONDITIONS

A comprehensive field inventory of existing conditions within the study area was conducted in August and November 2012. The field investigation consisted of an inventory of existing roadway geometrics; pedestrian and bicycle facilities; public transportation services; traffic volumes; and operating characteristics; as well as posted speed limits and land use information within the study area. The study area for the Project was selected to contain the major roadways providing access to the Project site, Seaport Boulevard/Northern Avenue and Congress Street, as well as the intersections of Congress Street at D Street; Northern Avenue and Seaport Boulevard at D Street; Northern Avenue at Congress Street; Northern Avenue at Massport Haul Road; and Congress Street at Park Lane.

The following describes existing conditions within the study area.

Roadways

Seaport Boulevard/Northern Avenue

Seaport Boulevard/Northern Avenue is a four-lane (two lanes per direction) urban principal arterial roadway under City jurisdiction west of D Street and under Massport jurisdiction east of D Street that traverses the study area in a general northwest-southeast alignment between Atlantic Avenue and Tide Street. Within the study area, Seaport Boulevard/Northern Avenue provides two 11 to 13-foot wide travel lanes per direction separated by a raised median, with metered on-street parking provided along the south side of the roadway; east of Congress Street, Northern Avenue provides one 16.5 to 18-foot wide travel lane per direction separated by double-yellow centerline with metered on-street parking provided on both sides of the roadway. Sidewalks are provided continuously along both sides of the roadway, with marked crosswalks provided at major intersections. Illumination is provided by way of street lights mounted on steel or concrete poles. Land use along Seaport Boulevard/Northern Avenue within the study area consists of the Project site; the World Trade Center; Boston Fish Pier; Seaport Apartments; John Hancock Financial; other commercial and residential uses; and the working port area encompassing water dependent uses along the Boston Inner Harbor.

Congress Street

Congress Street is generally a four-lane (two lanes per direction) principal arterial roadway under City jurisdiction that traverses northwest-southeast alignment between New Chardon Street and Northern Avenue. Within the study area, Congress Street provides two 11.5 to 13-foot wide travel lanes for the northwestbound direction, with a 14-foot wide travel lane for the southeastbound direction and metered on-street parking provided along both sides of the roadway. Sidewalks are provided continuously along both sides of the roadway, with marked crosswalks provided at major intersections. Illumination is provided by way of street lights mounted on concrete poles. Land use along Congress Street within the study area consists of the Project site and commercial uses.

Intersections

Congress Street at D Street

D Street intersects Congress Street from the north and south to form this four-legged intersection under traffic signal control. The Congress Street eastbound approach consists of a 12-foot wide left-turn/through travel lane, a 12-foot wide through/right-turn lane and an 11-foot wide right-turn lane with a 1-foot wide marked shoulder provided. The Congress Street westbound approach consists of two 11.5 to 13-foot wide general-purpose travel lanes with a 1-foot wide marked shoulder provided. The directions of travel along Congress Street are separated by a raised median and double-yellow centerline east of D Street, and by a raised median to the west. The D Street northbound approach consists of two 11 to 12-foot wide left-turn lanes and a 12-foot wide through/right-turn lane with no marked shoulder provided. The D Street southbound approach consists of two 12 to 13.5-foot wide general-purpose travel lanes with no marked shoulder provided. The directions of travel along D Street are separated by a pedestrian park to the north of Congress Street and by a raised median south. Sidewalks are provided along both sides of the intersecting roadways. Marked crosswalks are provided for crossing all legs of the intersection. Illumination is provided by way of street lights mounted on metal poles. Land use in the vicinity of the intersection consists of a pedestrian park and commercial properties. The traffic signal operates in a four-phase, fully-actuated mode. Pedestrian traffic signal equipment is provided as a part of the traffic signal system and includes concurrent pedestrian phasing.

Seaport Boulevard and Northern Avenue at D Street and the Boston Fish Pier

D Street and the Boston Fish Pier intersect Seaport Boulevard and Northern Avenue from the south and north, respectively, to form this four-legged intersection under traffic signal control. The Seaport Boulevard eastbound approach consists of two 12-foot wide general-purpose travel lanes and a 5-foot wide bicycle lane. The Northern Avenue westbound approach consists of two 11-foot wide general-purpose travel lanes and a 5-foot wide bicycle lane. The directions of travel along Seaport Boulevard to the west of the intersection are separated by a flush coble median. The directions of travel along Northern Avenue are separated by a double-yellow centerline. The D Street northbound approach consists of an 11-foot wide left-turn lane and a 13-foot wide right-turn lane with a 2-foot wide marked shoulder provided. The Boston Fish Pier southbound approach consists of a 14-foot wide general-purpose travel lane with no marked shoulder provided. The directions of travel along D Street are separated by a pedestrian park. The directions of travel along the Boston Fish Pier are separated by a painted median and double-yellow centerline. Sidewalks are provided along both sides of the intersecting roadways with marked crosswalks provided across all legs of the intersection. Illumination is provided by way of street lights mounted on metal poles. Land use in the vicinity of the intersection consists of a

pedestrian park, the Boston Fish Pier and commercial properties. The traffic signal operates in a three-phase, fully-actuated mode. Pedestrian traffic signal equipment is provided as a part of the traffic signal system and includes concurrent pedestrian phasing.

Northern Avenue at Congress Street

Congress Street intersects Northern Avenue from the south to form this three-legged, T-type, unsignalized intersection under STOP-sign control. The Northern Avenue eastbound approach consists of a two 10.5 to 11.5-foot wide general-purpose travel lanes and a 5-foot wide bicycle lane with metered on-street parking provided along the curb. The Northern Avenue westbound approach consists of 16.5-foot wide general-purpose travel lane with no marked shoulder provided. The directions of travel along Northern Avenue are separated by a flush cobble median east of the intersection and by a double-yellow centerline to the west. The Congress Street northbound approach consists of a 12-foot wide left-turn lane and a 7-foot wide right-turn lane with metered on-street parking provided along the curb and vehicles approaching Northern Avenue under STOP-sign control. The directions of travel along Congress Street are separated by a double-yellow centerline. Sidewalks are provided along both sides of the intersecting roadways with marked crosswalks present across all legs of the intersection. Illumination is provided by way of street lights mounted on metal poles. Land use in the vicinity of the intersection consists of the Project site, residential and commercial properties, and the working port area.

Congress Street at Park lane

Park Lane intersects Congress Street from the west to form this three-legged, T-type, unsignalized intersection under STOP-sign control. The Congress Street north and southbound approaches consist of a single 18-foot wide general-purpose travel lane with no marked shoulder provided. The directions of travel along Congress Street are separated by a double-yellow centerline. Park Lane is a 24-foot wide paved roadway that accommodates two-way travel with no marked centerline or shoulders provided. The Park Lane approach to Congress Street is under STOP-sign control. Sidewalks are provided along both sides of Congress Street with no marked crosswalks present at the intersection. Land use in the vicinity of the intersection consists of the Project site and commercial properties.

Northern Avenue at Massport Haul Road and the Yankee Lobster Driveway

Northern Avenue, Massport Haul Road and the Yankee Lobster driveway intersect to form this four-legged intersection under modern roundabout control. The Northern Avenue eastbound approach to the roundabout provides a 12-foot wide general-purpose travel lane and a 14-foot wide right-turn lane under YIELD-sign control. The Northern Avenue westbound approach to the roundabout provides two 10-foot wide general-purpose travel lanes under YIELD-sign control. The Massport Haul Road northbound approach to the roundabout provides a 13-foot wide general-purpose travel lane and a 13-foot wide right-turn lane under YIELD-sign control. The Yankee Lobster driveway consists of a paved 24-foot wide drive that accommodates two-way travel with no marked centerline or shoulders provided and is under assumed yield control; however, a YIELD-sign is not provided. The roundabout consists of two unmarked, counterclockwise circulating lanes with no marked shoulder provided. Sidewalks are provided along both sides of Northern Avenue and along the west side of Massport Haul Road. Marked crosswalks are provided for crossing all legs of the roundabout. Illumination is provided by way of street lights mounted on steel poles. Land use in the vicinity of the roundabout consists of the

Project site, Yankee Lobster, commercial properties, the Boston Marine Industrial Park (BMIP) and the working port area.

EXISTING TRAFFIC VOLUMES

In order to determine existing traffic-volume demands and flow patterns within the study area, manual turning movement counts (TMCs) and vehicle classification counts were completed in August 2012 during the weekday morning (7:00 to 9:00 AM) and evening (4:00 to 6:00 PM) peak periods at the study intersections. These time periods were selected for analysis purposes as they are representative of the peak traffic volume hours for both the Project and the adjacent roadway network.

Traffic Volume Adjustments

In order to evaluate the potential for seasonal fluctuation of traffic volumes within the study area, MassDOT weekday seasonal traffic volume factors for Group 6 roadways (urban arterials, collectors & rural arterials, the MassDOT functional classification for Seaport Boulevard/ Northern Avenue and Congress Street) were reviewed.[1] Based on a review of this data, it was determined that traffic volumes for the month of August are approximately 9 percent above average-month conditions. In order to provide a conservative (above average) analysis scenario, the August traffic volumes were not adjusted downward to average-month conditions. The 2012 Existing traffic volumes are graphically depicted on Figures 2 and 3 for the weekday morning and evening peak hours.

A review of the peak-period traffic counts indicates that the weekday morning peak hour generally occurs between 8:00 and 9:00 AM, with the weekday evening peak-hour generally occurring between 5:00 and 6:00 PM.

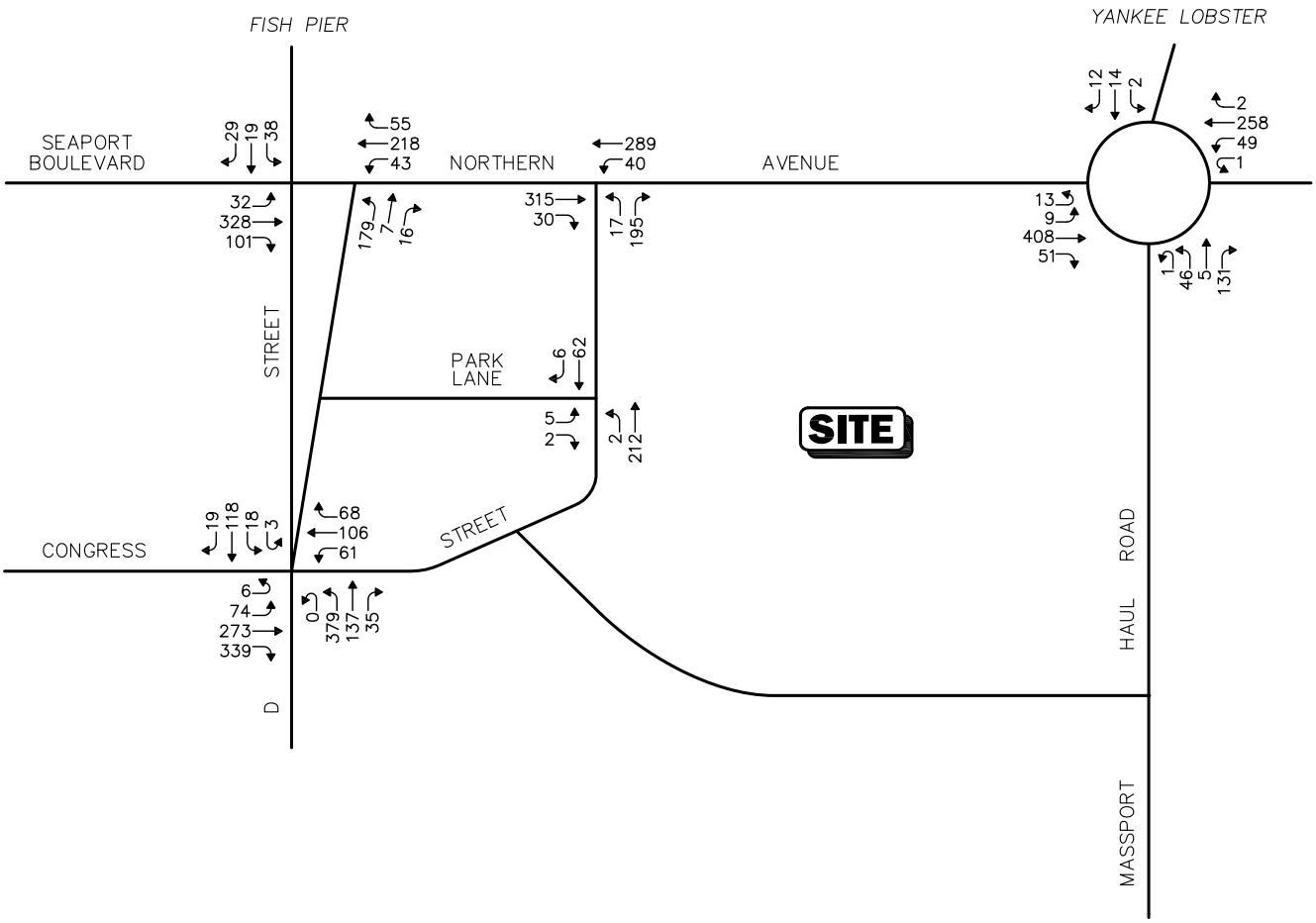
PEDESTRIAN AND BICYCLE FACILITIES

A comprehensive field inventory of pedestrian and bicycle facilities within the study area was undertaken in November 2012. The field inventory consisted of a review of the location of sidewalks and pedestrian crossing locations along the study roadways and at the study intersections, as well as the location of existing and planned future bicycle facilities.

Pedestrian Facilities

Within the study area, sidewalks are provided along both sides of Seaport Boulevard/ Northern Avenue, Congress Street and D Street, with marked crosswalks provided for crossing major intersections. Pedestrian traffic signal equipment and phasing are provided as a part of the traffic signal systems at the Congress Street/D Street and Seaport Boulevard/ Northern Avenue/ D Street intersections. In addition, the Harborwalk traverses the perimeter of the Fort Point Channel and extends around Fan Pier and the John Joseph Moakley Federal Courthouse, currently terminating at the ICA. The Harborwalk will be extended to Seaport Boulevard as a part of the Pier 4 project which will commence construction within the next year. Figures 4 and 5 depict the 2012 existing weekday morning and evening peak-hour pedestrian

[1] *MassDOT Traffic Volumes for the Commonwealth of Massachusetts;* 2007 Weekday Seasonal Factors; Group 6 – Urban Arterials, Collectors & Rural Arterials.



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

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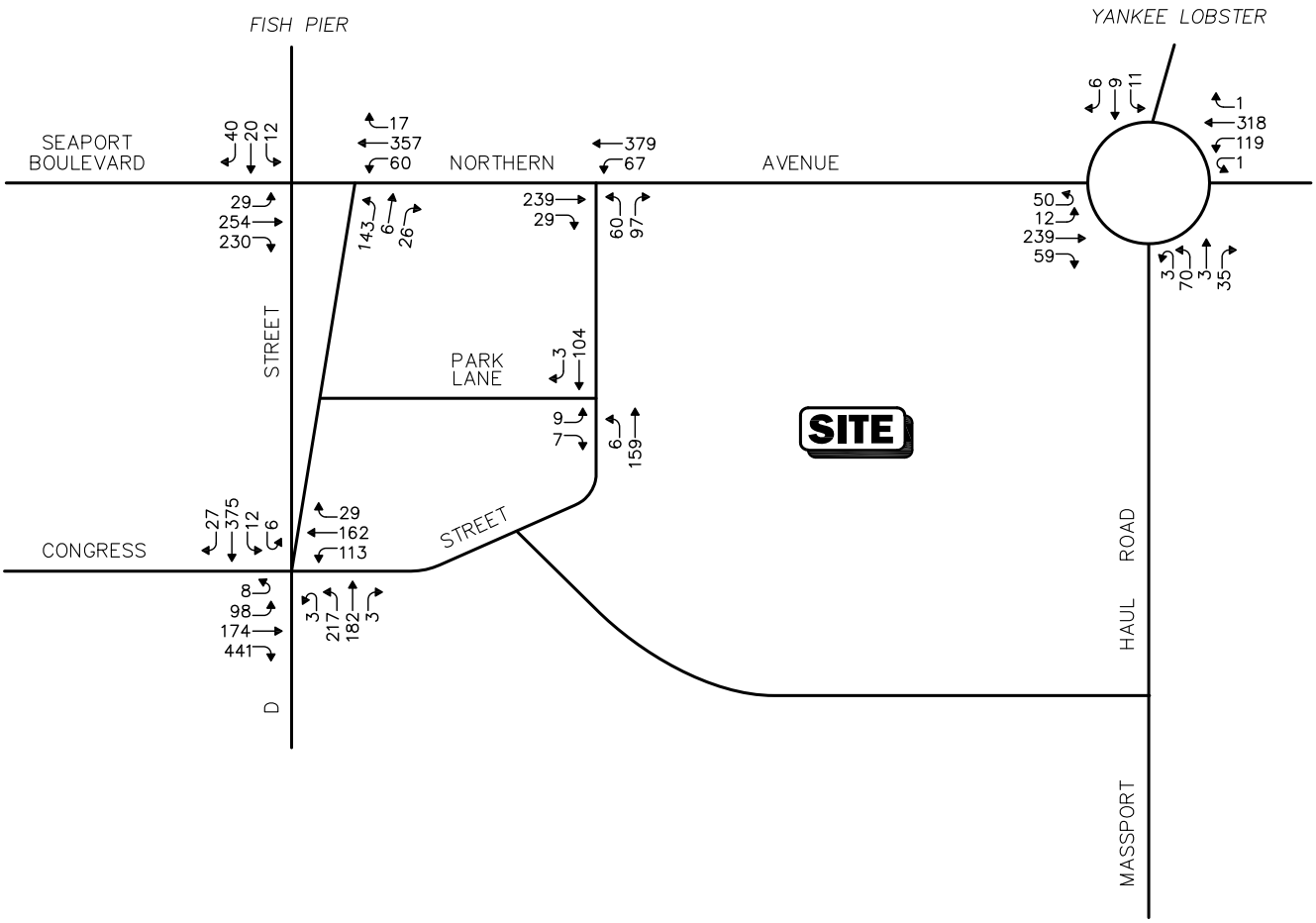
Figure 2

Vanasse & Associates, Inc.
Transportation Engineers & Planners

2012 Existing Weekday Morning Peak Hour Traffic Volumes

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Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

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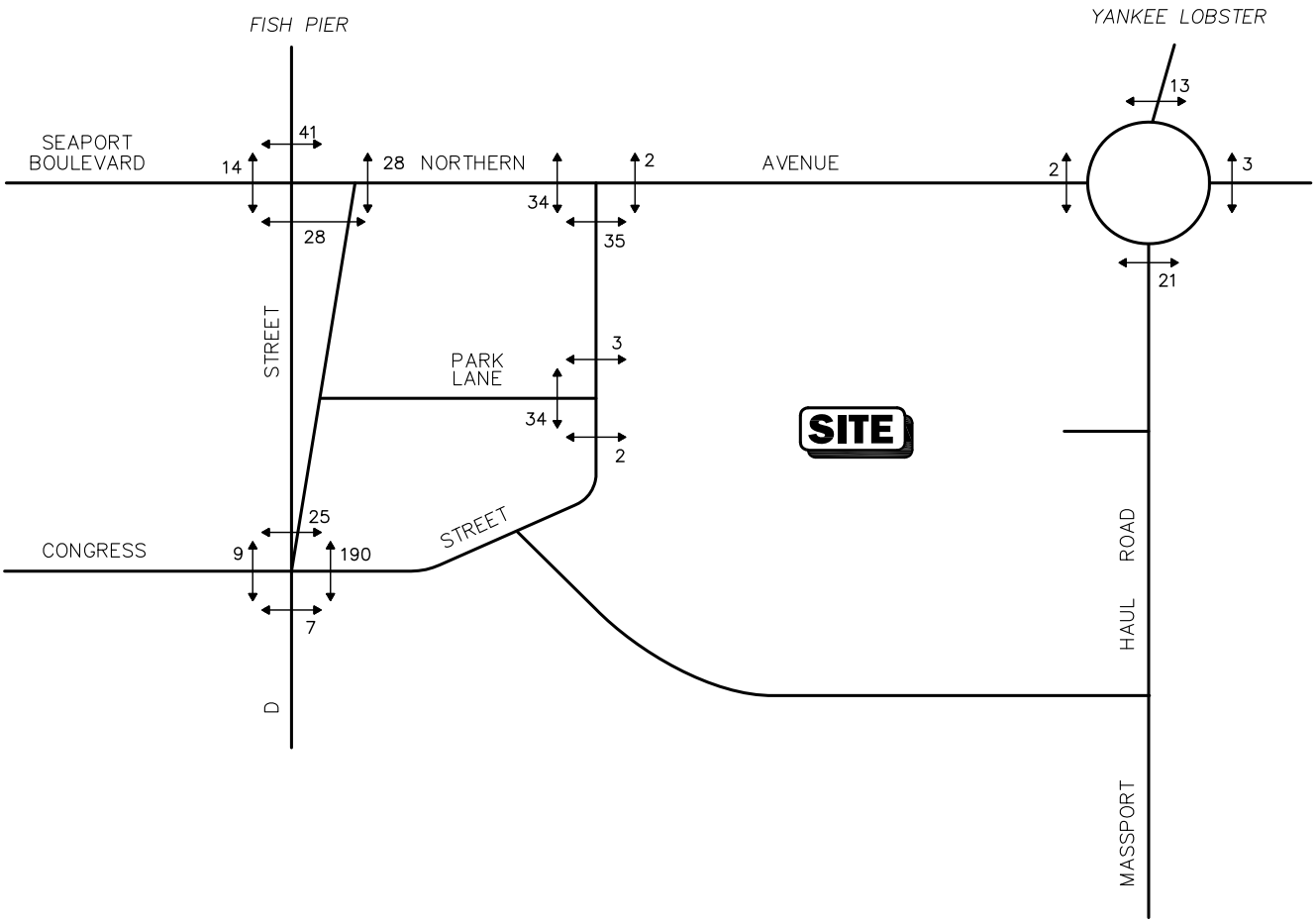
Figure 3

Vanasse & Associates, Inc.
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2012 Existing
Weekday Evening
Peak Hour Traffic Volumes

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Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

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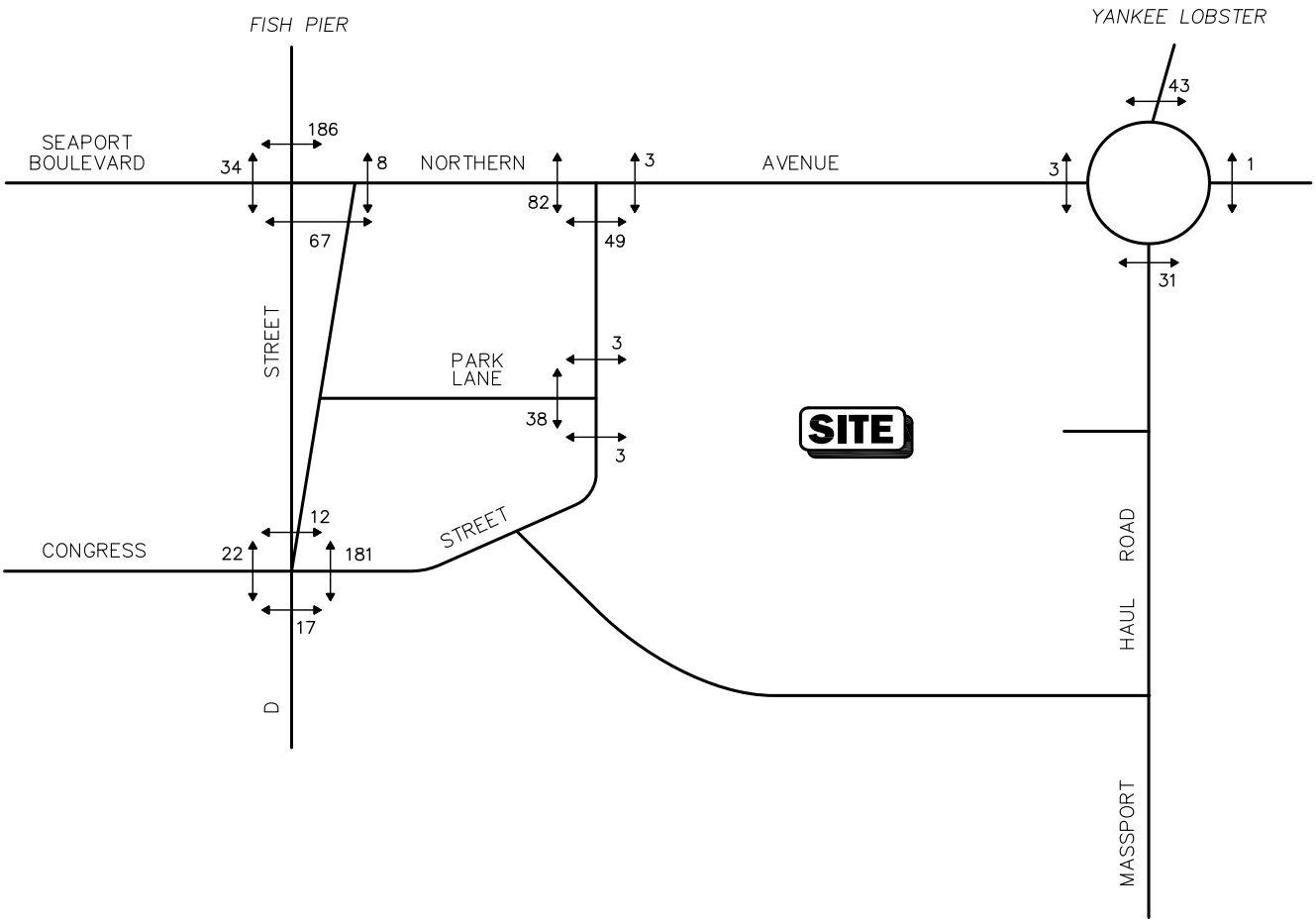
Figure 4

Vanasse & Associates, Inc.
Transportation Engineers & Planners

2012 Existing
Weekday Morning
Peak Hour Pedestrian Volumes

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Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale

Figure 5

Vanasse & Associates, Inc.
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2012 Existing
Weekday Evening
Peak Hour Pedestrian Volumes

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volumes at the study area intersections, respectively, and were collected in conjunction with the August 2012 TMCs.

Bicycle Facilities

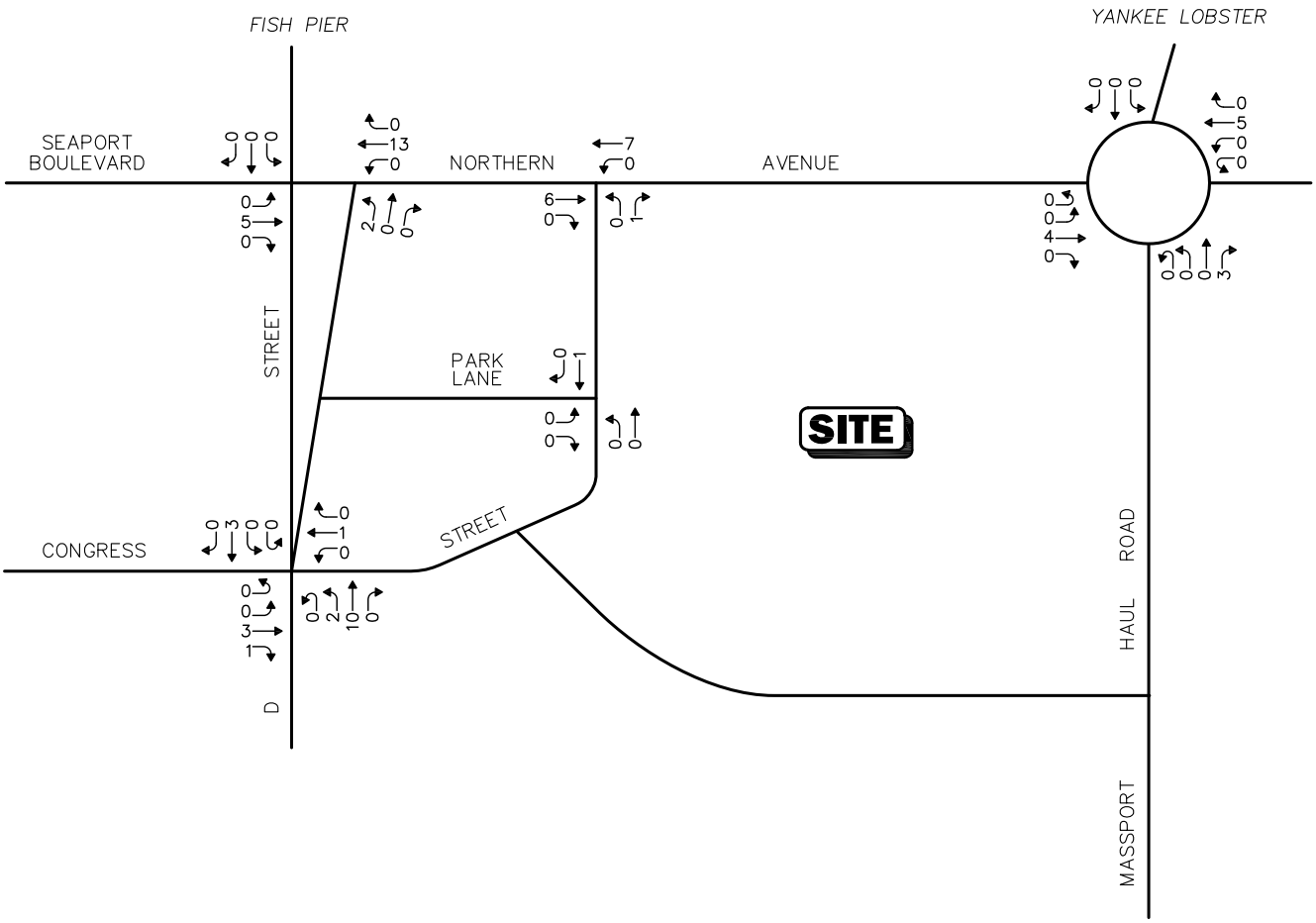
Within the study area, formal bicycle accommodations are provided along a section of Northern Avenue between D Street and Congress Street. Also, sections of Seaport Boulevard/ Northern Avenue, Congress Street and D Street appear to provide sufficient width (combined travel lane and shoulder, where present) to support bicycle travel in a shared travelled-way configuration. Bicycle accommodations and parking will be integrated into the Project. Figures 6 and 7 depict the 2012 existing weekday morning and evening peak-hour bicycle volumes at the study area intersections, respectively, and were collected in conjunction with the August 2012 TMCs.

PUBLIC TRANSPORTATION SERVICES

The study area and the Project site are served by a number of public transportation services provided by the MBTA, including fixed-route bus service and service on the Silver Line (SL1 and SL2). MBTA bus Route 4, *North Station/Tide Street*, provides service along Northern Avenue and Seaport Boulevard on weekdays between 6:25 AM and 9:00 PM, with no service provided on weekends or holidays. The closest regularly scheduled bus stops to the Project site are located at the World Trade Center. The Silver Line service operates along Seaport Boulevard and provides a stop on Silver Line Way to the immediate west of the Project site. Service on the Silver Line is provided on weekdays between 5:40 AM and 1:10 AM, on Saturday between 5:35 AM and 1:07 AM, and on Sunday between 6:12 AM and 1:10 AM. Connections to the Red Line subway system, the Commuter Rail, Amtrak and local, interstate and regional bus service can be made at the Silver Line stop at South Station and the South Station Transportation Center (SSTC). In addition, the Silver Line also provides access to Logan International Airport. The MBTA service map, schedules and fare information are provided in the Appendix.

MOTOR VEHICLE CRASH DATA

Motor vehicle crash information for the study area was provided by the MassDOT Highway Division Safety Management/Traffic Operations Unit for the most recent three year period available (2009 through 2011, inclusive) in order to examine motor vehicle crash trends occurring within the study area. The data is summarized by intersection, type, severity, and day of occurrence, and presented in Table 1.



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

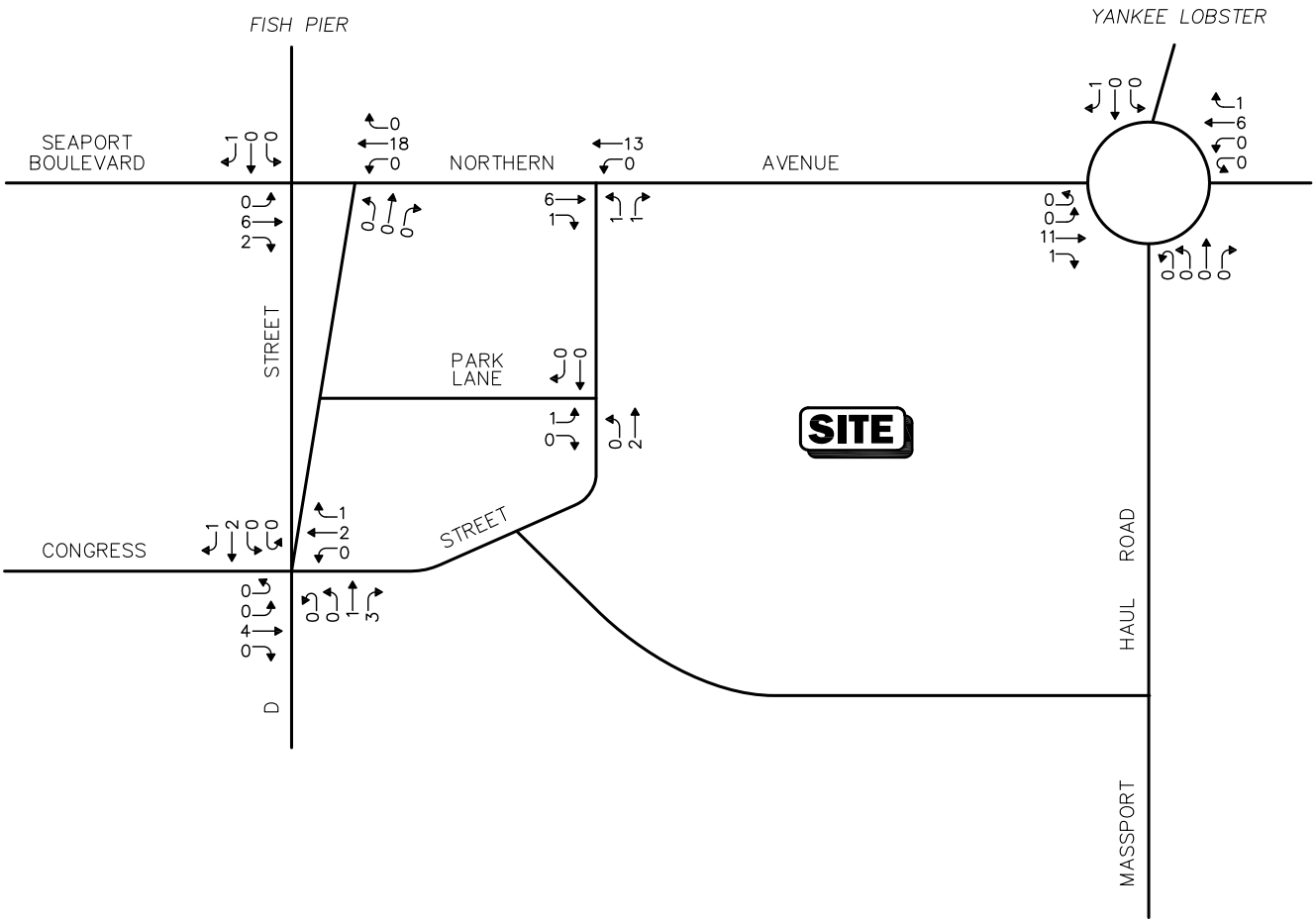
Not To Scale

Figure 6

Vanasse & Associates, Inc.
Transportation Engineers & Planners

2012 Existing
Weekday Morning
Peak Hour Bicycle Volumes

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Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale

Figure 7

Vanasse & Associates, Inc.
Transportation Engineers & Planners

2012 Existing
Weekday Evening
Peak Hour Bicycle Volumes

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Table 1
MOTOR VEHICLE CRASH DATA SUMMARY[a]

	D Street/ Congress Street	D Street/ Northern Avenue/ Seaport Boulevard	Northern Avenue/ Congress Street	Northern Avenue/ Massport Haul Road	Congress Street/ Park Lane
Year:					
2009	4	1	0	0	0
2010	2	1	0	0	0
2011	2	0	2	0	0
Total	8	2	2	0	0
Average	2.67	0.67	0.67	0.00	0.00
Rate[b]	0.36	0.14	0.19	0.00	0.00
Significant?[c]	No	No	No	No	No
Severity:					
Property Damage Only	6	1	2	0	0
Personal Injury	2	1	0	0	0
Fatal	0	0	0	0	0
Total	8	2	2	0	0
Type:					
Angle	2	1	1	0	0
Rear-End	0	0	1	0	0
Head-On	0	0	0	0	0
Fixed Object	1	0	0	0	0
Sideswipe Same Direction	4	0	0	0	0
Unknown/Other	1	1	0	0	0
Total	8	2	2	0	0
Weather Conditions:					
Clear	4	1	1	0	0
Cloudy	0	0	1	0	0
Rain	1	0	0	0	0
Snow/Ice	0	0	0	0	0
Unknown	3	1	0	0	0
Total	8	2	2	0	0
Lighting					
Daylight	4	1	2	0	0
Dawn/Dusk	0	0	0	0	0
Dark (Road Lit)	2	1	0	0	0
Dark (Road Unlit)	0	0	0	0	0
Dark (No Street Lights)	0	0	0	0	0
Other/Unknown	2	0	0	0	0
Total	8	2	2	0	0
Day of Week:					
Monday through Friday	5	2	2	0	0
Saturday	3	0	0	0	0
Sunday	0	0	0	0	0
Total	8	2	2	0	0

[a]Source: MassDOT Safety Management/Traffic Operations Unit records, 2009 through 2011.
[b]Crash rate per million vehicles entering the intersection.
[c]The intersection crash rate is significant if it is found to exceed 0.58 crashes per million vehicles entering the intersection for unsignalized intersections and 0.76 crashes per million vehicles entering the intersection for signalized intersections as defined by MassDOT for the MassDOT Highway Division District in which the intersections are located (District 6).

As can be seen in Table 1, the study area intersections were found to have experienced an average of three (3) or fewer reported motor vehicle crashes per year over the three-year review period, with no crashes reported to have occurred at the Northern Avenue/Massport Haul Road or Congress Street/Park Lane intersections. The Congress Street/D Street intersection was found to have experienced a total of eight (8) reported crashes over the three-year review period, the majority of which resulted in property damage only; occurred on a weekday during daylight; and were reported as sideswipe-type collisions. Two (2) crashes each were reported to have occurred at the Seaport Boulevard/Northern Avenue/D Street and Northern Avenue/Congress Street intersections over the three-year review period, the majority of which resulted in property damage only; occurred on a weekday during daylight; and were reported as angle-type collisions. All of the study intersections were found to have a motor vehicle crash rate below the MassDOT average crash rate for a signalized or unsignalized intersection, as appropriate, for the MassDOT Highway Division District in which the intersection is located (District 6). **Based on a review of this data, it has been concluded that there are no apparent safety deficiencies at the study area intersections.** The detailed MassDOT Crash Rate Worksheets are included in the Appendix.

FUTURE CONDITIONS

Traffic volumes in the study area were projected to the year 2018, which reflects a five-year planning horizon from the current year (2013) consistent with State traffic study guidelines. Independent of the Project, traffic volumes on the roadway network in the year 2018 under No-Build conditions include all existing traffic and new traffic resulting from background traffic growth. Anticipated Project-generated traffic volumes superimposed upon the 2018 No-Build traffic volumes reflect 2018 Build traffic volume conditions with the Project.

FUTURE TRAFFIC GROWTH

Future traffic growth is a function of the expected land development in the immediate area and the surrounding region. Several methods can be used to estimate this growth. A procedure frequently employed estimates an annual percentage increase in traffic growth and applies that percentage to all traffic volumes under study. The drawback to such a procedure is that some turning volumes may actually grow at either a higher or a lower rate at particular intersections.

An alternative procedure identifies the location and type of planned development, estimates the traffic to be generated, and assigns it to the area roadway network. This procedure produces a more realistic estimate of growth for local traffic; however, potential population growth and development external to the study area would not be accounted for in the resulting traffic projections.

To provide a conservative analysis framework, both procedures were used, the salient components of which are described below.

Specific Development by Others

A list of approved projects which are in various stages of completion and that would have an impact on future traffic volumes within the study area was obtained from the Boston Redevelopment Authority (BRA) and are listed below:

- ***Residential Development, 630 East Second Street, Boston, Massachusetts*** – This project consists of the development of an 18-unit residential community with 21 parking spaces to be located at 630 East Second Street in Boston, Massachusetts.

- ***Residential Development, 339 D Street, Boston, Massachusetts*** – This project consists of the development of a 24-unit residential community with 30 parking spaces to be located at 329 D Street in Boston, Massachusetts.

- ***Pier 4 Development, Boston, Massachusetts*** – This project consists of the initial phase of the Pier 4 development to be located off Seaport Boulevard in Boston, Massachusetts, and will consist of 383 residential units, 12,600 sf of restaurant/retail space and 20,000 sf of civil space with 258 parking spaces.

- ***Residential Development, 411 D Street, Boston, Massachusetts*** - This project consists of the development of a 197-unit residential apartment community with 129 parking spaces to be located at 411 D Street in Boston, Massachusetts.

- ***Residential Development, 360 West Second Street, Boston, Massachusetts*** – This project consists of the development of a 25-unit residential apartment building with 25 parking spaces to be located at 360 West Second Street in Boston, Massachusetts.

- ***Commercial Development, 368 Congress Street, Boston, Massachusetts*** – This project consists of the redevelopment of the existing building located at 368 Congress Street in Boston, Massachusetts, to accommodate a 120-room hotel and 5,000 sf of retail/restaurant space.

- ***Congress Street Hotel, Boston, Massachusetts*** – This project consists of the development of a 24-story, 505-room hotel to be located at 505 Congress Street in Boston, Massachusetts.

- ***Distillery Project, Boston, Massachusetts***– This project consists of a mixed-use development to be located at 516-524 East Second Street in Boston, Massachusetts, which will encompass residential and commercial uses, a greenhouse and two art galleries with 147 parking spaces.

- ***Fan Pier, Boston, Massachusetts*** - This project consists of the phased development of 2.9 million sf of office, residential, retail, restaurant and hotel space, and a cultural center to be located off Old Northern Avenue and in the waterfront area of Boston, Massachusetts.

- ***Boston Convention and Exhibition Center Expansion, Boston, Massachusetts*** – This proposed project consists of the expansion of the Boston Convention and Exhibition Center to include additional meeting space along with the development of two (2) new hotels, a parking garage and additional open space. Phase I of the expansion project includes the development of two (2) 250-room hotels to be located at 371-401 D Street.

- ***Seaport Square – Parcel A Development, Boston, Massachusetts*** – This project consists of the construction of an approximately 81,600 sf building to be located off Sleeper Street in Boston, Massachusetts, to include 34 residential units and 27,200 sf of retail space with 31 parking spaces.

- ***Waterside Place, Boston, Massachusetts*** – This project consists of the initial phase of the Waterside Place development to be located off Congress Street in Boston, Massachusetts, and will consist of 347,700 sf of space encompassing retail uses, a grocery store and 236 residential units with 140 parking spaces.

- ***West Square, Boston, Massachusetts*** – This project consists of the development of a 245-unit residential condominium community and 3,600 sf of retail space to be located off D Street in Boston, Massachusetts.

- ***Saint Augustine's at 205 E Street, Boston, Massachusetts*** – This project consists of the conversion of the Saint Augustine's School building into 39 residential units with 47 parking spaces to be located at 205 E Street in Boston, Massachusetts.

- ***Boston Cargo Terminal, Boston, Massachusetts*** - This project consists of an intermodal marine industrial facility with 459,917 sf of floor space and a 4.3–acre bulk cargo handling facility to be located on the North Jetty of the BMIP and off Northern Avenue in Boston, Massachusetts.

- ***E Street Self-Storage Facility, Boston, Massachusetts*** – This project will entail the construction of a four (4) story, 98,000± sf self-storage facility to be located along the north side of E Street in Boston, Massachusetts.

Traffic volumes associated with the aforementioned development projects by others were estimated using trip-generation statistics published by Institute of Transportation Engineers (ITE)[2] for the appropriate land use or were obtained from their respective traffic studies, and were assigned onto the study area roadway network based on existing traffic patterns where no other information was available. No other developments were identified at this time that are expected to result in an increase in traffic within the study area beyond the background traffic growth rate. The relevant background development traffic volume networks are provided in the Appendix.

General Background Traffic Growth

A review of recently completed studies performed within the study area was undertaken in order to determine general traffic growth trends in the study area. Based on this review, a 0.5 percent per year compounded annual background traffic growth rate was determined to be appropriate to account for future traffic growth and presently unforeseen development within the study area.

Planned Roadway Improvements

The City of Boston was contacted in order to determine if there were any planned roadway improvement projects expected to be completed within the study area. Based on these discussions, no roadway improvements outside of routine maintenance activities were identified to be planned within the study area at this time.

[2] *Trip Generation*, 9th Edition; Institute of Transportation Engineers; Washington, DC; 2012.

No-Build Traffic Volumes

The 2018 No-Build condition peak-hour traffic-volumes were developed by applying the 0.5 percent per year compounded annual background traffic growth rate to the 2012 Existing peak-hour traffic volumes and then superimposing the peak-hour traffic volumes associated with the identified specific developments by others. The resulting 2018 No-Build weekday morning and evening peak-hour traffic volumes are depicted on Figures 8 and 9, respectively.

PROJECT-GENERATED TRIPS

Design year (2018 Build) traffic volumes for the study area roadways were determined by estimating Project-generated traffic volumes and assigning those volumes on the study roadways. The following sections describe the methodology used to develop the anticipated trip-generation characteristics for the Project.

As proposed, the Project will entail the construction of approximately 304 residential units, of which 32 units will be innovation units, a 247-room hotel, 16,200± sf of office space, 17,198± sf of retail space, and 7,787± sf of restaurant space. In order to develop the trip characteristics of the Project, trip-generation statistics published by the ITE[3] for similar land uses as those proposed was used. ITE Land Use Codes (LUCs) 222, *High-Rise Apartment*; 310, Hotel; 710, *General Office Building*; 820, *Shopping Center*; and 931, *Quality Restaurant*; were used to develop the traffic characteristics of the Project.

Given the availability of public transportation to the Project site and the extensive sidewalk network that links the Project site to Downtown Boston, the South Boston Waterfront and the many shopping and recreational opportunities in the area, it is expected that a portion of the trips generated by the Project will be made by public transportation or will include pedestrian/bicycle trips. In order to disseminate the ITE trip characteristics of the Project, which are expressed in vehicle-trips, to the modes of travel that will be available to the Project (automobile, public transportation and pedestrian/bicycle), vehicle occupancy ratios (VORs) obtained from recent development projects in the South Boston Waterfront area[4] and travel mode data obtained from BTD were reviewed. Table 2 summarizes the travel mode split data used for the Project.

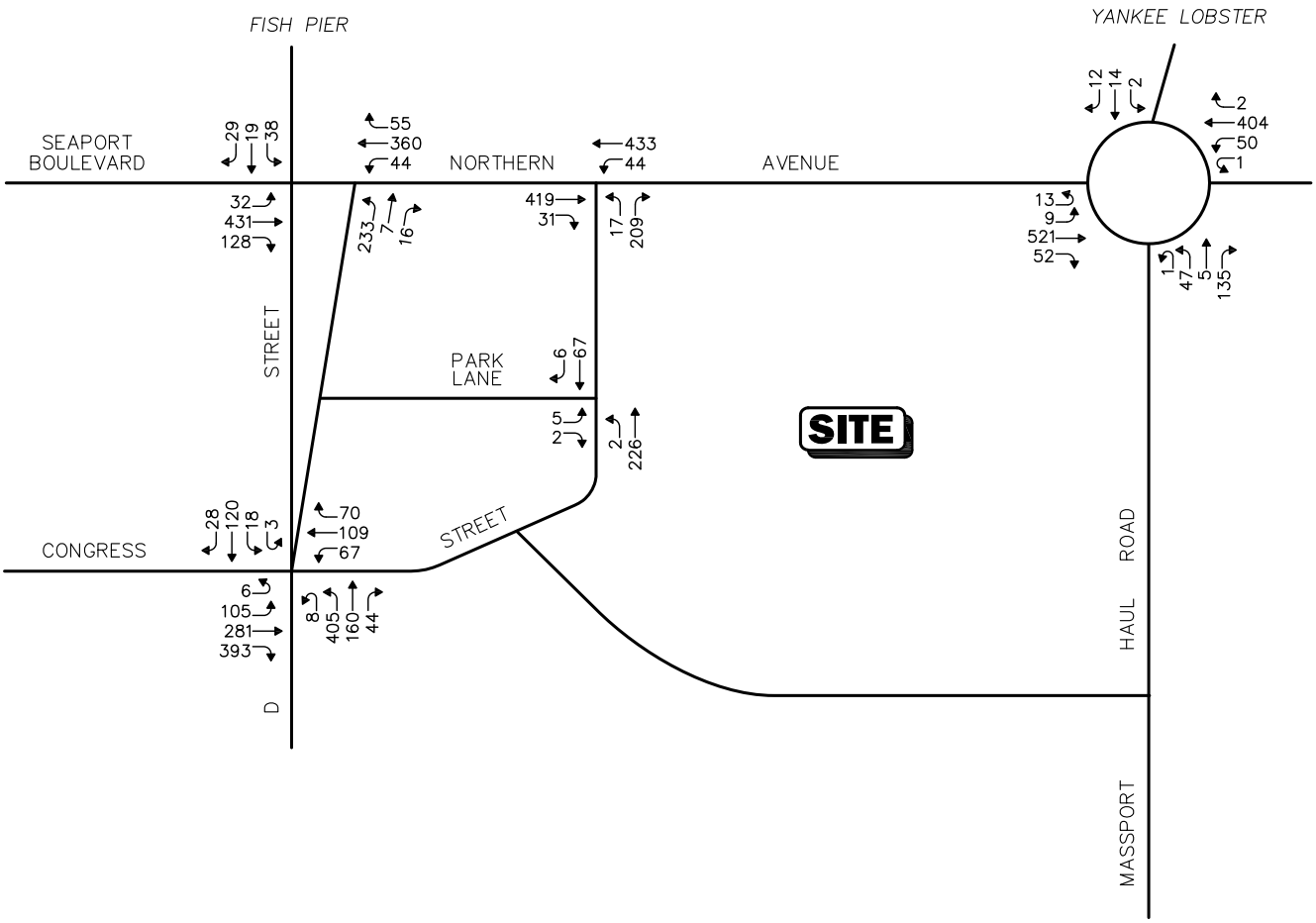
Table 2
TRAVEL MODE SPLIT[a]

Land Use	Auto (Percent)	Transit (Percent)	Walk/Other (Percent)	Total
Residential	34	24	42	100
Hotel	35	22	43	100
Office	60	17	23	100
Retail/Restaurant	40	6	54	100

[a]Source: Boston Transportation Department.

[3]Ibid.

[4]*Seaport Square, Final Environmental Impact Report, EEA #14255*; Boston, Massachusetts, Epsilon Associates, Inc. et al; June 2010; and *Pier 4 Residential Development, Seaport Boulevard*, Boston, Massachusetts, VAI; October, 2011.



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

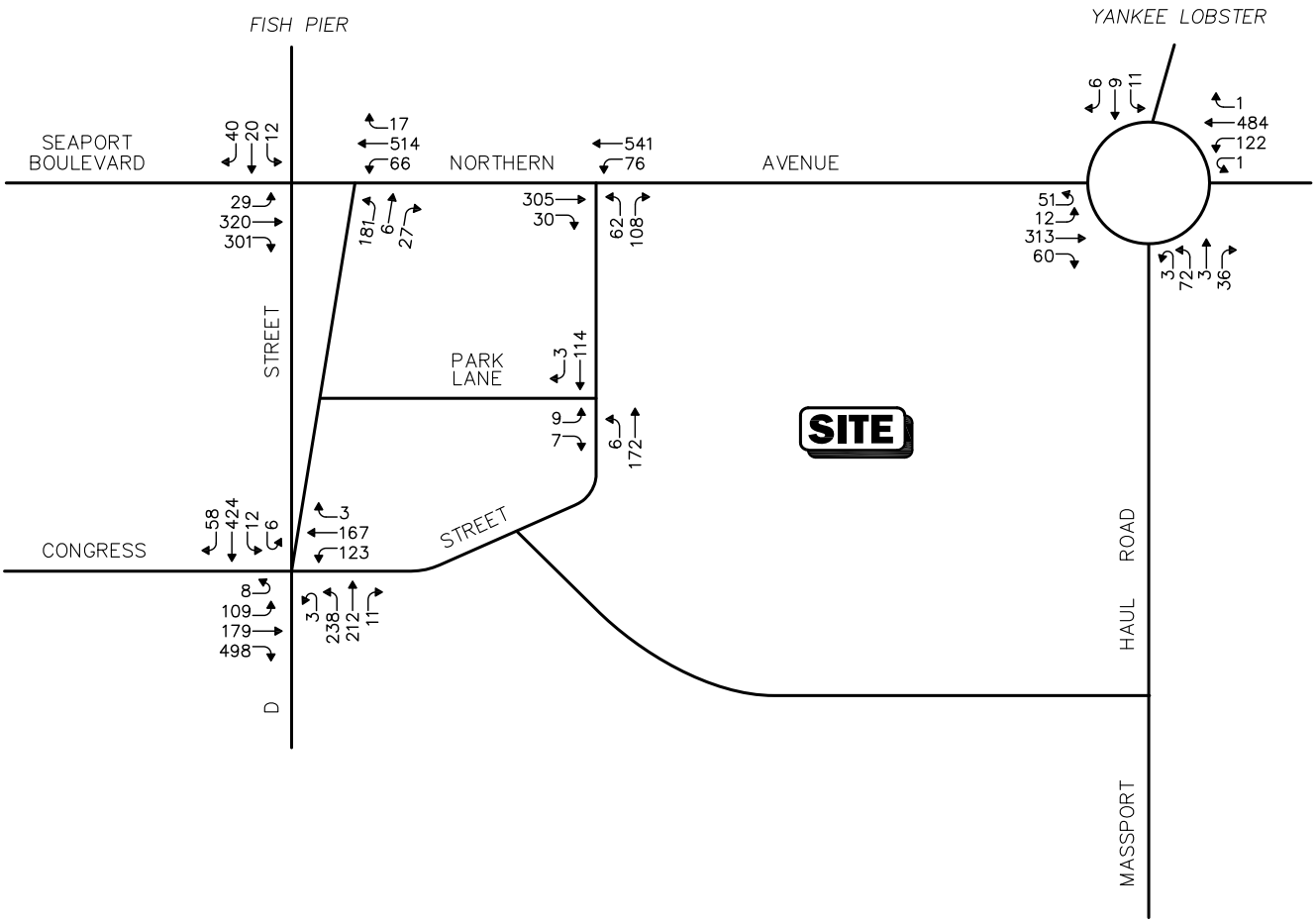
Not To Scale

Figure 8

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2018 No-Build
Weekday Morning
Peak Hour Traffic Volumes

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Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

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Figure 9

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2018 No-Build
Weekday Evening
Peak Hour Traffic Volumes

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Table 3 summarizes the anticipated trip-generation for the Project applying the appropriate ITE Land Use Codes and VORs defined above, and the travel mode data presented in Table 2. In addition, a 25 percent pass-by trip rate was applied to the automobile trips associated with the retail and restaurant components of the Project in order to account for motorists that are currently travelling in the area for other purposes and will patronize these uses in conjunction with their trip. The trip-generation tables for each component of the Project (residential, hotel, office, retail and restaurant) and supporting calculations are provided in the Appendix.

Table 3
PROJECT TRIP-GENERATION SUMMARY

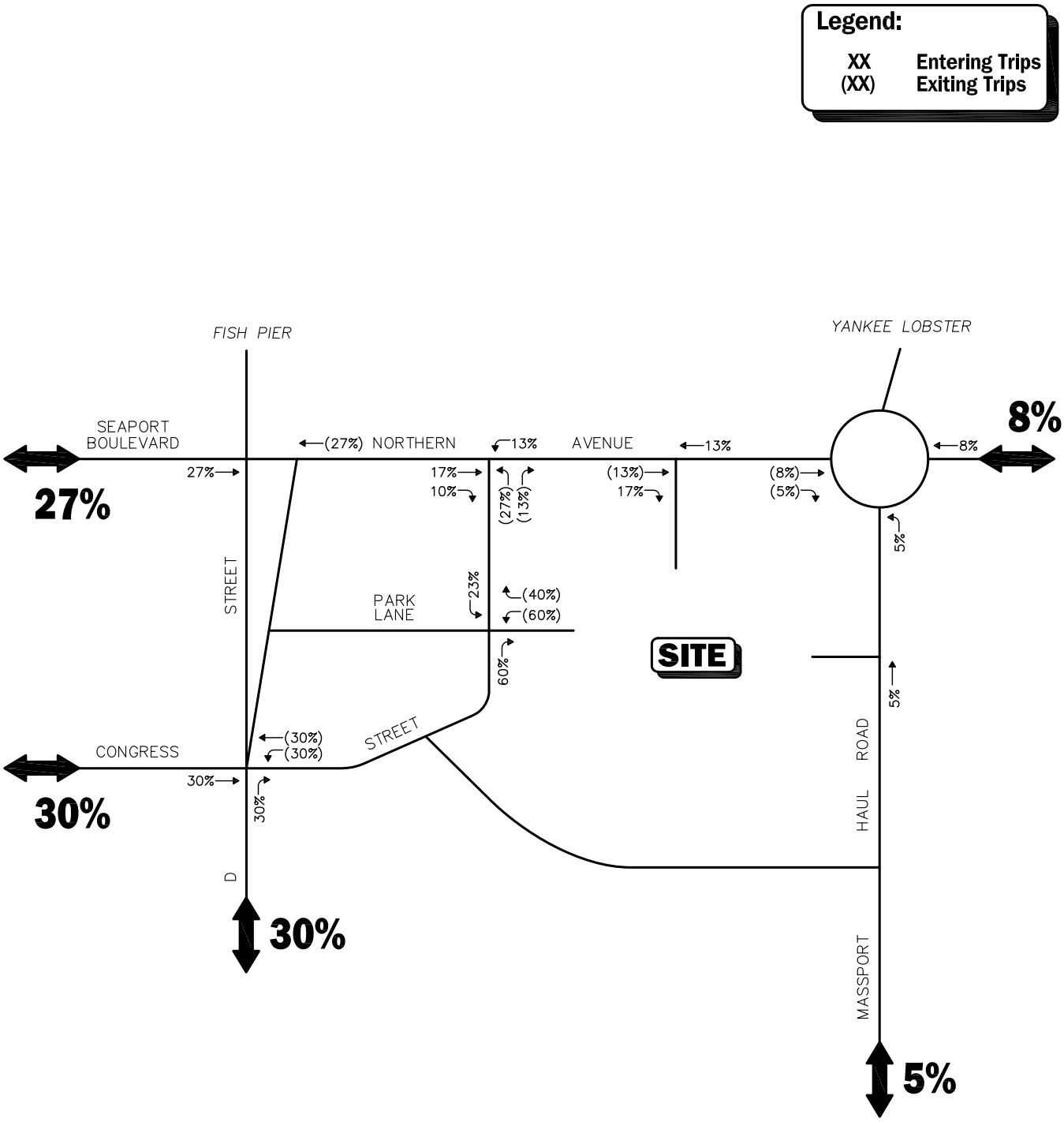
		Person Trips				Vehicle Trips		
Time Period/Direction	ITE Trips	Total Person	Automobile Trips	Transit Trips	Pedestrian/ Other Trips	(A) Automobile Trips	(B) Pass-By Trips (25%)	(C=A-B) New Automobile Trips
Average Weekday Daily:								
Entering	2,427	3,679	1,361	649	1,669	903	72	831
Exiting	2,427	3,679	1,361	649	1,669	903	72	831
Total	4,854	7,358	2,722	1,298	3,338	1,806	144	1,662
Weekday Morning Peak Hour:								
Entering	136	214	82	43	89	55	1	54
Exiting	135	197	69	43	85	47	1	46
Total	271	411	151	86	174	102	2	100
Weekday Evening Peak Hour:								
Entering	216	325	119	56	150	79	6	73
Exiting	188	285	109	51	125	73	6	67
Total	404	610	228	107	275	152	12	140

Project Generated Trip Summary

As can be seen in Table 3, using the aforementioned methodology, the Project is expected to generate approximately 1,662 new automobile trips (two-way, 24-hour volume, or 831 vehicles entering and 831 exiting), 1,298 transit trips and 3,338 pedestrian/other trips on an average weekday; with approximately 100 new automobile vehicle trips (54 vehicles entering and 46 exiting), 86 transit trips and 174 pedestrian/others trip expected during the weekday morning peak-hour; and 140 new automobile trips (73 vehicles entering and 67 exiting), 107 transit trips and 275 pedestrian/other trips during the weekday evening peak-hour.

Vehicle Trip Distribution and Assignment

The directional distribution of generated trips to and from the Project site was developed based on a review of: i) existing traffic patterns within the study area; and ii) the trip distribution patterns reflected in recently completed studies within in the study area. The general trip distribution pattern for the Project is summarized in Table 4 and is graphically depicted on Figure 10, with



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Figure 10

Trip Distribution Map

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Figures 11 and 12 depicting the assignment of Project-related traffic on to the study area roadway network for the weekday morning and evening peak hours, respectively.

Table 4
TRIP-DISTRIBUTION SUMMARY

Roadway	Direction (To/From)	Percent (To/From)
Northern Avenue	East	8
Seaport Boulevard	West	27
Congress Street	West	30
D Street	South	30
Massport Haul Road	South	5
Total		100

PROJECT PARKING SUPPLY

The Project will provide 640 parking spaces in a below-grade parking garage to support the parking demands of residents, patrons, guests and other uses within the Commonwealth Flats Development Area (CFDA). This parking supply is sufficient to accommodate the parking demands of the Project while encouraging the use of alternative modes of transportation that are available to the Project site (public transportation by way of the Silver Line (Silver Line Way Station) and MBTA Bus Route 4, and the extensive and interconnected network of sidewalks and bicycle accommodations afforded on the roadway network). The parking demand for each of the Project components is summarized in Table 5. It should be noted that the 640 parking spaces to be provided within the Project site is 30 spaces less than the allocated spaces as defined in the CFDA Master Plan. [5].

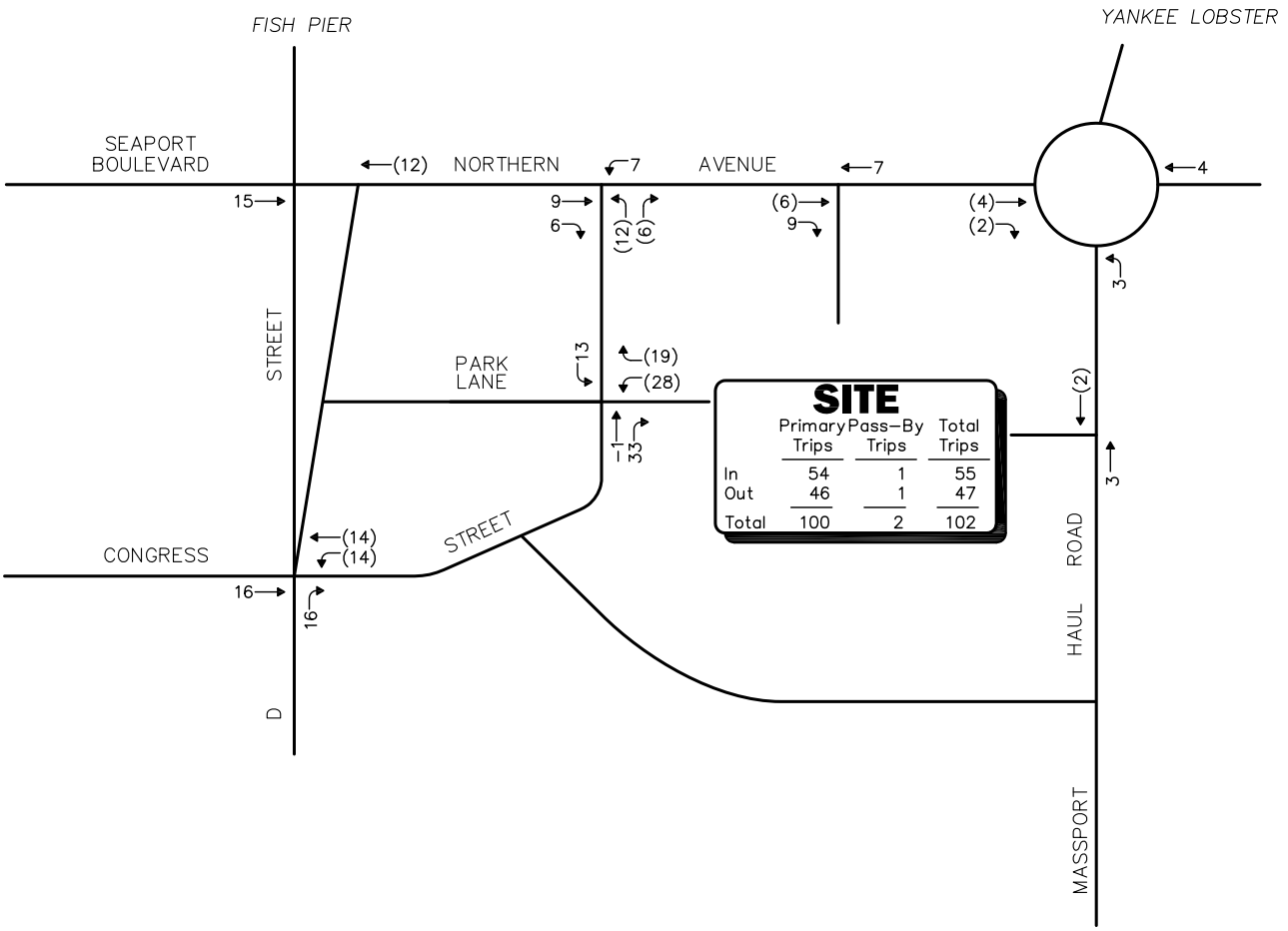
Table 5
PARKING RATIO AND DEMAND SUMMARY

Land Use	BTD Recommended Parking Ratio	Parking Ratio Used	Number of Spaces Required
Residential (304 Units)	1.0 to 1.5 space/unit	1.0 space/unit	304
Hotel (247 Rooms)	0.40 space/room	0.40 space/room	99
Office (16,200 sf)	0.70 space/1,000 sf	0.70 space/1,000 sf	11
Restaurant & Retail (24,985 sf)	0.70 space/1,000 sf	0.70 space/1,000 sf	18
Project Subtotal			432
District Commercial Spaces			208
TOTAL			**640**

[5] *Final Environmental Impact Report, Commonwealth Flats Development Area*; VHB, et al; December 15, 2000.

Legend:

XX	Entering Trips
(XX)	Exiting Trips



Not To Scale

Figure 11

Project-Generated Weekday Morning Peak Hour Traffic Volumes

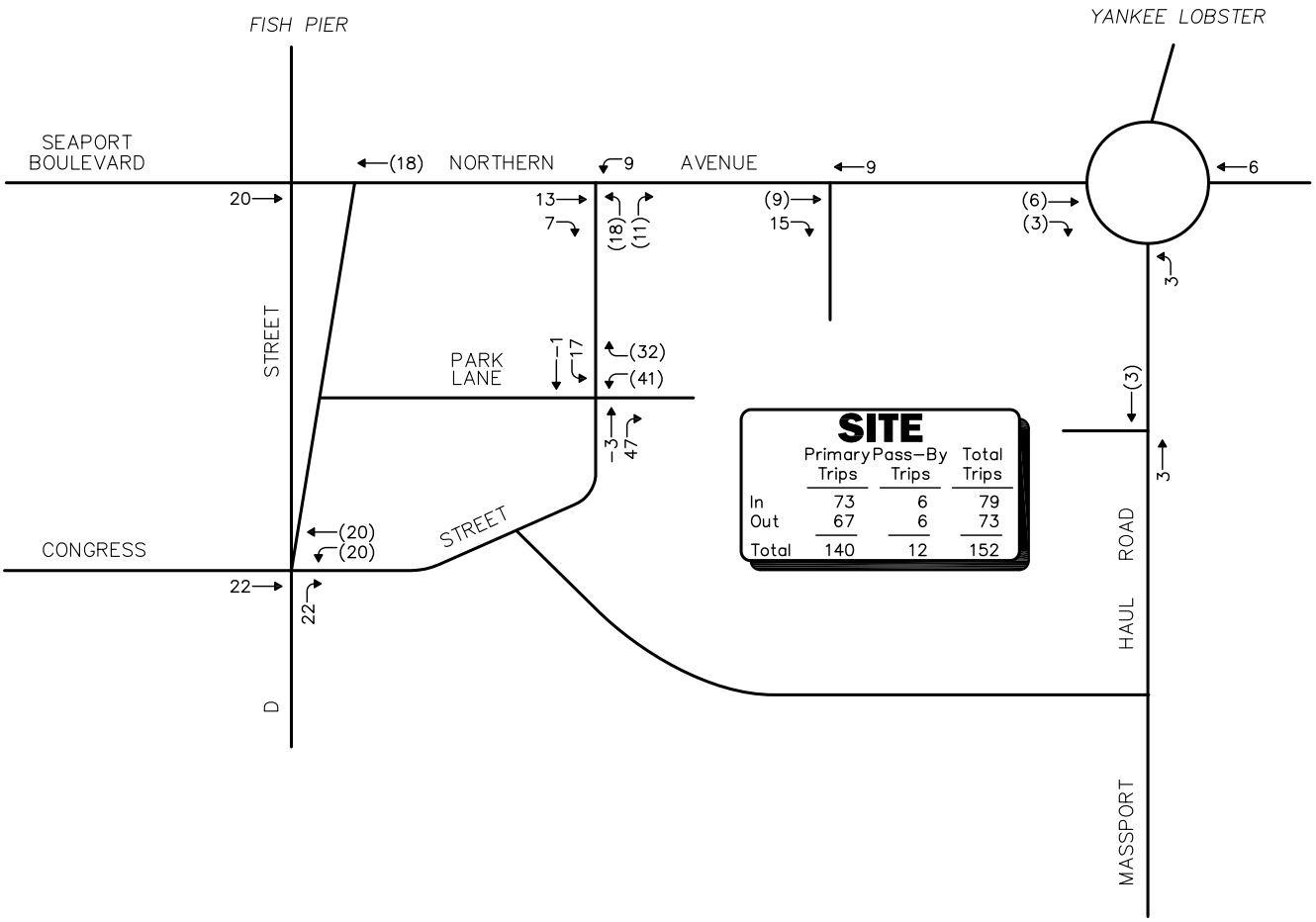
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Legend:

XX	Entering Trips
(XX)	Exiting Trips



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Figure 12

Project-Generated Weekday Evening Peak Hour Traffic Volumes

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As shown in Table 5, the calculated parking demand for the Project is approximately 432 spaces, leaving 208 spaces available for other uses in the CFDA (640 spaces total – 432 spaces required for the Project = 208 available spaces). In order to account for the additional traffic arriving/departing from the Project site associated with the use of the 208 available parking spaces, it was assumed that 60 entering vehicle trips would be generated during the weekday morning peak-hour (1 vehicle per minute) and that 120 vehicle trips (60 vehicles entering and 60 exiting) will be generated during the weekday evening peak-hour. The relevant traffic volume networks for these trips are provided in the Appendix.

FUTURE BUILD TRAFFIC VOLUMES

The 2018 Build condition traffic-volumes consist of the 2018 No-Build traffic volumes with the addition of vehicle trips associated with the 208 non-allocated CFDA parking spaces located within the Project site and the anticipated Project-generated traffic added to them. The resulting 2018 Build condition weekday morning and evening peak-hour traffic volumes are graphically depicted on Figures 13 and 14, respectively.

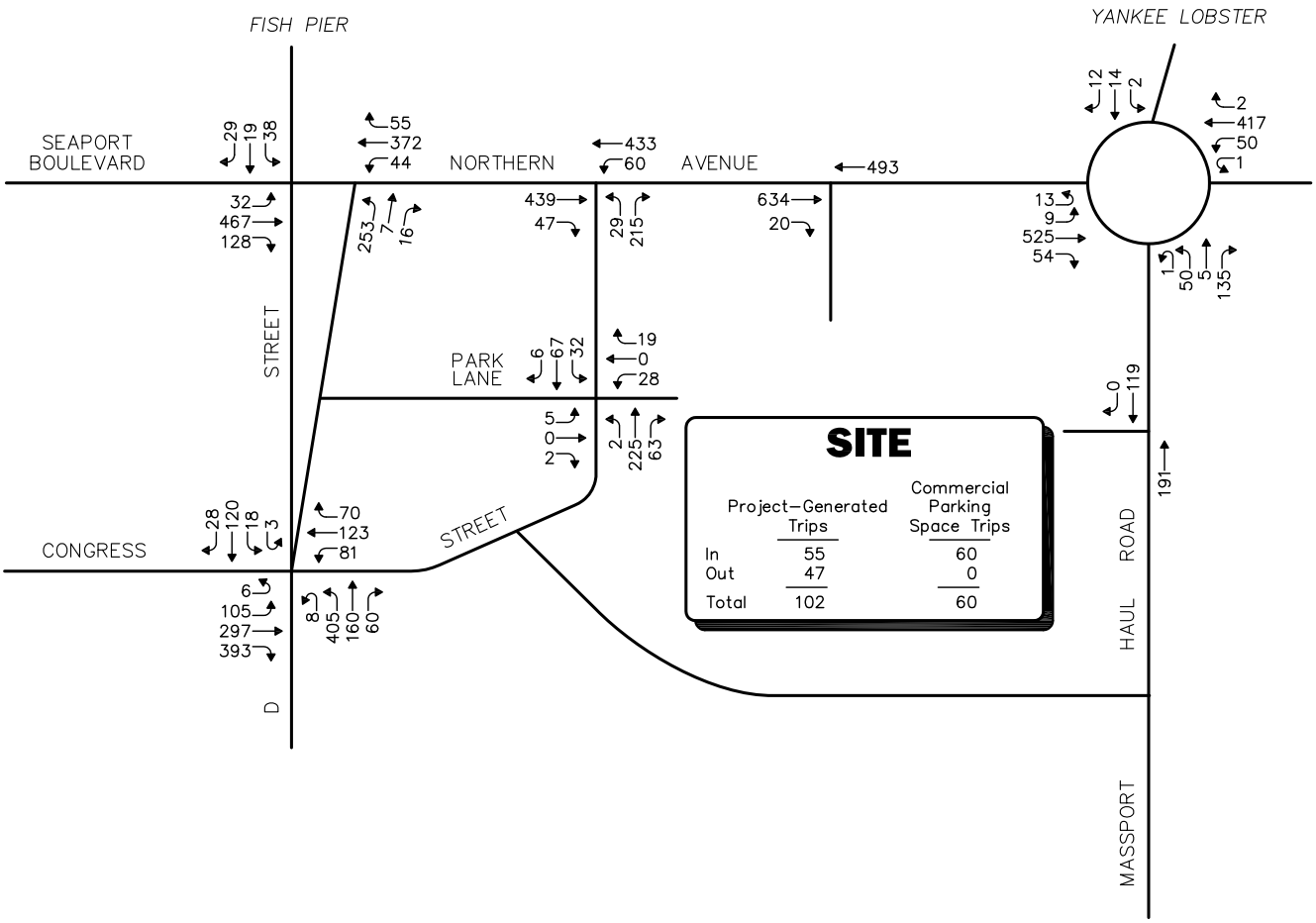
CFDA COMPARABILITY METRICS

The Final Environmental Impact Reports (EIR) for the CFDA established a methodology for the analysis of projects within the CFDA. This methodology is based on a determination of comparability between the development proposal and the assumptions for the specific parcel as presented in the Draft and Final EIR's for the CFDA. The key criteria to be compared are as follows:

1. Vehicle trip-generation for vehicle trips;
2. Benchmarked transit capacity and demand; and
3. Development of parking spaces.

If, after reviewing the three criteria listed above, it is determined that development proposal is comparable to the assumptions contained in the Draft and Final EIR for the subject CFDA parcel, then no further detailed analyses of the impact of the project on the transportation infrastructure will be required. If it is determined that there are significant differences between the development proposal and the CFDA assumption, the project may require an analysis of the additional impacts. With specific regard to the parking allocation, the comparability criteria allow for a variance of less than or equal to 10 percent of the parking allocation defined for the specific development parcel in the aforementioned CFDA documents.

Table 6 provides the requisite CFDA comparability analysis as identified in the CFDA Final EIR for the current development program for Parcel K.



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

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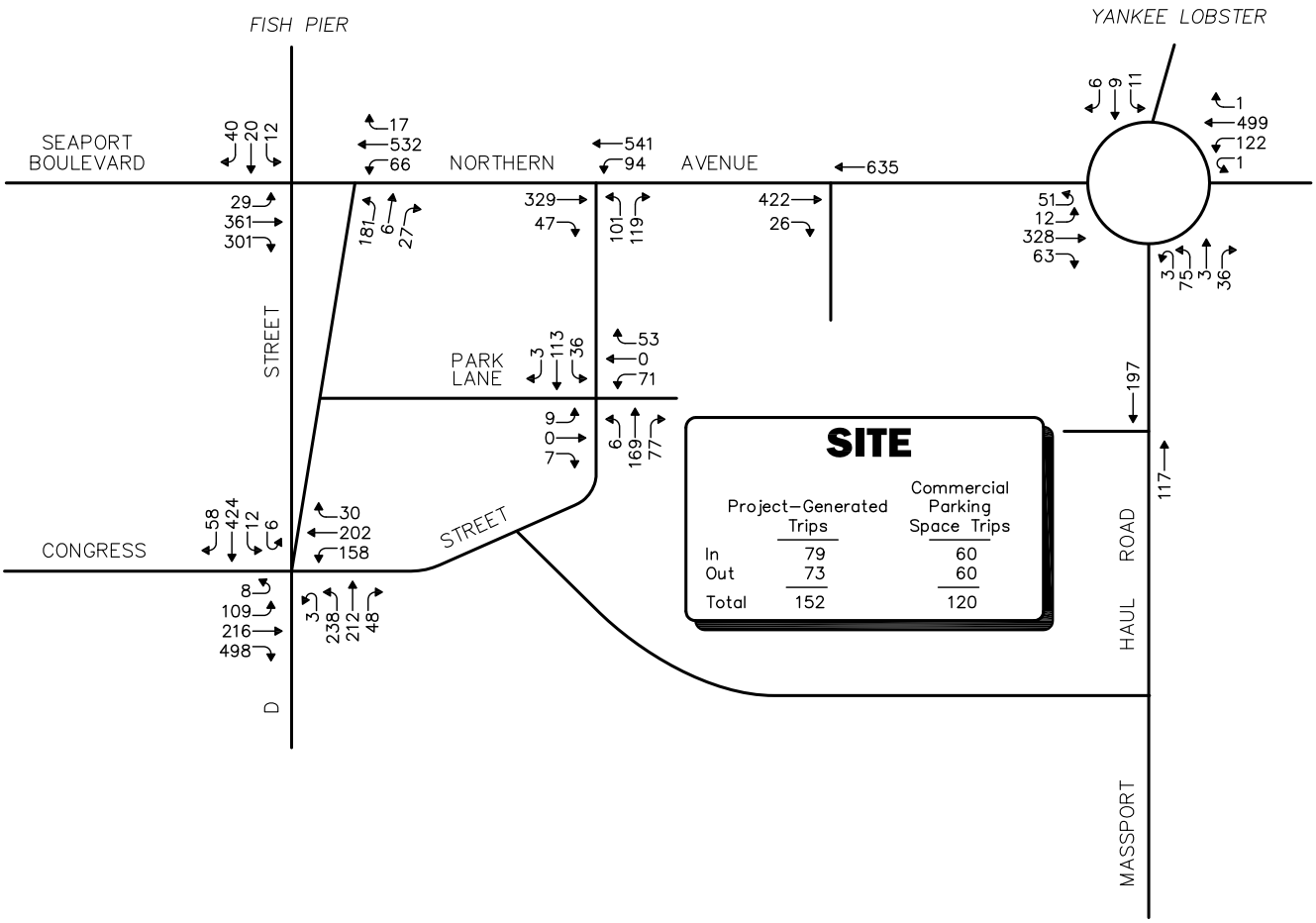
Figure 13

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2018 Build
Weekday Morning
Peak Hour Traffic Volumes

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Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

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Figure 14

2018 Build
Weekday Evening
Peak Hour Traffic Volumes

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Table 6
PARCEL K CFDA COMPARABILITY ANALYSIS

Comparability Metric	CFDA Allocation	Project	Comparable? (Yes/No)
Vehicle Trips (AM/PM Peak Hour)	130/140	100/140	**Yes**
Transit Trips[a]	185	51	**Yes**
Parking Spaces	670	640	**Yes[b]**

[a]Evening peak-hour outbound trips only.
[b]Less than a 10 percent variation from the CFDA parking allocation for Parcel K.

As can be seen in Table 6, ***the Project was found to meet the comparability test for compliance with the CFDA master plan as defined in the Draft and Final EIR with respect to the three comparability criteria (vehicle trips, transit trips and parking spaces).***

TRAFFIC OPERATIONS ANALYSIS

Measuring existing and future traffic volumes quantifies traffic flow within the study area. To assess quality of flow, roadway capacity and vehicle queue analyses were conducted under Existing, No-Build and Build traffic-volume conditions. Capacity analyses provide an indication of how well the roadway facilities serve the traffic demands placed upon them, with vehicle queue analyses providing a secondary measure of the operational characteristics of an intersection or section of roadway under study.

METHODOLOGY

Levels of Service

A primary result of capacity analyses is the assignment of level of service to traffic facilities under various traffic-flow conditions.[6] The concept of level of service is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers. A level-of-service definition provides an index to quality of traffic flow in terms of such factors as speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety.

Six levels of service are defined for each type of facility. They are given letter designations from A to F, with level-of-service (LOS) A representing the best operating conditions and LOS F representing congested or constrained operating conditions.

Since the level of service of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of levels of service, depending on the time of day, day of week, or period of year.

[6]The capacity analysis methodology is based on the concepts and procedures presented in the *Highway Capacity Manual;* Transportation Research Board; Washington, DC; 2000.

Unsignalized Intersections

The six levels of service for unsignalized intersections may be described as follows:

- *LOS A* represents a condition with little or no control delay to minor street traffic.
- *LOS B* represents a condition with short control delays to minor street traffic.
- *LOS C* represents a condition with average control delays to minor street traffic.
- *LOS D* represents a condition with long control delays to minor street traffic.
- *LOS E* represents operating conditions at or near capacity level, with very long control delays to minor street traffic.
- *LOS F* represents a condition where minor street demand volume exceeds capacity of an approach lane, with extreme control delays resulting.

The levels of service of unsignalized intersections are determined by application of a procedure described in the 2000 *Highway Capacity Manual.*[7] Level of service is measured in terms of average control delay. Mathematically, control delay is a function of the capacity and degree of saturation of the lane group and/or approach under study and is a quantification of motorist delay associated with traffic control devices such as traffic signals and STOP signs. Control delay includes the affects of initial deceleration delay approaching a STOP sign, stopped delay, queue move-up time, and final acceleration delay from a stopped condition. Definitions for level of service at unsignalized intersections are also given in the 2000 *Highway Capacity Manual*. Table 7 summarizes the relationship between level of service and average control delay.

Table 7
LEVEL-OF-SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS[a]

Level of Service	Average Control Delay (Seconds Per Vehicle)
A	≤ 10.0
B	10.1 to 15.0
C	15.1 to 25.0
D	25.1 to 35.0
E	35.1 to 50.0
F	>50.0

[a]Source: *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2000; page 17-2.

[7]*Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2000.

Signalized Intersections

The six levels of service for signalized intersections may be described as follows:

- *LOS A* describes operations with very low control delay; most vehicles do not stop at all.
- *LOS B* describes operations with relatively low control delay. However, more vehicles stop than LOS A.
- *LOS C* describes operations with higher control delays. Individual cycle failures may begin to appear. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
- *LOS D* describes operations with control delay in the range where the influence of congestion becomes more noticeable. Many vehicles stop and individual cycle failures are noticeable.
- *LOS E* describes operations with high control delay values. Individual cycle failures are frequent occurrences.
- *LOS F* describes operations with high control delay values that often occur with over-saturation. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

Levels of service for signalized intersections are calculated using the operational analysis methodology of the 2000 *Highway Capacity Manual*. This method assesses the effects of signal type, timing, phasing, and progression; vehicle mix; and geometrics on delay. Level-of-service designations are based on the criterion of control or signal delay per vehicle. Control or signal delay is a measure of driver discomfort, frustration, and fuel consumption, and includes initial deceleration delay approaching the traffic signal, queue move-up time, stopped delay and final acceleration delay. Table 8 summarizes the relationship between level of service and control delay. The tabulated control delay criterion may be applied in assigning level-of-service designations to individual lane groups, to individual intersection approaches, or to entire intersections.

Table 8
LEVEL-OF-SERVICE CRITERIA
FOR SIGNALIZED INTERSECTIONS[a]

Level of Service	Control (Signal) Delay Per Vehicle (Seconds)
A	≤10.0
B	10.1 to 20.0
C	20.1 to 35.0
D	35.1 to 55.0
E	55.1 to 80.0
F	>80.0

[a]Source: *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2000; page 16-2.

Roundabouts

The roundabout capacity analysis is based on the procedures described in the aaTraffic Signalized and Unsignalized Intersection Design and Research Aid (aaSIDRA)[8]. The main features of the aaSIDRA method for roundabout capacity estimation are the dependence of gap acceptance parameters on roundabout geometry, circulating flows and entry lane flows, and the designation of approach lanes as controlling and otherwise that have different capacity characteristics. Provision of two-lane approaches tends to substantially increase roundabout capacity. As a general rule, individual approach volumes exceeding 85 percent of the calculated capacity of the approach are considered over-saturated and indicate areas of concern.

The aaSIDRA analytical model calculates several components of delay. One of these, the average total delay component, produces level-of-service results based on the concepts described in the HCM. Using this level-of-service delay definition for roundabouts results in criteria that are the same as those defined for unsignalized intersections. The delay ranges that define levels of service for roundabouts are shown in Table 9.

Table 9
LEVEL-OF-SERVICE CRITERIA FOR ROUNDABOUTS[a]

Level-of-Service	Control Delay per Vehicle (Seconds)
A	<10.0
B	10.1 to 15.0
C	15.1 to 25.0
D	25.1 to 35.0
E	35.1 to 50.0
F	>50.0

[a] Source: aaSIDRA Users Guide; Akcelik & Associates Pty Ltd; Greythorn, Victoria 3104, Australia; 2012.

Vehicle Queue Analysis

Vehicle queue analyses are a direct measurement of an intersection's ability to process vehicles under various traffic control and volume scenarios and lane use arrangements. The vehicle queue analysis was performed using the Synchro™ intersection capacity analysis software which is based upon the methodology and procedures presented in the 2000 *Highway Capacity Manual.* The Synchro™ vehicle queue analysis methodology is a simulation based model which reports the number of vehicles that experience a delay of six seconds or more at an intersection. For unsignalized intersections, Synchro™ reports the 95th percentile vehicle queue. Vehicle queue lengths are a function of the capacity of the movement under study and the volume of traffic being processed by the intersection during the analysis period. The 95th percentile vehicle queue is the vehicle queue length that will be exceeded only 5 percent of the time, or approximately three (3) minutes out of 60 minutes during the peak one hour of the day (during the remaining 57 minutes, the vehicle queue length will be less than the 95th percentile queue length).

[8] *aaTraffic Signalized and Unsignalized Intersection Design and Research Aid,* aaSIDRA User Guide; Akcelik & Associates, Pty Ltd; Greythorn, Victoria 3104, Australia; 2012.

ANALYSIS RESULTS

Level-of-service and vehicle queue analyses were conducted for 2012 Existing, 2018 No-Build and 2018 Build conditions for the intersections within the study area. The results of the intersection capacity and vehicle queue analyses are summarized in Tables 10, 11 and 12, with the detailed analysis results presented in the Appendix. The analysis demonstrates that the addition of Project-related traffic to the study area roadways and intersections will not materially adversely affect the level-of-service or vehicle queues at the study area intersections.

The following is a summary of the level-of-service and vehicle queue analyses for the intersections within the study area.

Signalized Intersections

Congress Street at D Street

Under 2012 Existing, 2018 No-Build and 2018 Build conditions, the signalized intersection of Congress Street at D Street was shown to operate at an overall LOS D during the weekday morning and evening peak hours. Vehicle queues at the intersection were shown to range from 0 to 243 feet (approximately 10 vehicles) during the peak periods, with no significant increases shown to result from the addition of Project-related traffic (approximately 3 vehicles).

Seaport Boulevard and Northern Avenue at D Street Southbound

Under 2012 Existing, 2018 No-Build and 2018 Build conditions, the signalized intersection of Seaport Boulevard and Northern Avenue at D Street southbound was shown to operate at an overall LOS B during the weekday morning peak-hour and at LOS A during the weekday evening peak-hour. Vehicle queues at the intersection were shown to range from 0 to 204 feet (approximately 8 vehicles) during the peak periods, with no significant increases shown to result from the addition of Project-related traffic (approximately 1 vehicle).

Seaport Boulevard and Northern Avenue at D Street Northbound

Under 2012 Existing conditions, the signalized intersection of Seaport Boulevard and Northern Avenue at D Street northbound was shown to operate at an overall LOS B during the weekday morning and evening peak hours. Under 2018 No-Build and 2018 Build conditions, this signalized intersection was shown to degrade to an overall LOS C during the weekday morning peak-hour as a result of traffic volume increased independent of the Project and continue to operate at LOS B during the weekday evening peak-hour. Vehicle queues at the intersection were shown to range from 0 to 342 feet (approximately 14 vehicles) during the peak periods, with no significant increases shown to result from the addition of Project-related traffic (approximately 1 vehicle).

Unsignalized Intersections

Northern Avenue at Congress Street

Under 2012 Existing conditions, the critical movements at this unsignalized intersection (left turns from Congress Street) were shown to operate at LOS C during the weekday morning peak-hour and at LOS D during the weekday evening peak-hour. Under 2018 No-Build conditions, the critical movements were shown to continue to operate at LOS C during the weekday morning

peak-hour and degrade to LOS F during the weekday evening peak-hour as a result of traffic volume increases independent of the Project. Under 2018 Build conditions, with the addition of Project-related traffic, the critical movements were shown to degrade slightly (4.6 second increase in average delay) to LOS D during the weekday morning peak-hour and continue to operate at LOS F during the weekday evening peak-hour. Vehicle queues at the intersection were shown to range from 0 to 153 feet (approximately 6 vehicles) during the peak periods, with no significant increases shown to result from the addition of Project-related traffic (approximately 4 vehicles).

Congress Street at Park Lane and the Project Driveway

Under 2012 Existing and 2018 No-Build conditions, the critical movements at this unsignalized intersection (all movements from Park Lane) were shown to operate at LOS B during the weekday morning peak-hour and at LOS A during the weekday evening peak-hour. Under 2018 Build conditions, with the addition of the Project site driveway as the fourth leg of this unsignalized intersection, the critical movements (all movements from Project site driveway) were shown to operate at LOS B during both the weekday morning and evening peak hours. Vehicle queues at the intersection were shown to range from 0 to 23 feet (approximately 1 vehicle) during the peak periods, with no significant increases shown to result from the addition of Project-related traffic (approximately 1 vehicle).

Northern Avenue at the Project Driveway

Under 2018 Build conditions, all movements at this unsignalized intersection were shown to operate at LOS A during both weekday morning and evening peak hours with negligible vehicle queuing.

Roundabout

Northern Avenue at Massport Haul Road

Under 2012 Existing conditions, this roundabout controlled intersection was shown to operate at an overall LOS A during the weekday morning peak-hour and at LOS B during the weekday evening peak-hour. Under 2018 No-Build and 2018 Build conditions, overall operating conditions at the intersection were shown to degrade to LOS B during the weekday morning peak-hour and to LOS C during the weekday evening peak-hour as a result of traffic volume increases independent of the Project. Vehicle queues at the intersection were shown to range from 4 to 446 feet (approximately 18 vehicles) during the peak periods, with no significant increases shown to result from the addition of Project-related traffic (approximately 3 vehicles).

Table 10
SIGNALIZED INTERSECTION LEVEL-OF-SERVICE AND VEHICLE QUEUE SUMMARY

	2012 Existing				2018 No-Build				2018 Build			
Signalized Intersection/Peak Hour/Movement	V/C[a]	Delay[b]	LOS[c]	Queue[d] Avg/95th	V/C	Delay	LOS	Queue Avg./95th	V/C	Delay	LOS	Queue Avg./95th
Congress Street at D Street												
Weekday Morning:												
Congress Street EB LT/TH/RT	0.68	38.5	D	134/179	0.72	38.8	D	145/200	0.72	39.0	D	148/203
Congress Street EB RT	0.26	32.4	C	0/79	0.31	32.2	C	0/89	0.32	32.0	C	0/92
Congress Street WB LT/TH/RT	0.36	31.9	C	68/108	0.42	34.6	C	77/116	0.50	36.5	D	95/152
D Street NB LT	0.69	42.1	D	141/204	0.73	42.8	D	156/226	0.74	43.1	D	160/234
D Street NB LT/TH/RT	0.66	37.8	D	129/162	0.71	38.5	D	145/185	0.71	38.4	D	148/187
D Street SB LT/TH/RT	0.47	30.5	C	49/64	0.50	28.1	C	52/64	0.49	28.1	C	52/64
Overall	**0.55**	**35.8**	**D**	--	**0.60**	**36.2**	**D**	--	**0.63**	**36.6**	**D**	--
Weekday Evening:												
Congress Street EB LT/TH/RT	0.71	41.4	D	125/176	0.75	42.7	D	135/189	0.76	43.0	D	144/198
Congress Street EB RT	0.30	34.5	C	0/83	0.34	34.7	C	0/91	0.37	34.6	C	0/95
Congress Street WB LT/TH/RT	0.45	34.0	C	99/154	0.56	39.3	D	114/173	0.72	44.7	D	146/237
D Street NB LT	0.57	40.7	D	94/150	0.61	41.0	D	107/169	0.64	41.6	D	117/183
D Street NB LT/TH/RT	0.57	39.3	D	86/130	0.61	39.2	D	109/146	0.62	39.0	D	112/152
D Street SB LT/TH/RT	0.73	42.1	D	162/201	0.78	43.2	D	192/243	0.80	44.3	D	193/243
Overall	**0.61**	**38.8**	**D**	--	**0.68**	**40.2**	**D**	--	**0.73**	**41.3**	**D**	--
Seaport Boulevard and Northern Avenue at D Street Southbound												
Weekday Morning:												
Seaport Boulevard EB LT/TH/RT	0.32	11.7	B	78/134	0.44	14.2	B	113/186	0.45	14.6	B	124/204
Northern Avenue WB LT/TH/RT	0.18	1.1	A	0/0	0.38	1.9	A	0/3	0.39	2.1	A	0/4
Fish Pier Driveway SB LT/TH/RT	0.47	42.8	D	44/89	0.46	42.7	D	44/89	0.46	42.7	D	44/89
Overall	**0.31**	**11.1**	**B**	--	**0.43**	**11.6**	**B**	--	**0.44**	**11.8**	**B**	--
Weekday Evening:												
Seaport Boulevard EB LT/TH/RT	0.28	8.4	A	41/80	0.37	9.9	A	64/116	0.40	10.2	B	78/135
Northern Avenue WB LT/TH/RT	0.31	1.1	A	2/5	0.42	1.8	A	13/18	0.43	1.9	A	15/22
Fish Pier Driveway SB LT/TH/RT	0.31	43.3	D	24/59	0.30	43.1	D	24/59	0.30	43.1	D	24/59
Overall	**0.31**	**7.2**	**A**	--	**0.41**	**7.5**	**A**	--	**0.42**	**7.7**	**A**	--

See notes at end of table

Table 10 (Continued)
SIGNALIZED INTERSECTION LEVEL-OF-SERVICE AND VEHICLE QUEUE SUMMARY

Signalized Intersection/Peak Hour/Movement	2012 Existing				2018 No-Build				2018 Build			
	V/C[a]	Delay[b]	LOS[c]	Queue[d] Avg/95th	V/C	Delay	LOS	Queue Avg./95th	V/C	Delay	LOS	Queue Avg./95th
Seaport Boulevard and Northern Avenue at D Street Northbound												
Weekday Morning:												
Seaport Boulevard EB TH	0.18	1.3	A	8/11	0.24	1.4	A	11/13	0.26	1.4	A	11/13
Seaport Boulevard WB TH	0.21	10.7	B	54/94	0.32	12.6	B	84/138	0.32	12.7	B	87/143
D Street NB LT	0.79	54.0	D	125/224	0.93	74.3	E	171/319	0.95	77.8	E	185/342
D Street NB RT	0.01	33.6	C	0/18	0.01	32.1	C	0/18	0.01	32.1	C	0/18
Overall	**0.33**	**16.5**	**B**	**--**	**0.44**	**21.2**	**C**	**--**	**0.46**	**22.2**	**C**	**--**
Weekday Evening:												
Seaport Boulevard EB TH	0.12	1.6	A	11814	0.15	1.7	A	13/15	0.17	1.7	A	13/16
Seaport Boulevard WB TH	0.25	8.2	A	62/103	0.35	9.7	A	95/148	0.36	9.8	A	98/153
D Street NB LT	0.68	48.0	D	96/163	0.78	54.6	D	122/225	0.78	54.6	D	122/226
D Street NB RT	0.02	36.5	D	0/24	0.02	35.4	D	0/25	0.02	35.4	D	0/25
Overall	**0.31**	**13.9**	**B**	**--**	**0.41**	**15.3**	**B**	--	**0.42**	**15.4**	**B**	--

[a]Volume-to-capacity ratio.
[b]Control (signal) delay per vehicle in seconds.
[c]Level-of-Service.
[d]Queue length in feet.
EB = eastbound; WB = westbound; NB = northbound; SB = southbound; LT = left-turning movements; TH = through movements; RT = right-turning movements.

Table 11
UNSIGNALIZED INTERSECTION LEVEL-OF-SERVICE AND VEHICLE QUEUE SUMMARY

	2012 Existing				2018 No-Build				2018 Build			
Unsignalized Intersection/Peak Hour/Movement	Demand[a]	Delay[b]	LOS[c]	Queue[d] 95th	Demand	Delay	LOS	Queue 95th	Demand[a]	Delay	LOS	Queue 95th
Northern Avenue at Congress Street												
Weekday Morning:												
Northern Avenue EB TH/RT	345	0.0	A	0	450	0.0	A	0	486	0.0	A	0
Northern Avenue WB LT/TH	329	1.2	A	3	477	1.3	A	4	493	1.7	A	5
Congress Street NB LT	17	17.0	C	5	17	24.0	C	8	29	28.6	D	16
Congress Street NB RT	195	11.3	B	29	209	12.4	B	36	215	12.8	B	39
Weekday Evening:												
Northern Avenue EB TH/RT	268	0.0	A	0	335	0.0	A	0	376	0.0	A	0
Northern Avenue WB LT/TH	446	1.9	A	6	617	2.1	A	7	635	2.7	A	9
Congress Street NB LT	60	27.6	D	29	62	>50.0	F	59	101	>50.0	F	153
Congress Street NB RT	97	10.0	B	11	108	10.5	B	13	119	10.8	B	16
Congress Street at Park Lane and the Project Driveway												
Weekday Morning:												
Park Lane EB LT/TH/RT	7	10.1	B	2	7	10.2	B	2	7	12.0	B	2
Project Driveway WB LT/TH/RT	--	--	--	--	--	--	--	--	47	12.2	B	8
Congress Street NB LT/TH/RT	214	0.1	A	0	228	0.1	A	0	290	0.1	A	0
Congress Street SB LT/TH/RT	58	0.0	A	0	73	0.0	A	0	105	2.7	A	3
Weekday Evening:												
Park Lane EB LT/TH/RT	16	9.9	A	3	16	10.0	A	3	16	11.9	B	4
Project Driveway WB LT/TH/RT	--	--	--	--	--	--	--	--	124	13.2	B	23
Congress Street NB LT/TH/RT	165	0.3	A	0	178	0.3	A	0	252	0.2	A	0
Congress Street SB LT/TH/RT	107	0.0	A	0	117	0.0	A	0	152	2.1	A	3
Northern Avenue at the Project Driveway												
Weekday Morning:												
Northern Avenue EB TH/RT	--	--	--	--	--	--	--	--	654	0.0	A	0
Northern Avenue WB TH	--	--	--	--	--	--	--	--	493	0.0	A	0
Weekday Evening:												
Northern Avenue EB TH/RT	--	--	--	--	--	--	--	--	448	0.0	A	0
Northern Avenue WB TH	--	--	--	--	--	--	--	--	635	0.0	A	0

[a]Demand in vehicles per hour..
[b] Average control delay per vehicle (in seconds).
[c]Level-of-Service.
[d]Queue length in feet.
EB = eastbound; WB = westbound; NB = northbound; SB = southbound; LT = left-turning movements; TH = through movements; RT = right-turning movements.

Table 12
ROUNDABOUT CONTROLLED INTERSECTION TRAFFIC OPERATIONS SUMMARY

Location/Peak Hour/Movement	2012 Existing				2018 No-Build				2018 Build			
	Demand[a]	Delay[b]	LOS[c]	Queue[d] 95th	Demand	Delay	LOS	Queue 95th	Demand	Delay	LOS	Queue 95th
Northern Avenue at Massport Haul Road												
Weekday Morning Peak Hour:												
Northern Avenue EB	481	9.1	A	67	595	11.8	B	103	601	11.9	B	104
Northern Avenue WB	310	8.0	A	44	457	11.3	B	82	470	11.8	B	87
Massport Haul Road NB	183	9.3	A	27	188	11.2	B	32	191	11.3	B	33
Yankee Lobster Driveway SB	28	5.8	A	4	28	7.0	A	5	28	7.2	A	5
Overall	**1,002**	**8.7**	**A**	--	**1,268**	**11.4**	**B**	--	**1,290**	**11.6**	**B**	--
Weekday Evening Peak Hour:												
Northern Avenue EB	360	8.1	A	45	436	9.7	A	64	454	10.1	B	68
Northern Avenue WB	439	14.1	B	115	608	30.7	D	383	623	34.4	D	446
Massport Haul Road NB	111	6.8	A	11	114	7.6	A	12	117	7.7	A	13
Yankee Lobster Driveway SB	26	7.8	A	7	26	10.1	B	9	26	10.4	B	10
Overall	**936**	**10.9**	**B**	--	**1,184**	**21.0**	**C**	--	**1,210**	**23.0**	**C**	--

[a]Demand in vehicles per hour from respective approach.
[b]Average stopped delay in seconds per vehicle.
[c]Level of service. Based on Levels of Service as defined in aaSIDRA User Guide.
[d]Queue length in feet.
EB=eastbound; WB=westbound; NB=northbound; SB=southbound.

PEDESTRIAN IMPACT ANALYSIS

The Project is expected to generate approximately 174 new pedestrian/other trips (89 entering and 85 exiting) during the weekday morning peak-hour and 275 new pedestrian/other trips (150 entering and 125 exiting) during the weekday evening peak-hour. In addition, the Project will result in 86 new transit trips (43 entering and 42 exiting) during the weekday morning peak-hour and 107 new transit trips (56 entering and 51 exiting) during the weekday evening peak-hour which will also contribute to the pedestrian trips associated with the Project. This level of pedestrian activity normalized over the peak-hour of occurrence is equivalent to approximately 5 additional pedestrian trips per minute during the weekday morning peak-hour and approximately 7 additional pedestrian trips per minute during the weekday evening peak-hour. With the extensive pedestrian infrastructure that is available within the study area and to the Project site (i.e., sidewalks, crosswalks and signalized crossings), sufficient capacity should be afforded to accommodate the additional pedestrian trips associated with the Project in a safe and efficient manner and without impacting traffic operations on the study area roadways and at the study intersections.

PUBLIC TRANSPORTATION IMPACT ANALYSIS

The Project is expected to generate approximately 86 new transit trips (43 boarding and 43 alighting) during the weekday morning peak-hour and 107 new transit trips (56 boarding and 51 alighting) during the weekday evening peak-hour. This relatively small increase in transit trips during the peak commuter periods is not expected to have a significant impact on transit service in the study area and is within the transit trip allocation for the Project site as defined in the CFDA Master Plan, the basis of which was used in the planning of the Silver Line transit service.

SIGHT DISTANCE EVALUATION

Sight distance measurements were performed at the Project site driveway intersections with Northern Avenue and Massport Haul Road in accordance with MassDOT and American Association of State Highway and Transportation Officials (AASHTO)[9] standards. Both stopping sight distance (SSD) and intersection sight distance (ISD) measurements were performed. In brief, SSD is the distance required by a vehicle traveling at the design speed of a roadway, on wet pavement, to stop prior to striking an object in its travel path. ISD or corner sight distance (CSD) is the sight distance required by a driver entering or crossing an intersecting roadway to perceive an on-coming vehicle and safely complete a turning or crossing maneuver with on-coming traffic. In accordance with AASHTO standards, if the measured ISD is at least equal to the required SSD value for the appropriate design speed, the intersection can operate in a safe manner. Table 13 presents the measured SSD and ISD at the subject intersection.

[9] *A Policy on Geometric Design of Highway and Streets*, 6th Edition; American Association of State Highway and Transportation Officials (AASHTO); 2011.

Table 13
SIGHT DISTANCE MEASUREMENTS[a]

Intersection/Sight Distance Measurement	Feet		
	Required Minimum	ISD[b]	Measured
Congress Street at the Project Site Driveway			
Stopping Sight Distance:			
Congress Street approaching from the north	200	--	161[c]
Congress Street approaching from the south	200	--	330
Intersection Sight Distance:			
Looking to the north from the Project site driveway	200	290/355	161[c]
Looking to the south from the Project site driveway	200	290/355	330
Massport Haul Road at the Project Site Driveway			
Stopping Sight Distance:			
Massport Haul Road approaching from the north	200	--	196[c]
Massport Haul Road approaching from the south	200	--	650
Intersection Sight Distance:			
Looking to the north from the Project site driveway	200	290/355	196[c]
Looking to the south from the Project site driveway	200	290/355	650
Northern Avenue at the Project Site Driveway			
Stopping Sight Distance:			
Northern Avenue approaching from the west	200	--	200[+]

[a]Recommended minimum values obtained from *A Policy on Geometric Design of Highways and Streets*, 6th Edition; American Association of State Highway and Transportation Officials (AASHTO); 2011; and based on a 30 mph approach speed on Congress Street and Massport Haul Road.

[b]Values shown are the intersection sight distance for a vehicle turning right/left exiting a roadway under STOP control such that motorists approaching the intersection on the major street should not need to adjust their travel speed to less than 70 percent of their initial approach speed.

[c]Values shown represent the resulting non-obstructed sight line to and from Northern Avenue. It should be noted that turning traffic from Northern Avenue will be travelling at a reduced speed (i.e., less than 30 mph) and, therefore, the available sight line will be sufficient to allow the intersection to operate in a safe manner.

As can be seen in Table 13, the available lines of sight at the Project driveway intersections with Congress Street, Massport Haul Road and Northern Avenue were found to meet or exceed the recommended minimum sight distance requirements for a 30 mph approach speed along both roadways, consistent with the "prima facie" speed in the absence of a posted speed limit.[10]

[10]The "prima facie" speed limit is defined in Chapter 90, Sections 17 and 18, of the Massachusetts General Laws as that rate of speed greater than which is considered reasonable or proper to operate motor vehicle under a defined roadway type and abutting land use.

RECOMMENDATIONS AND CONCLUSIONS

CONCLUSIONS

VAI has conducted a TIAS in order to determine the potential impacts on the transportation infrastructure associated with the proposed mixed-use development to be located on Parcel K at the southwest corner of the intersection of Northern Avenue and Massport Haul Road in Boston, Massachusetts. This assessment has been completed in accordance with State and BTD standards, and those of the Traffic Engineering and Transportation Planning professions for the preparation of such reports. The following specific areas have been evaluated as they relate to the Project: i) access requirements; ii) potential off-site improvements; and iii) safety considerations; under existing and future conditions, both with and without the Project. Based on this assessment, we have concluded the following with respect to the Project:

1. Using trip-generation statistics published by the ITE[11] for similar land uses as those proposed, the Project is expected to generate approximately 1,662 new automobile trips (two-way, 24-hour volume), 1,298 transit trips and 3,338 pedestrian/other trips on an average weekday; with approximately 100 new automobile vehicle trips, 86 transit trips and 174 pedestrian/other trips expected during the weekday morning peak-hour; and 140 new automobile trips, 107 transit trips and 275 pedestrian/other trips expected during the weekday evening peak-hour;

2. The Project was found to meet the comparability test for compliance with the CFDA Master Plan with respect to the peak-hour traffic demands, transit trips and parking supply allocated to the Project site (Parcel K);

3. The Project will provide a parking supply of 640 underground garage spaces, which is sufficient to accommodate the parking demands of the Project and other uses within the CFDA while also encouraging the use of alternative modes of transportation that are available to the Project site and within the study area;

4. The addition of Project-related traffic to the study area roadways and intersections was not shown to result in a significant impact on motorist delays or vehicle queuing over No-Build conditions, with the majority of the movements at the study intersections shown to continue to operate at a level-of-service of "D" or better during the peak periods;

[11] Ibid 2.

5. Sufficient capacity is afforded by the pedestrian and public transportation infrastructure that serves the study area to accommodate the projected increase in pedestrian and transit trips that may be associated with the Project;

6. No discernible safety deficiencies were noted with respect to the study area intersections based on a review of the MassDOT motor vehicle crash data; and

7. The Project site driveways are appropriately designed and located so as to provide the required line of sight to function in a safe manner.

Based on a review of these findings, we have concluded: i) the existing transportation infrastructure affords sufficient capacity to accommodate the Project in a safe and efficient manner; ii) the Project will have a less pronounced impact on the transportation infrastructure serving the Project site when compared to the impacts that were associated with the allowed uses identified in the CFDA Master Plan; and iii) the Project has been programmed and is being designed so as to minimize both pedestrian and non-commercial vehicles from negatively impacting the Massport Haul Road by allowing only one curb cut from the Project site onto the Haul Road, which will be primarily used for service vehicles, and programming Project-related pedestrian elements along Northern Avenue and Congress Street, and within the interior of the site, with the urban court and elevated courtyard terrace.

RECOMMENDATIONS

A detailed transportation improvement program has been developed for the Project that is designed to provide safe and efficient access to the Project site while minimizing impacts to motorists traveling along adjacent roadways. The following improvements have been recommended as a part of this evaluation specifically related to the Project and will be completed subject to receipt of all necessary rights, permits and approvals, and will be formalized in the Transportation Access Plan Agreement (TAPA) to be executed between the Project proponent and the Boston Transportation Department (BTD).

Project Access

Access to the Project site will be provided by way of two (2) new driveways as follows: a full access driveway that will intersect the east side of Congress Street opposite Park Lane and a right-turn entrance only driveway that will intersect the south side of Northern Avenue approximately 150 feet east of Congress Street. An additional access drive for service and delivery vehicles is proposed along the west side of the Massport Haul Road, south of Northern Avenue. The following recommendations are offered with respect to the design and operation of the Project driveways and the Project site, and to indicate compliance with relevant design standards:

- The full access Project site driveway should be a minimum of 24-feet in width and accommodate two-way travel.

- The right-turn entrance only Project site driveway should be a minimum of 16 feet in width with appropriate signs and pavement markings provided to indicate the function of the driveway as a right-turn entrance only facility.

- The existing raised median on Northern Avenue approaching the Massport Haul Road should be extended to the west so as to prohibit left turns entering the Project site driveway.

- The Project site driveways and circulating roadways within the Project site should provide sufficient width to accommodate bicycle travel in a shared travelled-way configuration.

- Vehicles exiting the Project site should be placed under STOP-sign control with illumination (lighting) provided.

- All signs and pavement markings to be installed as a part of the Project shall conform to the applicable standards of the *Manual on Uniform Traffic Control Devices* (MUTCD).[12]

- Signs and landscaping adjacent to the Project site driveways and within the Project site should be designed and maintained so as not to restrict lines of sight.

- Marked crosswalks and wheelchair ramps should be provided for crossing the Project site driveways or the driveways should be designed to be flush with the sidewalk and then ramp down to the intersecting roadway (i.e., a "pan-type" driveway).

As indicated above, these recommendations are being incorporated into the design and operation of the Project.

Transportation Demand Management (TDM) Program

The Project site is served by public transportation resources provided by the MBTA and is bounded by an interconnected sidewalk infrastructure, both of which serve to provide an opportunity to reduce automobile trips associated with the Project. In an effort to facilitate trip-reduction measures for the Project, a comprehensive Transportation Demand Management (TDM) program will be implemented in conjunction with the Project and will include the following major elements:

- A full-time Transportation Coordinator will be assigned;

- Join the local Seaport Transportation Management Association (TMA);

- Coordinate with MassRIDES through the Seaport TMA to provide commuter services to residents and employees of the Project;

- Provide on-site sale of MBTA Charlie cards;

- Make available information regarding public transportation services, maps, schedules and fare information;

- Participate in the MBTA Corporate T-Pass Program to the extent practical and as allowable pursuant to commercial tenant lease requirements;

- Promote the use of public transportation to hotel guests in website based materials including links to the appropriate homepages of the MBTA and MassRIDES;

- Provide a periodic newsletter or bulletin concerning commuting options as provided through the Seaport TMA;

- Encourage employees to participate in MassRIDES' NuRide program which rewards employees that choose to walk, bicycle, carpool, vanpool or use public transportation;

- Offer a "Guaranteed Ride Home" through the Seaport TMA to all employees that commute to the Project by means other than private automobile;

[12] *Manual on Uniform Traffic Control Devices* (MUTCD); Federal Highway Administration; Washington, DC; 2009.

- Work with the Seaport TMA and tenants to develop an informational packet of commuting alternatives to be made available to residents, employees and hotel guests;

- Work with the Seaport TMA to provide information regarding bicycle commuting and area bicycle and pedestrian facilities, including the Harborwalk;

- Provide short-term exterior bicycle parking spaces proximate to the Project building entrances and long-term bicycle parking within the parking garage;

- Provide dedicated parking for car sharing services (ZipCar), car/vanpools and alternatively fueled vehicles within the parking garage;

- Provide electric vehicle charging stations within the parking garage; and

- Proportionately participate in a shared shuttle service for the hotel, should such a service be proposed in the future.

Annual Monitoring and Reporting Program

An Annual Monitoring Report will be provided to Massport and the BTD that will document the basic transportation and commuting characteristics of the tenants, residents, employees and guests of the Project. The Annual Monitoring Report will be developed in conjunction with the Seaport TMA and will include an employee and resident survey of commuting modes, traffic monitoring of the parking garage (parking utilization and number of vehicles serviced), and documentation concerning the elements of the TDM program currently available to employees, residents and guests. The results of the annual monitoring program will be provided to the BRA and the BTD. The monitoring program will commence upon full completion and occupancy of the Project and will continue for a period of 2-years thereafter.

Loading and Deliveries

The Project has been designed to accommodate all loading and delivery functions on-site in a safe and efficient manner. Designated loading areas have been provided within the Project site to accommodate deliveries in a safe and efficient manner and separate from resident, customer and pedestrian traffic. Truck routes and hours of deliveries will be scheduled to the extent possible to minimize truck activity during the commuter peak hours. Reasonable efforts will be made to use service vendors currently serving the Project vicinity in an effort to reduce the overall number of new trucks in the area.

With implementation of the above recommendations, safe and efficient access will be provided to the Project site and the Project can be constructed with minimal impact on the roadway system.

Construction Management Plan (CMP)

An important component of the transportation plan for the Project is an effective series of measures that are designed to minimize traffic flow and safety impacts during the Project's construction phase. Summarized below are several measures which will be undertaken during the construction phase of the Project.

- The Project proponent and the general contractor will coordinate with Massport and BTD regarding all transportation-related construction impacts of the Project.

- Designated truck routes will be established to govern how trucks access the Project site. The goal of this commitment is to have construction trucks use only the regional highway system (I-90), the South Boston By-Pass Road and Massport Haul Road, and to avoid travelling through residential areas and pedestrian oriented corridors to the extent practical.

- Secure fencing will be provided in areas affected by construction to protect nearby pedestrian and vehicular traffic. Gate entrances into the construction area will be determined jointly with Massport.

- During construction activities, as required by Massport, a police detail will be employed to safely manage pedestrian and vehicle traffic at the point of construction access to the Project site.

- Secure on-site storage will be provided for tools and equipment in an effort to minimize construction-related vehicle trips to the site.

- Full or partial street closures will be avoided to the extent possible. Should a partial street closure be necessary in order to off-load construction materials and/or complete construction-related activities which cannot be accommodated on site, the closure will be limited to off-peak periods. Police details will be used as required by the Massport. Prior to the implementation of any planned construction activities within the public right-of-way, the contractor will submit to Massport for review and approval a traffic and pedestrian management plan.

- To the degree it is necessary and feasible, construction worker parking will be provided within the Project site and expressly prohibited along Congress Street, Northern Avenue, Massport Haul Road and within residential neighborhoods.

- The general contractor will work with the Seaport TMA to implement appropriate measures to encourage ridesharing and the use of public transportation services by employees and subcontractors working on the Project.

With implementation of the above elements of the CMP, construction-related impacts associated with the Project will be appropriately managed and safe and efficient access for vehicles, pedestrians and bicyclists will be maintained.

APPENDIX

MANUAL TURNING MOVEMENT COUNTS
SEASONAL ADJUSTMENT DATA
PUBLIC TRANSPORTATION SCHEDULES
MASSDOT CRASH RATE WORKSHEETS
TOTAL BACKGROUND DEVELOPMENT TRAFFIC VOLUME NETWORKS
TRIP-GENERATION CALCULATIONS
COMMERCIAL PARKING SPACE TRIP DISTRIBUTION
CAPACITY ANALYSIS WORKSHEETS

MANUAL TURNING MOVEMENT COUNTS

Accurate Counts
978-664-2565

N/S Street : 'D' Street
E/W Street: Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 60730002
Site Code : 60730002
Start Date : 8/9/2012
Page No : 1

Groups Printed- Cars - Trucks

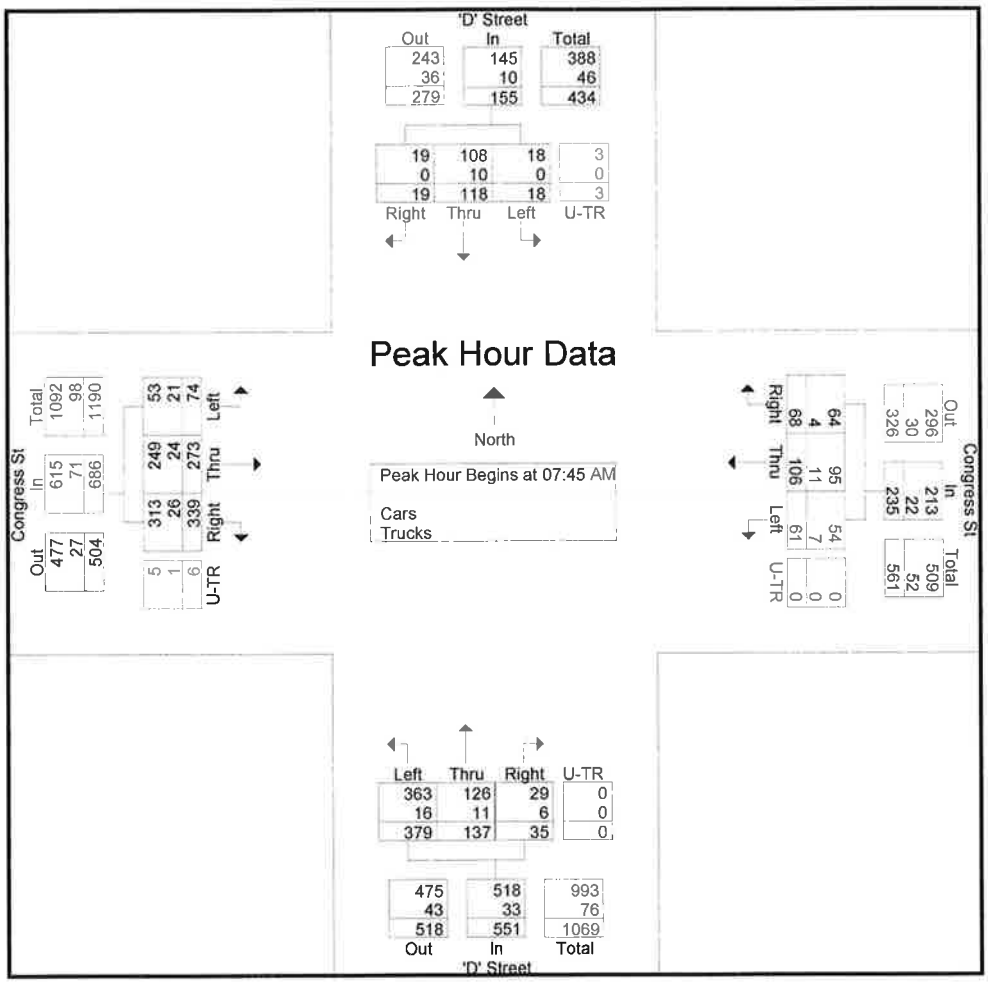
	'D' Street From North				Congress St From East				'D' Street From South				Congress St From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
07:00 AM	0	22	7	0	9	24	13	0	66	17	3	0	11	43	69	0	284
07:15 AM	0	23	6	0	15	36	13	0	89	31	5	0	17	39	70	0	344
07:30 AM	3	22	5	0	18	27	9	0	82	23	7	3	21	64	68	2	354
07:45 AM	2	24	6	0	16	17	8	0	87	27	11	0	20	68	94	3	383
Total	5	91	24	0	58	104	43	0	324	98	26	3	69	214	301	5	1365
08:00 AM	6	32	2	0	14	25	19	0	98	52	10	0	18	79	92	0	447
08:15 AM	7	34	8	1	13	32	17	0	93	35	4	0	13	68	77	2	404
08:30 AM	3	28	3	2	18	32	24	0	101	23	10	0	23	58	76	1	402
08:45 AM	1	20	7	1	14	27	14	0	85	32	9	0	19	73	52	0	354
Total	17	114	20	4	59	116	74	0	377	142	33	0	73	278	297	3	1607
Grand Total	22	205	44	4	117	220	117	0	701	240	59	3	142	492	598	8	2972
Apprch %	8	74.5	16	1.5	25.8	48.5	25.8	0	69.9	23.9	5.9	0.3	11.5	39.7	48.2	0.6	
Total %	0.7	6.9	1.5	0.1	3.9	7.4	3.9	0	23.6	8.1	2	0.1	4.8	16.6	20.1	0.3	
Cars	22	184	41	4	106	197	110	0	670	218	53	3	108	438	556	7	2717
% Cars	100	89.8	93.2	100	90.6	89.5	94	0	95.6	90.8	89.8	100	76.1	89	93	87.5	91.4
Trucks	0	21	3	0	11	23	7	0	31	22	6	0	34	54	42	1	255
% Trucks	0	10.2	6.8	0	9.4	10.5	6	0	4.4	9.2	10.2	0	23.9	11	7	12.5	8.6

	'D' Street From North					Congress St From East					'D' Street From South					Congress St From West					
Start Time	Left	Thru	Right	U-TR	App Total	Left	Thru	Right	U-TR	App Total	Left	Thru	Right	U-TR	App Total	Left	Thru	Right	U-TR	App Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	2	24	6	0	32	16	17	8	0	41	87	27	**11**	0	125	20	68	**94**	**3**	185	383
08:00 AM	6	32	2	0	40	14	25	19	0	58	98	**52**	10	0	**160**	18	**79**	92	0	**189**	**447**
08:15 AM	**7**	**34**	**8**	1	**50**	13	**32**	17	0	62	93	35	4	0	132	13	68	77	2	160	404
08:30 AM	3	28	3	**2**	36	**18**	32	**24**	0	**74**	**101**	23	10	**0**	134	**23**	58	76	1	158	402
Total Volume	18	118	19	3	158	61	106	68	0	235	379	137	35	0	551	74	273	339	6	692	1636
% App. Total	11.4	74.7	12	1.9		26	45.1	28.9	0		68.8	24.9	6.4	0		10.7	39.5	49	0.9		
PHF	.643	.868	.594	.375	.790	.847	.828	.708	.000	.794	.938	.659	.795	.000	.861	.804	.864	.902	.500	.915	.915
Cars	18	108	19	3	148	54	95	64	0	213	363	126	29	0	518	53	249	313	5	620	1499
% Cars	100	91.5	100	100	93.7	88.5	89.6	94.1	0	90.6	95.8	92.0	82.9	0	94.0	71.6	91.2	92.3	83.3	89.6	91.6
Trucks	0	10	0	0	10	7	11	4	0	22	16	11	6	0	33	21	24	26	1	72	137
% Trucks	0	8.5	0	0	6.3	11.5	10.4	5.9	0	9.4	4.2	8.0	17.1	0	6.0	28.4	8.8	7.7	16.7	10.4	8.4

Accurate Counts
978-664-2565

N/S Street : 'D' Street
E/W Street: Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 60730002
Site Code : 60730002
Start Date : 8/9/2012
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:45 AM					08:00 AM					08:00 AM					07:45 AM				
+0 mins.	2	24	6	0	32	14	25	19	0	58	98	**52**	**10**	0	**160**	20	68	**94**	**3**	185
+15 mins.	6	32	2	0	40	13	**32**	17	0	62	93	35	4	0	132	18	**79**	92	0	**189**
+30 mins.	7	**34**	**8**	1	**50**	**18**	32	**24**	0	**74**	**101**	23	10	0	134	13	68	77	2	160
+45 mins.	3	28	3	**2**	36	14	27	14	0	55	85	32	9	0	126	**23**	58	76	1	158
Total Volume	18	118	19	3	158	59	116	74	0	249	377	142	33	0	552	74	273	339	6	692
% App. Total	11.4	74.7	12	1.9		23.7	46.6	29.7	0		68.3	25.7	6	0		10.7	39.5	49	0.9	
PHF	.643	.868	.594	.375	.790	.819	.906	.771	.000	.841	.933	.683	.825	.000	.863	.804	.864	.902	.500	.915
Cars	18	108	19	3	148	52	102	71	0	225	354	130	29	0	513	53	249	313	5	620
% Cars	100	91.5	100	100	93.7	88.1	87.9	95.9	0	90.4	93.9	91.5	87.9	0	92.9	71.6	91.2	92.3	83.3	89.6
Trucks	0	10	0	0	10	7	14	3	0	24	23	12	4	0	39	21	24	26	1	72
% Trucks	0	8.5	0	0	6.3	11.9	12.1	4.1	0	9.6	6.1	8.5	12.1	0	7.1	28.4	8.8	7.7	16.7	10.4

Accurate Counts
978-664-2565

N/S Street : 'D' Street
E/W Street: Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 60730002
Site Code : 60730002
Start Date : 8/9/2012
Page No : 1

Groups Printed- Cars

	'D' Street From North				Congress St From East				'D' Street From South				Congress St From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
07:00 AM	0	20	5	0	9	21	12	0	63	15	3	0	9	36	65	0	258
07:15 AM	0	22	5	0	13	33	12	0	89	28	5	0	13	31	68	0	319
07:30 AM	3	19	5	0	17	25	9	0	78	21	7	3	17	57	62	2	325
07:45 AM	2	22	6	0	15	16	6	0	86	24	9	0	13	61	88	3	351
Total	5	83	21	0	54	95	39	0	316	88	24	3	52	185	283	5	1253
08:00 AM	6	30	2	0	11	21	19	0	96	51	8	0	14	74	82	0	414
08:15 AM	7	31	8	1	13	31	16	0	89	32	3	0	8	60	71	2	372
08:30 AM	3	25	3	2	15	27	23	0	92	19	9	0	18	54	72	0	362
08:45 AM	1	15	7	1	13	23	13	0	77	28	9	0	16	65	48	0	316
Total	17	101	20	4	52	102	71	0	354	130	29	0	56	253	273	2	1464
Grand Total	22	184	41	4	106	197	110	0	670	218	53	3	108	438	556	7	2717
Apprch %	8.8	73.3	16.3	1.6	25.7	47.7	26.6	0	71	23.1	5.6	0.3	9.7	39.5	50.1	0.6	
Total %	0.8	6.8	1.5	0.1	3.9	7.3	4	0	24.7	8	2	0.1	4	16.1	20.5	0.3	

	'D' Street From North					Congress St From East					'D' Street From South					Congress St From West					
Start Time	Left	Thru	Right	U-TR	App Total	Left	Thru	Right	U-TR	App Total	Left	Thru	Right	U-TR	App Total	Left	Thru	Right	U-TR	App Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	2	22	6	0	30	**15**	16	6	0	37	86	24	**9**	0	119	13	61	**88**	**3**	165	351
08:00 AM	6	30	2	0	38	11	21	19	0	51	**96**	**51**	8	0	**155**	14	**74**	82	0	**170**	**414**
08:15 AM	**7**	**31**	**8**	1	**47**	13	**31**	16	0	60	89	32	3	0	124	8	60	71	2	141	372
08:30 AM	3	25	3	**2**	33	15	27	**23**	0	**65**	92	19	9	0	120	**18**	54	72	0	144	362
Total Volume	18	108	19	3	148	54	95	64	0	213	363	126	29	0	518	53	249	313	5	620	1499
% App. Total	12.2	73	12.8	2		25.4	44.6	30	0		70.1	24.3	5.6	0		8.5	40.2	50.5	0.8		
PHF	.643	.871	.594	.375	.787	.900	.766	.696	.000	.819	.945	.618	.806	.000	.835	.736	.841	.889	.417	.912	.905

Accurate Counts
978-664-2565

N/S Street : 'D' Street
E/W Street: Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 60730002
Site Code : 60730002
Start Date : 8/9/2012
Page No : 1

Groups Printed- Trucks

	'D' Street From North				Congress St From East				'D' Street From South				Congress St From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
07:00 AM	0	2	2	0	0	3	1	0	3	2	0	0	2	7	4	0	26
07:15 AM	0	1	1	0	2	3	1	0	0	3	0	0	4	8	2	0	25
07:30 AM	0	3	0	0	1	2	0	0	4	2	0	0	4	7	6	0	29
07:45 AM	0	2	0	0	1	1	2	0	1	3	2	0	7	7	6	0	32
Total	0	8	3	0	4	9	4	0	8	10	2	0	17	29	18	0	112
08:00 AM	0	2	0	0	3	4	0	0	2	1	2	0	4	5	10	0	33
08:15 AM	0	3	0	0	0	1	1	0	4	3	1	0	5	8	6	0	32
08:30 AM	0	3	0	0	3	5	1	0	9	4	1	0	5	4	4	1	40
08:45 AM	0	5	0	0	1	4	1	0	8	4	0	0	3	8	4	0	38
Total	0	13	0	0	7	14	3	0	23	12	4	0	17	25	24	1	143
Grand Total	0	21	3	0	11	23	7	0	31	22	6	0	34	54	42	1	255
Apprch %	0	87.5	12.5	0	26.8	56.1	17.1	0	52.5	37.3	10.2	0	26	41.2	32.1	0.8	
Total %	0	8.2	1.2	0	4.3	9	2.7	0	12.2	8.6	2.4	0	13.3	21.2	16.5	0.4	

	'D' Street From North					Congress St From East					'D' Street From South					Congress St From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	2	0	0	2	**3**	4	0	0	7	2	1	**2**	0	5	4	5	**10**	0	**19**	33
08:15 AM	0	3	0	0	3	0	1	**1**	0	2	4	3	1	0	8	**5**	**8**	6	0	19	32
08:30 AM	0	3	0	0	3	3	**5**	1	0	**9**	**9**	**4**	1	0	**14**	5	4	4	**1**	14	**40**
08:45 AM	0	**5**	0	0	**5**	**1**	4	1	0	6	8	4	0	0	12	3	8	4	0	15	38
Total Volume	0	13	0	0	13	7	14	3	0	24	23	12	4	0	39	17	25	24	1	**67**	143
% App. Total	0	100	0	0		29.2	58.3	12.5	0		59	30.8	10.3	0		25.4	37.3	35.8	1.5		
PHF	.000	.650	.000	.000	.650	.583	.700	.750	.000	.667	.639	.750	.500	.000	.696	.850	.781	.600	.250	.882	.894

Accurate Counts
978-664-2565

N/S Street : 'D' Street
E/W Street: Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 60730002
Site Code : 60730002
Start Date : 8/9/2012
Page No : 1

Groups Printed- Bikes Peds

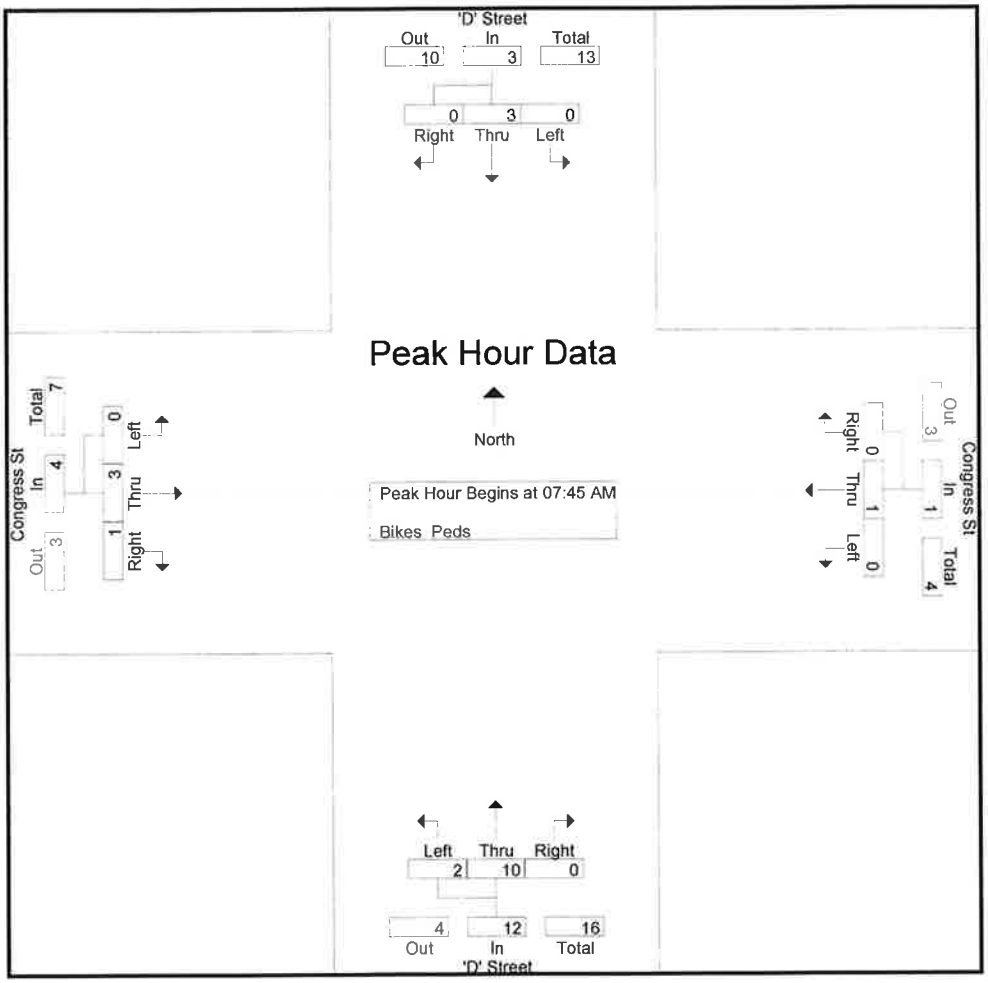
	'D' Street From North				Congress St From East				'D' Street From South				Congress St From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	0	0	7	0	0	0	3	0	1	1	2	0	0	0	3	15	2	17
07:15 AM	0	0	0	5	0	0	0	20	0	0	0	1	1	0	0	1	27	1	28
07:30 AM	1	0	0	0	0	0	0	28	0	1	0	1	0	0	0	1	30	2	32
07:45 AM	0	1	0	3	0	0	0	31	0	3	0	0	0	1	0	2	36	5	41
Total	1	1	0	15	0	0	0	82	0	5	1	4	1	1	0	7	108	10	118
08:00 AM	0	0	0	6	0	0	0	24	1	1	0	2	0	0	1	1	33	3	36
08:15 AM	0	1	0	8	0	0	0	68	1	2	0	3	0	0	0	3	82	4	86
08:30 AM	0	1	0	10	0	1	0	47	0	4	0	0	0	2	0	4	61	8	69
08:45 AM	0	0	0	1	0	0	0	51	0	3	0	2	0	0	0	1	55	3	58
Total	0	2	0	25	0	1	0	190	2	10	0	7	0	2	1	9	231	18	249
Grand Total	1	3	0	40	0	1	0	272	2	15	1	11	1	3	1	16	339	28	367
Apprch %	25	75	0		0	100	0		11.1	83.3	5.6		20	60	20				
Total %	3.6	10.7	0		0	3.6	0		7.1	53.6	3.6		3.6	10.7	3.6		92.4	7.6	

	'D' Street From North				Congress St From East				'D' Street From South				Congress St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	0	**1**	0	**1**	0	0	0	0	0	3	0	3	0	1	0	1	5
08:00 AM	0	0	0	0	0	0	0	0	**1**	1	0	2	0	0	**1**	1	3
08:15 AM	0	1	0	1	0	0	0	0	1	2	0	3	0	0	0	0	4
08:30 AM	0	1	0	1	0	**1**	0	**1**	0	**4**	0	**4**	0	**2**	0	**2**	**8**
Total Volume	0	3	0	3	0	1	0	1	2	10	0	12	0	3	1	4	20
% App. Total	0	100	0		0	100	0		16.7	83.3	0		0	75	25		
PHF	.000	.750	.000	.750	.000	.250	.000	.250	.500	.625	.000	.750	.000	.375	.250	.500	.625

Accurate Counts
978-664-2565

N/S Street : 'D' Street
E/W Street: Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 60730002
Site Code : 60730002
Start Date : 8/9/2012
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:30 AM				07:45 AM				07:45 AM				07:45 AM			
+0 mins.	**1**	0	0	**1**	0	0	0	0	0	3	0	3	0	1	0	1
+15 mins.	0	**1**	0	1	0	0	0	0	**1**	1	0	2	0	0	**1**	1
+30 mins.	0	0	0	0	0	0	0	0	1	2	0	3	0	0	0	0
+45 mins.	0	1	0	1	0	**1**	0	**1**	0	**4**	0	**4**	0	**2**	0	**2**
Total Volume	1	2	0	3	0	1	0	1	2	10	0	12	0	3	1	4
% App. Total	33.3	66.7	0		0	100	0		16.7	83.3	0		0	75	25	
PHF	.250	.500	.000	.750	.000	.250	.000	.250	.500	.625	.000	.750	.000	.375	.250	.500

Accurate Counts
978-664-2565

N/S Street : 'D' Street
E/W Street: Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 60730002
Site Code : 60730002
Start Date : 8/9/2012
Page No : 1

Groups Printed- Cars - Trucks

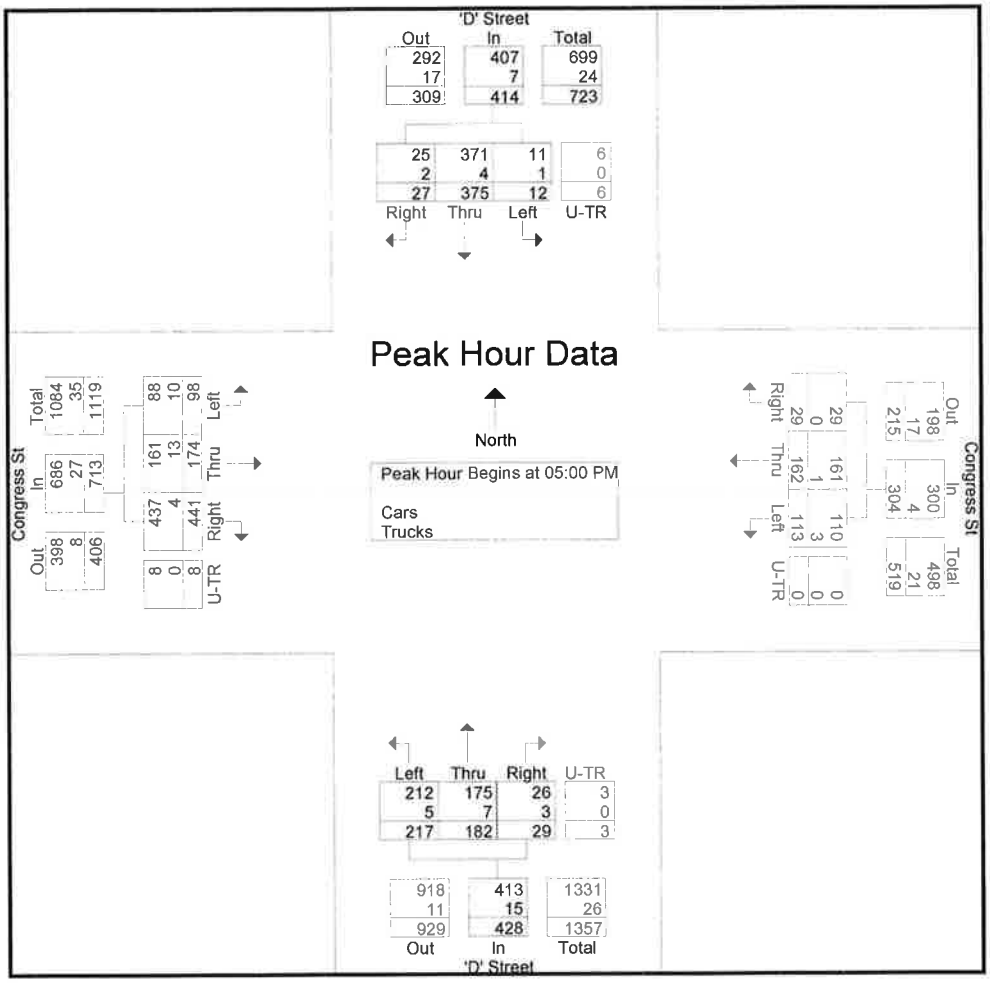
	'D' Street From North				Congress St From East				'D' Street From South				Congress St From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
04:00 PM	2	65	11	1	8	21	9	1	77	22	9	3	18	30	105	0	382
04:15 PM	1	72	4	0	10	31	7	0	67	33	7	0	17	30	76	0	355
04:30 PM	2	80	10	1	15	23	8	0	73	20	4	0	25	32	105	2	400
04:45 PM	0	85	3	1	24	49	10	0	57	33	8	0	22	36	103	1	432
Total	5	302	28	3	57	124	34	1	274	108	28	3	82	128	389	3	1569
05:00 PM	1	92	8	2	17	47	6	0	63	46	7	1	25	35	108	3	461
05:15 PM	3	114	8	1	30	50	6	0	53	52	9	0	23	45	101	4	499
05:30 PM	3	76	6	1	27	27	13	0	57	40	5	2	23	48	134	1	463
05:45 PM	5	93	5	2	39	38	4	0	44	44	8	0	27	46	98	0	453
Total	12	375	27	6	113	162	29	0	217	182	29	3	98	174	441	8	1876
Grand Total	17	677	55	9	170	286	63	1	491	290	57	6	180	302	830	11	3445
Apprch %	2.2	89.3	7.3	1.2	32.7	55	12.1	0.2	58.2	34.4	6.8	0.7	13.6	22.8	62.7	0.8	
Total %	0.5	19.7	1.6	0.3	4.9	8.3	1.8	0	14.3	8.4	1.7	0.2	5.2	8.8	24.1	0.3	
Cars	16	668	50	9	166	282	63	1	474	274	49	6	162	270	818	11	3319
% Cars	94.1	98.7	90.9	100	97.6	98.6	100	100	96.5	94.5	86	100	90	89.4	98.6	100	96.3
Trucks	1	9	5	0	4	4	0	0	17	16	8	0	18	32	12	0	126
% Trucks	5.9	1.3	9.1	0	2.4	1.4	0	0	3.5	5.5	14	0	10	10.6	1.4	0	3.7

	'D' Street From North					Congress St From East					'D' Street From South					Congress St From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	1	92	**8**	**2**	103	17	47	6	0	70	**63**	46	7	1	**117**	25	35	108	3	171	461
05:15 PM	3	**114**	8	1	**126**	30	**50**	6	0	**86**	53	**52**	**9**	0	114	23	45	101	**4**	173	**499**
05:30 PM	3	76	6	1	86	27	27	**13**	0	67	57	40	5	**2**	104	23	**48**	**134**	1	**206**	463
05:45 PM	**5**	93	5	**2**	105	**39**	38	4	0	81	44	44	8	0	96	**27**	46	98	0	171	453
Total Volume	12	375	27	6	420	113	162	29	0	304	217	182	29	3	431	98	174	441	8	721	1876
% App. Total	2.9	89.3	6.4	1.4		37.2	53.3	9.5	0		50.3	42.2	6.7	0.7		13.6	24.1	61.2	1.1		
PHF	.600	.822	.844	.750	.833	.724	.810	.558	.000	.884	.861	.875	.806	.375	.921	.907	.906	.823	.500	.875	.940
Cars	11	371	25	6	413	110	161	29	0	300	212	175	26	3	416	88	161	437	8	694	1823
% Cars	91.7	98.9	92.6	100	98.3	97.3	99.4	100	0	98.7	97.7	96.2	89.7	100	96.5	89.8	92.5	99.1	100	96.3	97.2
Trucks	1	4	2	0	7	3	1	0	0	4	5	7	3	0	15	10	13	4	0	27	53
% Trucks	8.3	1.1	7.4	0	1.7	2.7	0.6	0	0	1.3	2.3	3.8	10.3	0	3.5	10.2	7.5	0.9	0	3.7	2.8

Accurate Counts
978-664-2565

N/S Street : 'D' Street
E/W Street: Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 60730002
Site Code : 60730002
Start Date : 8/9/2012
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	05:00 PM					04:45 PM					04:45 PM					05:00 PM				
+0 mins.	1	92	**8**	**2**	103	24	49	10	0	83	57	33	8	0	98	25	35	108	3	171
+15 mins.	3	**114**	8	1	**126**	17	47	6	0	70	**63**	46	7	1	**117**	23	45	101	**4**	173
+30 mins.	3	76	6	1	86	**30**	**50**	6	0	**86**	53	**52**	**9**	0	114	23	**48**	**134**	1	**206**
+45 mins.	**5**	93	5	2	105	**27**	27	**13**	0	67	57	40	5	**2**	104	**27**	46	98	0	171
Total Volume	12	375	27	6	420	98	173	35	0	306	230	171	29	3	433	98	174	441	8	721
% App. Total	2.9	89.3	6.4	1.4		32	56.5	11.4	0		53.1	39.5	6.7	0.7		13.6	24.1	61.2	1.1	
PHF	.600	.822	.844	.750	.833	.817	.865	.673	.000	.890	.913	.822	.806	.375	.925	.907	.906	.823	.500	.875
Cars	11	371	25	6	413	96	172	35	0	303	224	163	26	3	416	88	161	437	8	694
% Cars	91.7	98.9	92.6	100	98.3	98	99.4	100	0	99	97.4	95.3	89.7	100	96.1	89.8	92.5	99.1	100	96.3
Trucks	1	4	2	0	7	2	1	0	0	3	6	8	3	0	17	10	13	4	0	27
% Trucks	8.3	1.1	7.4	0	1.7	2	0.6	0	0	1	2.6	4.7	10.3	0	3.9	10.2	7.5	0.9	0	3.7

Accurate Counts
978-664-2565

N/S Street : 'D' Street
E/W Street: Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 60730002
Site Code : 60730002
Start Date : 8/9/2012
Page No : 1

Groups Printed- Cars

	'D' Street From North				Congress St From East				'D' Street From South				Congress St From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
04:00 PM	2	65	11	1	8	20	9	1	72	19	6	3	16	25	103	0	361
04:15 PM	1	72	3	0	10	30	7	0	64	30	5	0	16	25	73	0	336
04:30 PM	2	77	9	1	14	22	8	0	71	19	4	0	22	30	104	2	385
04:45 PM	0	83	2	1	24	49	10	0	55	31	8	0	20	29	101	1	414
Total	5	297	25	3	56	121	34	1	262	99	23	3	74	109	381	3	1496
05:00 PM	1	90	8	2	17	47	6	0	62	45	5	1	22	30	108	3	447
05:15 PM	2	113	8	1	28	49	6	0	53	51	8	0	21	45	100	4	489
05:30 PM	3	75	5	1	27	27	13	0	54	36	5	2	21	45	134	1	449
05:45 PM	5	93	4	2	38	38	4	0	43	43	8	0	24	41	95	0	438
Total	11	371	25	6	110	161	29	0	212	175	26	3	88	161	437	8	1823
Grand Total	16	668	50	9	166	282	63	1	474	274	49	6	162	270	818	11	3319
Apprch %	2.2	89.9	6.7	1.2	32.4	55.1	12.3	0.2	59	34.1	6.1	0.7	12.8	21.4	64.9	0.9	
Total %	0.5	20.1	1.5	0.3	5	8.5	1.9	0	14.3	8.3	1.5	0.2	4.9	8.1	24.6	0.3	

	'D' Street From North					Congress St From East					'D' Street From South					Congress St From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	1	90	**8**	**2**	101	17	47	6	0	70	**62**	45	5	1	**113**	22	30	108	3	163	447
05:15 PM	2	**113**	8	1	**124**	28	**49**	6	0	**83**	53	**51**	**8**	0	112	21	**45**	100	**4**	170	**489**
05:30 PM	3	75	5	1	84	27	27	**13**	0	67	54	36	5	**2**	97	21	45	**134**	1	**201**	449
05:45 PM	**5**	93	4	**2**	104	**38**	38	4	0	80	**43**	43	8	0	94	**24**	41	95	0	160	**438**
Total Volume	11	371	25	6	413	110	161	29	0	300	212	175	26	3	416	88	161	437	8	694	1823
% App. Total	2.7	89.8	6.1	1.5		36.7	53.7	9.7	0		51	42.1	6.2	0.7		12.7	23.2	63	1.2		
PHF	.550	.821	.781	.750	.833	.724	.821	.558	.000	.904	.855	.858	.813	.375	.920	.917	.894	.815	.500	.863	.932

Accurate Counts
978-664-2565

N/S Street : 'D' Street
E/W Street: Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 60730002
Site Code : 60730002
Start Date : 8/9/2012
Page No : 1

Groups Printed- Trucks

	'D' Street From North				Congress St From East				'D' Street From South				Congress St From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
04:00 PM	0	0	0	0	0	1	0	0	5	3	3	0	2	5	2	0	21
04:15 PM	0	0	1	0	0	1	0	0	3	3	2	0	1	5	3	0	19
04:30 PM	0	3	1	0	1	1	0	0	2	1	0	0	3	2	1	0	15
04:45 PM	0	2	1	0	0	0	0	0	2	2	0	0	2	7	2	0	18
Total	0	5	3	0	1	3	0	0	12	9	5	0	8	19	8	0	73
05:00 PM	0	2	0	0	0	0	0	0	1	1	2	0	3	5	0	0	14
05:15 PM	1	1	0	0	2	1	0	0	0	1	1	0	2	0	1	0	10
05:30 PM	0	1	1	0	0	0	0	0	3	4	0	0	2	3	0	0	14
05:45 PM	0	0	1	0	1	0	0	0	1	1	0	0	3	5	3	0	15
Total	1	4	2	0	3	1	0	0	5	7	3	0	10	13	4	0	53
Grand Total	1	9	5	0	4	4	0	0	17	16	8	0	18	32	12	0	126
Apprch %	6.7	60	33.3	0	50	50	0	0	41.5	39	19.5	0	29	51.6	19.4	0	
Total %	0.8	7.1	4	0	3.2	3.2	0	0	13.5	12.7	6.3	0	14.3	25.4	9.5	0	

	'D' Street From North					Congress St From East					'D' Street From South					Congress St From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	0	0	0	0	**1**	0	0	1	**5**	**3**	**3**	0	**11**	2	5	2	0	9	**21**
04:15 PM	0	0	**1**	0	1	0	1	0	0	1	3	3	2	0	**8**	1	5	**3**	0	9	19
04:30 PM	0	**3**	1	0	**4**	**1**	1	0	0	**2**	2	1	0	0	3	**3**	2	1	0	6	15
04:45 PM	0	2	1	0	3	0	0	0	0	0	2	2	0	0	4	2	**7**	2	0	**11**	18
Total Volume	0	5	3	0	8	1	3	0	0	4	12	9	5	0	26	8	19	8	0	35	73
% App. Total	0	62.5	37.5	0		25	75	0	0		46.2	34.6	19.2	0		22.9	54.3	22.9	0		
PHF	.000	.417	.750	.000	.500	.250	.750	.000	.000	.500	.600	.750	.417	.000	.591	.667	.679	.667	.000	.795	.869

Accurate Counts
978-664-2565

N/S Street : 'D' Street
E/W Street: Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 60730002
Site Code : 60730002
Start Date : 8/9/2012
Page No : 1

Groups Printed- Bikes Peds

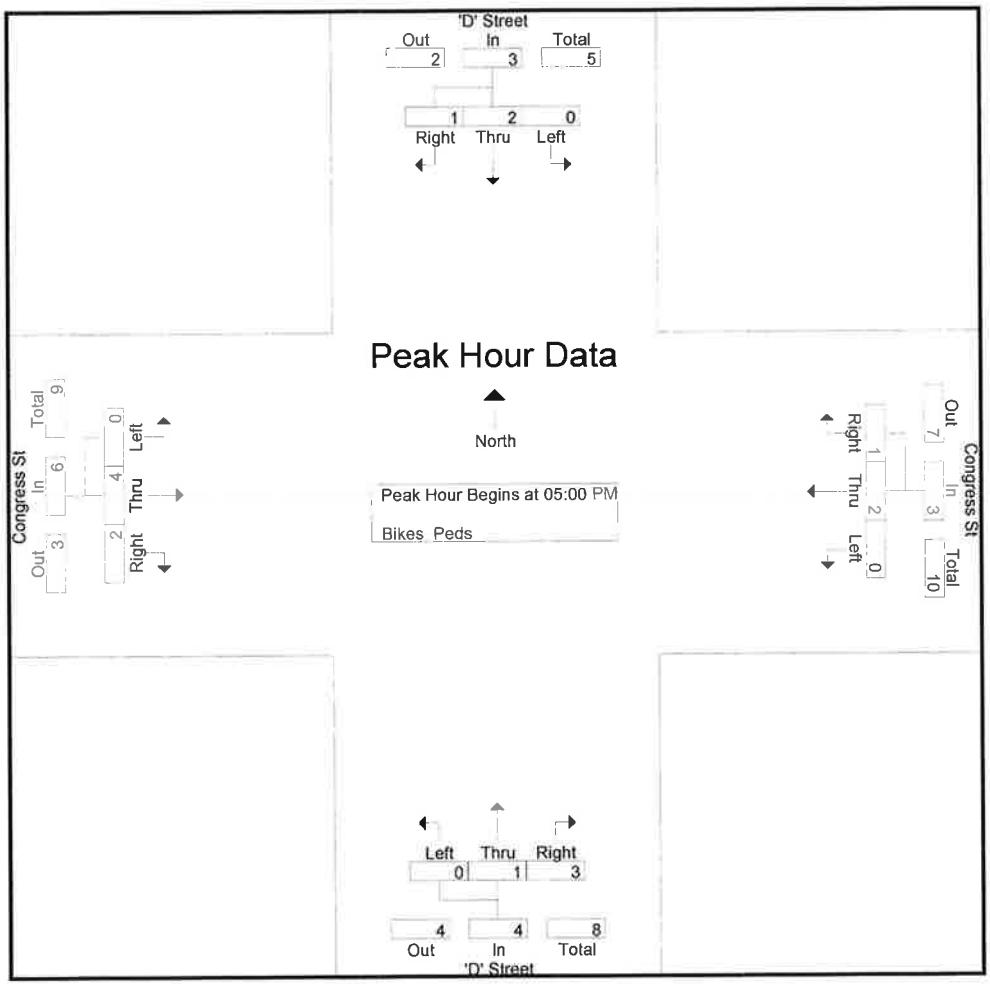
	'D' Street From North				Congress St From East				'D' Street From South				Congress St From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	0	1	0	3	0	0	0	17	0	1	0	0	0	0	0	1	21	2	23
04:15 PM	1	3	0	6	0	1	0	22	0	0	0	4	0	0	1	1	33	6	39
04:30 PM	0	1	0	0	0	0	0	15	1	0	0	0	0	0	0	3	18	2	20
04:45 PM	0	0	0	0	0	0	0	9	1	0	0	2	0	0	0	4	15	1	16
Total	1	5	0	9	0	1	0	63	2	1	0	6	0	0	1	9	87	11	98
05:00 PM	0	1	0	1	0	0	0	52	0	1	0	4	0	1	0	15	72	3	75
05:15 PM	0	0	0	5	0	1	1	55	0	0	0	7	0	0	1	5	72	3	75
05:30 PM	0	1	1	3	0	0	0	39	0	0	2	4	0	3	1	0	46	8	54
05:45 PM	0	0	0	3	0	1	0	35	0	0	1	2	0	0	0	2	42	2	44
Total	0	2	1	12	0	2	1	181	0	1	3	17	0	4	2	22	232	16	248
Grand Total	1	7	1	21	0	3	1	244	2	2	3	23	0	4	3	31	319	27	346
Apprch %	11.1	77.8	11.1		0	75	25		28.6	28.6	42.9		0	57.1	42.9				
Total %	3.7	25.9	3.7		0	11.1	3.7		7.4	7.4	11.1		0	14.8	11.1		92.2	7.8	

	'D' Street From North				Congress St From East				'D' Street From South				Congress St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	0	**1**	0	1	0	0	0	0	0	**1**	0	1	0	1	0	1	3
05:15 PM	0	0	0	0	0	**1**	**1**	**2**	0	0	0	0	0	0	**1**	1	3
05:30 PM	0	1	**1**	**2**	0	0	0	0	0	0	**2**	**2**	0	**3**	1	**4**	**8**
05:45 PM	0	0	0	0	0	1	0	1	0	0	1	1	0	0	0	0	2
Total Volume	0	2	1	3	0	2	1	3	0	1	3	4	0	4	2	6	16
% App. Total	0	66.7	33.3		0	66.7	33.3		0	25	75		0	66.7	33.3		
PHF	.000	.500	.250	.375	.000	.500	.250	.375	.000	.250	.375	.500	.000	.333	.500	.375	.500

Accurate Counts
978-664-2565

N/S Street : 'D' Street
E/W Street: Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 60730002
Site Code : 60730002
Start Date : 8/9/2012
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:00 PM				05:00 PM				04:45 PM				04:45 PM			
+0 mins.	0	1	0	1	0	0	0	0	**1**	0	0	1	0	0	0	0
+15 mins.	**1**	**3**	0	4	0	**1**	**1**	**2**	0	**1**	0	1	0	1	0	1
+30 mins.	0	1	0	1	0	0	0	0	0	0	0	0	0	0	**1**	1
+45 mins.	0	0	0	0	0	1	0	1	0	0	**2**	**2**	0	**3**	1	**4**
Total Volume	1	5	0	6	0	2	1	3	1	1	2	4	0	4	2	6
% App. Total	16.7	83.3	0		0	66.7	33.3		25	25	50		0	66.7	33.3	
PHF	.250	.417	.000	.375	.000	.500	.250	.375	.250	.250	.250	.500	.000	.333	.500	.375

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730003
Site Code : 60730003
Start Date : 8/9/2012
Page No : 1

Groups Printed- Cars - Trucks

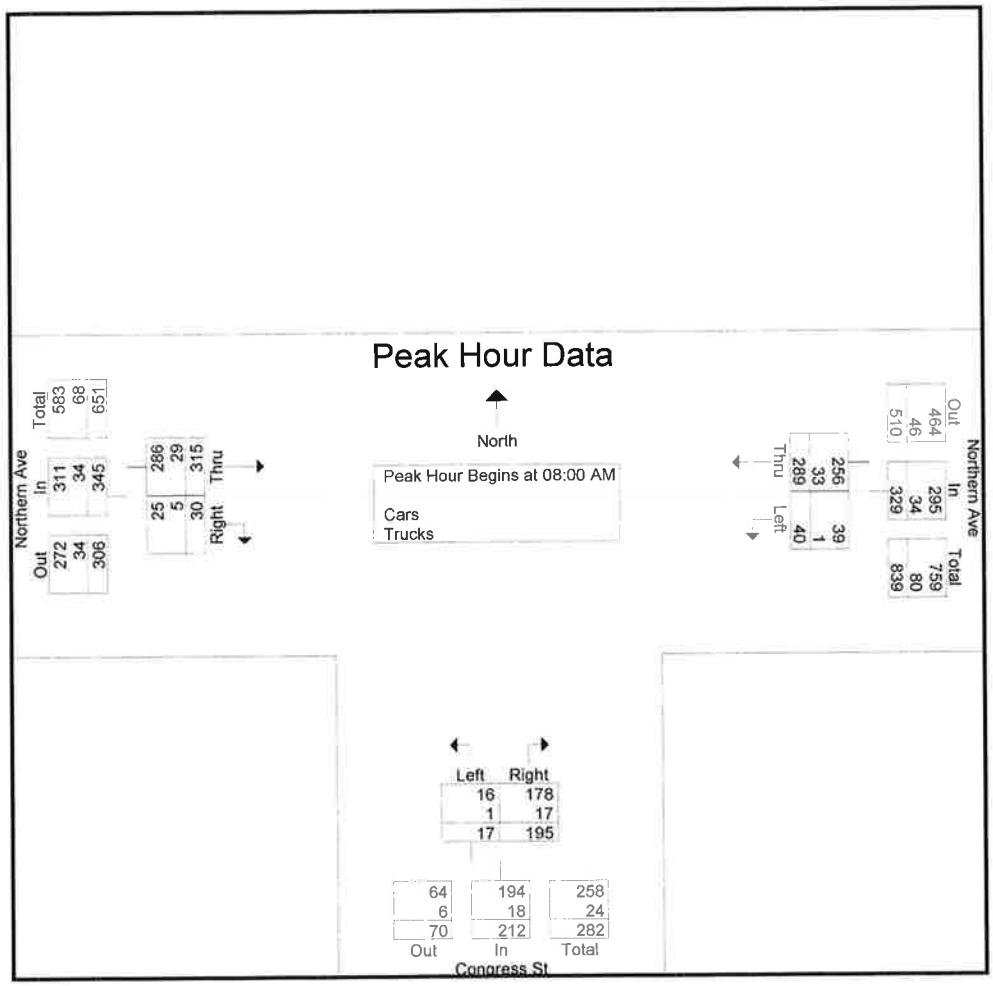
	Northern Ave From East		Congress St From South		Northern Ave From West		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
07:00 AM	7	55	1	38	62	6	169
07:15 AM	8	60	8	26	75	11	188
07:30 AM	7	61	6	51	83	7	215
07:45 AM	9	57	3	46	71	9	195
Total	31	233	18	161	291	33	767
08:00 AM	17	63	5	44	71	10	210
08:15 AM	4	80	7	44	67	6	208
08:30 AM	8	80	1	51	87	7	234
08:45 AM	11	66	4	56	90	7	234
Total	40	289	17	195	315	30	886
Grand Total	71	522	35	356	606	63	1653
Apprch %	12	88	9	91	90.6	9.4	
Total %	4.3	31.6	2.1	21.5	36.7	3.8	
Cars	68	453	29	319	558	52	1479
% Cars	95.8	86.8	82.9	89.6	92.1	82.5	89.5
Trucks	3	69	6	37	48	11	174
% Trucks	4.2	13.2	17.1	10.4	7.9	17.5	10.5

	Northern Ave From East			Congress St From South			Northern Ave From West			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 08:00 AM										
08:00 AM	17	63	80	5	44	49	71	10	81	210
08:15 AM	4	80	84	7	44	51	67	6	73	208
08:30 AM	8	80	88	1	51	52	87	7	94	234
08:45 AM	11	66	77	4	56	60	90	7	97	234
Total Volume	40	289	329	17	195	212	315	30	345	886
% App. Total	12.2	87.8		8	92		91.3	8.7		
PHF	.588	.903	.935	.607	.871	.883	.875	.750	.889	.947
Cars	39	256	295	16	178	194	286	25	311	800
% Cars	97.5	88.6	89.7	94.1	91.3	91.5	90.8	83.3	90.1	90.3
Trucks	1	33	34	1	17	18	29	5	34	86
% Trucks	2.5	11.4	10.3	5.9	8.7	8.5	9.2	16.7	9.9	9.7

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730003
Site Code : 60730003
Start Date : 8/9/2012
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	08:00 AM			08:00 AM			08:00 AM		
+0 mins.	**17**	63	80	5	44	49	71	**10**	81
+15 mins.	4	**80**	84	7	44	51	67	6	73
+30 mins.	8	80	**88**	1	51	52	87	7	94
+45 mins.	11	66	77	4	**56**	**60**	**90**	7	**97**
Total Volume	40	289	329	17	195	212	315	30	345
% App. Total	12.2	87.8		8	92		91.3	8.7	
PHF	.588	.903	.935	.607	.871	.883	.875	.750	.889
Cars	39	256	295	16	178	194	286	25	311
% Cars	97.5	88.6	89.7	94.1	91.3	91.5	90.8	83.3	90.1
Trucks	1	33	34	1	17	18	29	5	34
% Trucks	2.5	11.4	10.3	5.9	8.7	8.5	9.2	16.7	9.9

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730003
Site Code : 60730003
Start Date : 8/9/2012
Page No : 1

Groups Printed- Cars

	Northern Ave From East		Congress St From South		Northern Ave From West		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
07:00 AM	6	44	1	34	57	5	147
07:15 AM	7	53	4	22	70	9	165
07:30 AM	7	53	6	45	79	5	195
07:45 AM	9	47	2	40	66	8	172
Total	29	197	13	141	272	27	679
08:00 AM	17	58	5	43	62	9	194
08:15 AM	4	70	6	40	57	6	183
08:30 AM	8	69	1	46	82	6	212
08:45 AM	10	59	4	49	85	4	211
Total	39	256	16	178	286	25	800
Grand Total	68	453	29	319	558	52	1479
Apprch %	13.1	86.9	8.3	91.7	91.5	8.5	
Total %	4.6	30.6	2	21.6	37.7	3.5	

	Northern Ave From East			Congress St From South			Northern Ave From West			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 08:00 AM										
08:00 AM	**17**	58	75	5	43	48	62	**9**	71	194
08:15 AM	4	**70**	74	**6**	40	46	57	6	63	183
08:30 AM	8	69	77	1	46	47	82	6	88	**212**
08:45 AM	10	59	69	4	**49**	**53**	**85**	4	**89**	211
Total Volume	39	256	295	16	178	194	286	25	311	800
% App. Total	13.2	86.8		8.2	91.8		92	8		
PHF	.574	.914	.958	.667	.908	.915	.841	.694	.874	.943

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730003
Site Code : 60730003
Start Date : 8/9/2012
Page No : 1

Groups Printed- Trucks

	Northern Ave From East		Congress St From South		Northern Ave From West		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
07:00 AM	1	11	0	4	5	1	22
07:15 AM	1	7	4	4	5	2	23
07:30 AM	0	8	0	6	4	2	20
07:45 AM	0	10	1	6	5	1	23
Total	2	36	5	20	19	6	88
08:00 AM	0	5	0	1	9	1	16
08:15 AM	0	10	1	4	10	0	25
08:30 AM	0	11	0	5	5	1	22
08:45 AM	1	7	0	7	5	3	23
Total	1	33	1	17	29	5	86
Grand Total	3	69	6	37	48	11	174
Apprch %	4.2	95.8	14	86	81.4	18.6	
Total %	1.7	39.7	3.4	21.3	27.6	6.3	

	Northern Ave From East			Congress St From South			Northern Ave From West			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:00 AM										
07:00 AM	**1**	**11**	**12**	0	4	4	**5**	1	6	22
07:15 AM	1	7	8	**4**	4	**8**	5	**2**	7	**23**
07:30 AM	0	8	8	0	**6**	6	4	2	6	20
07:45 AM	0	10	10	1	6	7	5	1	6	23
Total Volume	2	36	38	5	20	25	19	6	25	88
% App. Total	5.3	94.7		20	80		76	24		
PHF	.500	.818	.792	.313	.833	.781	.950	.750	.893	.957

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730003
Site Code : 60730003
Start Date : 8/9/2012
Page No : 1

Groups Printed- Bikes Peds

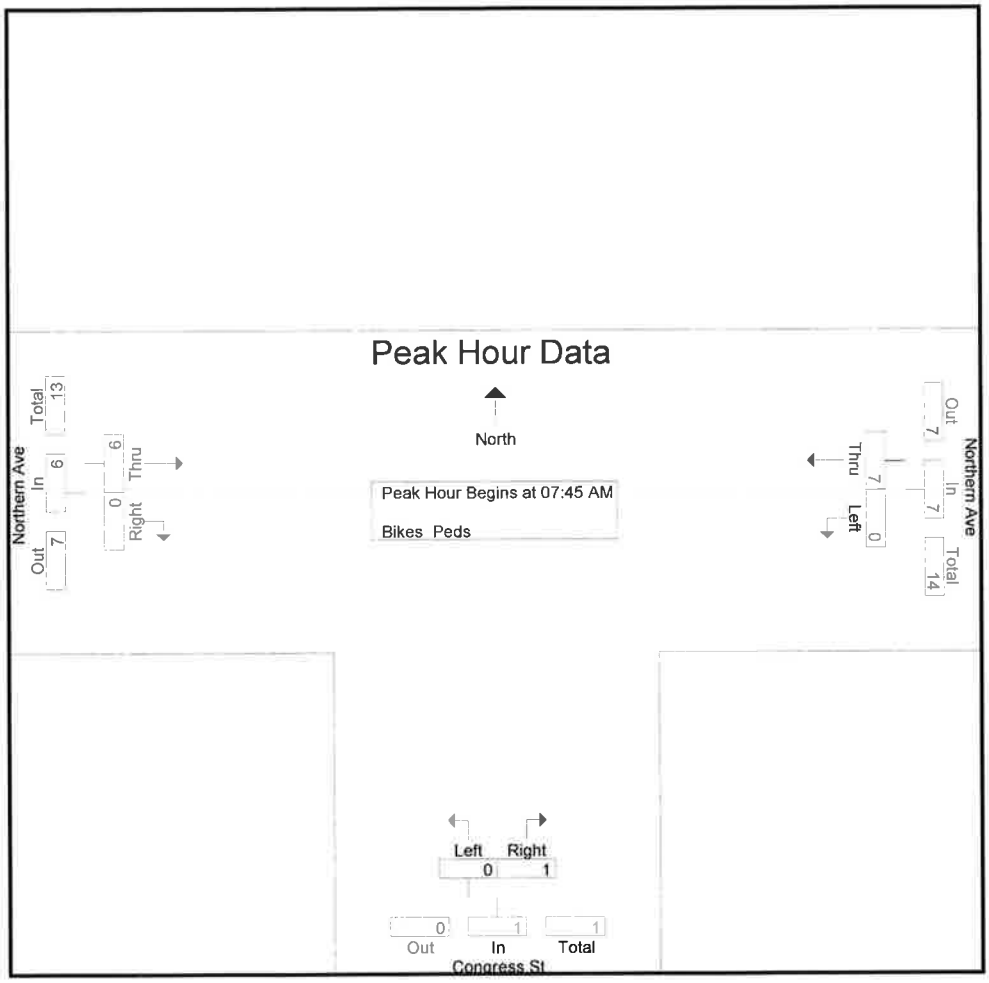
	Northern Ave From East			Congress St From South			Northern Ave From West					
Start Time	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	1	1	0	0	3	1	0	1	5	2	7
07:15 AM	1	1	4	0	0	6	1	0	1	11	3	14
07:30 AM	0	0	7	0	0	7	1	0	4	18	1	19
07:45 AM	0	1	0	0	0	5	2	0	5	10	3	13
Total	1	3	12	0	0	21	5	0	11	44	9	53
08:00 AM	0	1	1	0	0	13	0	0	15	29	1	30
08:15 AM	0	4	1	0	0	4	1	0	3	8	5	13
08:30 AM	0	1	0	0	1	13	3	0	8	21	5	26
08:45 AM	0	0	0	0	0	5	1	0	8	13	1	14
Total	0	6	2	0	1	35	5	0	34	71	12	83
Grand Total	1	9	14	0	1	56	10	0	45	115	21	136
Apprch %	10	90		0	100		100	0				
Total %	4.8	42.9		0	4.8		47.6	0		84.6	15.4	

	Northern Ave From East			Congress St From South			Northern Ave From West			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:45 AM										
07:45 AM	0	1	**1**	0	0	0	2	0	2	**3**
08:00 AM	0	1	1	0	0	0	0	0	0	**1**
08:15 AM	0	**4**	**4**	0	0	0	1	0	1	**5**
08:30 AM	0	1	1	0	**1**	**1**	**3**	0	**3**	5
Total Volume	0	7	7	0	1	1	6	0	6	14
% App. Total	0	100		0	100		100	0		
PHF	.000	.438	.438	.000	.250	.250	.500	.000	.500	.700

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730003
Site Code : 60730003
Start Date : 8/9/2012
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:45 AM			07:45 AM			07:45 AM		
+0 mins.	0	1	1	0	0	0	2	0	2
+15 mins.	0	1	1	0	0	0	0	0	0
+30 mins.	0	4	4	0	0	0	1	0	1
+45 mins.	0	1	1	0	1	1	3	0	3
Total Volume	0	7	7	0	1	1	6	0	6
% App. Total	0	100		0	100		100	0	
PHF	.000	.438	.438	.000	.250	.250	.500	.000	.500

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730003
Site Code : 60730003
Start Date : 8/9/2012
Page No : 1

Groups Printed- Cars - Trucks

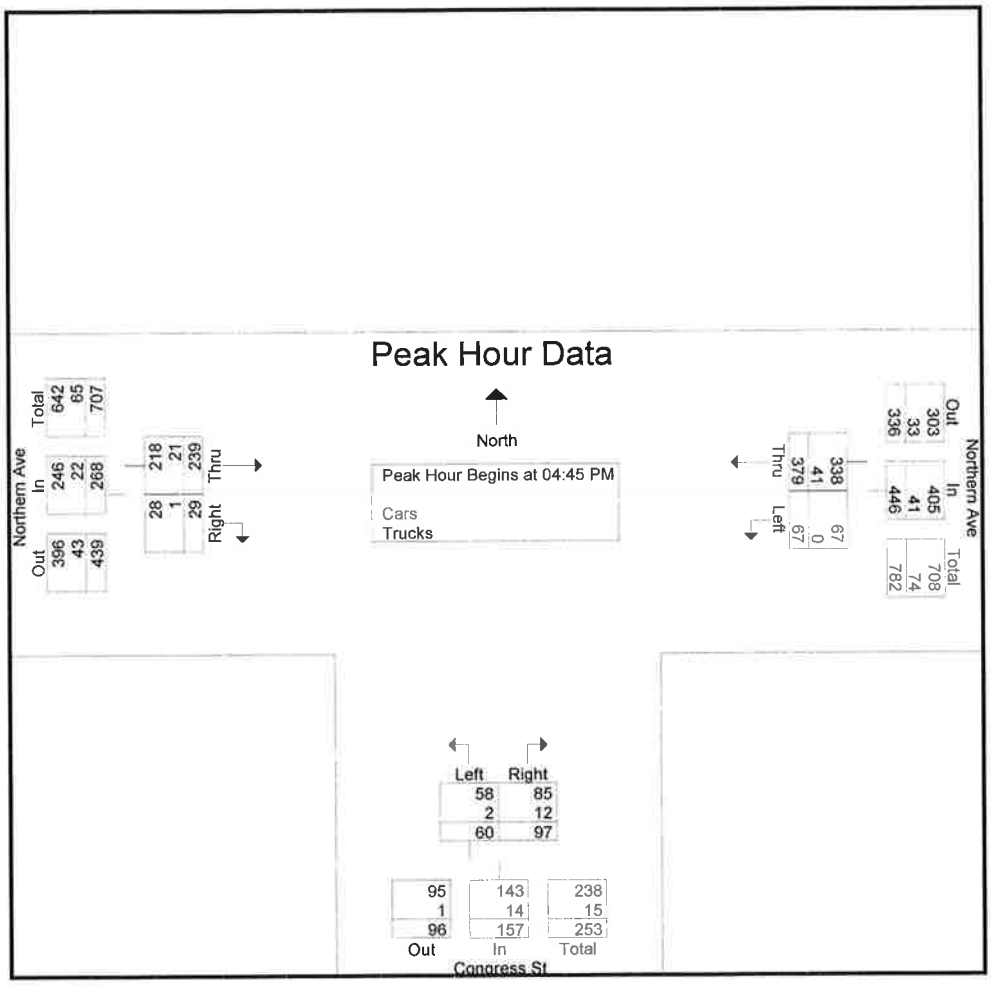
	Northern Ave From East		Congress St From South		Northern Ave From West		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
04:00 PM	13	82	14	24	70	4	207
04:15 PM	8	68	2	31	68	4	181
04:30 PM	7	69	11	25	49	9	170
04:45 PM	13	100	10	26	47	5	201
Total	41	319	37	106	234	22	759
05:00 PM	12	83	17	20	58	10	200
05:15 PM	12	77	16	25	58	9	197
05:30 PM	30	119	17	26	76	5	273
05:45 PM	21	72	10	35	51	11	200
Total	75	351	60	106	243	35	870
Grand Total	116	670	97	212	477	57	1629
Apprch %	14.8	85.2	31.4	68.6	89.3	10.7	
Total %	7.1	41.1	6	13	29.3	3.5	
Cars	113	600	92	186	439	56	1486
% Cars	97.4	89.6	94.8	87.7	92	98.2	91.2
Trucks	3	70	5	26	38	1	143
% Trucks	2.6	10.4	5.2	12.3	8	1.8	8.8

	Northern Ave From East			Congress St From South			Northern Ave From West			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:45 PM										
04:45 PM	13	100	113	10	**26**	36	47	5	52	201
05:00 PM	12	83	95	**17**	20	37	58	**10**	68	200
05:15 PM	12	77	89	16	25	41	58	9	67	197
05:30 PM	**30**	**119**	**149**	17	26	**43**	**76**	5	**81**	**273**
Total Volume	67	379	446	60	97	157	239	29	268	871
% App. Total	15	85		38.2	61.8		89.2	10.8		
PHF	.558	.796	.748	.882	.933	.913	.786	.725	.827	.798
Cars	67	338	405	58	85	143	218	28	246	794
% Cars	100	89.2	90.8	96.7	87.6	91.1	91.2	96.6	91.8	91.2
Trucks	0	41	41	2	12	14	21	1	22	77
% Trucks	0	10.8	9.2	3.3	12.4	8.9	8.8	3.4	8.2	8.8

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730003
Site Code : 60730003
Start Date : 8/9/2012
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	04:45 PM			05:00 PM			05:00 PM		
+0 mins.	13	100	113	**17**	20	37	58	10	68
+15 mins.	12	83	95	16	25	41	58	9	67
+30 mins.	12	77	89	17	26	43	**76**	5	**81**
+45 mins.	**30**	**119**	**149**	10	**35**	**45**	51	**11**	62
Total Volume	67	379	446	60	106	166	243	35	278
% App. Total	15	85		36.1	63.9		87.4	12.6	
PHF	.558	.796	.748	.882	.757	.922	.799	.795	.858
Cars	67	338	405	58	98	156	229	34	263
% Cars	100	89.2	90.8	96.7	92.5	94	94.2	97.1	94.6
Trucks	0	41	41	2	8	10	14	1	15
% Trucks	0	10.8	9.2	3.3	7.5	6	5.8	2.9	5.4

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730003
Site Code : 60730003
Start Date : 8/9/2012
Page No : 1

Groups Printed- Cars

	Northern Ave From East		Congress St From South		Northern Ave From West		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
04:00 PM	12	70	14	17	63	4	180
04:15 PM	8	62	1	25	63	4	163
04:30 PM	5	63	10	24	46	9	157
04:45 PM	13	87	9	22	38	5	174
Total	38	282	34	88	210	22	674
05:00 PM	12	69	17	18	55	9	180
05:15 PM	12	70	16	20	54	9	181
05:30 PM	30	112	16	25	71	5	259
05:45 PM	21	67	9	35	49	11	192
Total	75	318	58	98	229	34	812
Grand Total	113	600	92	186	439	56	1486
Apprch %	15.8	84.2	33.1	66.9	88.7	11.3	
Total %	7.6	40.4	6.2	12.5	29.5	3.8	

	Northern Ave From East			Congress St From South			Northern Ave From West			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 05:00 PM										
05:00 PM	12	69	**81**	**17**	18	35	55	9	64	180
05:15 PM	12	70	82	16	20	36	54	9	63	181
05:30 PM	**30**	**112**	**142**	16	25	41	**71**	5	**76**	**259**
05:45 PM	21	67	88	9	**35**	**44**	49	**11**	60	192
Total Volume	75	318	393	58	98	156	229	34	263	812
% App. Total	19.1	80.9		37.2	62.8		87.1	12.9		
PHF	.625	.710	.692	.853	.700	.886	.806	.773	.865	.784

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730003
Site Code : 60730003
Start Date : 8/9/2012
Page No : 1

Groups Printed- Trucks

	Northern Ave From East		Congress St From South		Northern Ave From West		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
04:00 PM	1	12	0	7	7	0	27
04:15 PM	0	6	1	6	5	0	18
04:30 PM	2	6	1	1	3	0	13
04:45 PM	0	13	1	4	9	0	27
Total	3	37	3	18	24	0	85
05:00 PM	0	14	0	2	3	1	20
05:15 PM	0	7	0	5	4	0	16
05:30 PM	0	7	1	1	5	0	14
05:45 PM	0	5	1	0	2	0	8
Total	0	33	2	8	14	1	58
Grand Total	3	70	5	26	38	1	143
Apprch %	4.1	95.9	16.1	83.9	97.4	2.6	
Total %	2.1	49	3.5	18.2	26.6	0.7	

	Northern Ave From East			Congress St From South			Northern Ave From West			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:00 PM										
04:00 PM	**1**	12	**13**	0	**7**	7	7	0	7	**27**
04:15 PM	0	6	6	**1**	6	7	5	0	5	18
04:30 PM	**2**	6	8	1	1	2	3	0	3	13
04:45 PM	0	**13**	13	1	4	**5**	**9**	0	**9**	27
Total Volume	3	37	40	3	18	21	24	0	24	85
% App. Total	7.5	92.5		14.3	85.7		100	0		
PHF	.375	.712	.769	.750	.643	.750	.667	.000	.667	.787

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730003
Site Code : 60730003
Start Date : 8/9/2012
Page No : 1

Groups Printed- Bikes Peds

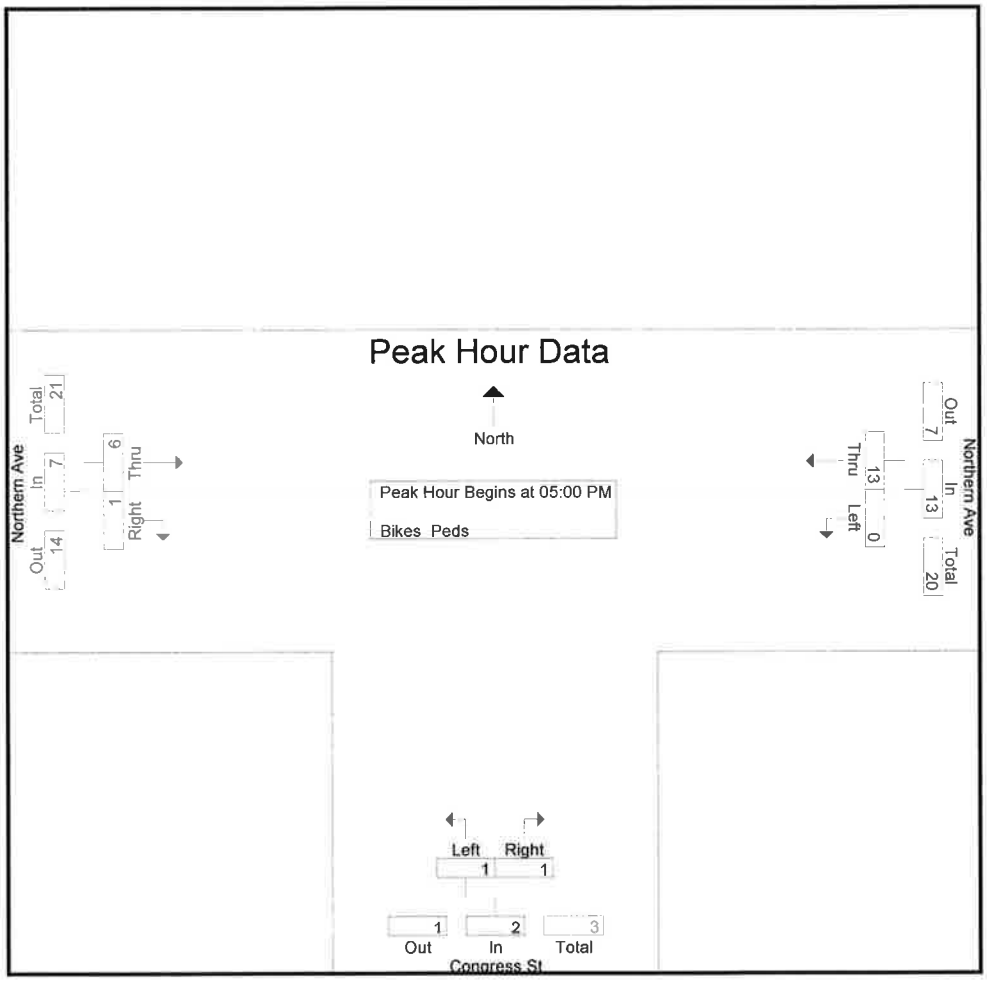
	Northern Ave From East			Congress St From South			Northern Ave From West					
Start Time	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	0	0	1	0	0	11	0	0	10	22	0	22
04:15 PM	0	0	2	0	0	10	4	0	17	29	4	33
04:30 PM	0	0	0	0	0	5	2	1	17	22	3	25
04:45 PM	0	1	1	0	0	11	1	1	20	32	3	35
Total	0	1	4	0	0	37	7	2	64	105	10	115
05:00 PM	0	1	0	0	0	8	1	0	24	32	2	34
05:15 PM	0	3	1	0	0	11	0	0	22	34	3	37
05:30 PM	0	4	0	1	1	16	2	0	27	43	8	51
05:45 PM	0	5	2	0	0	14	3	1	9	25	9	34
Total	0	13	3	1	1	49	6	1	82	134	22	156
Grand Total	0	14	7	1	1	86	13	3	146	239	32	271
Apprch %	0	100		50	50		81.2	18.8				
Total %	0	43.8		3.1	3.1		40.6	9.4		88.2	11.8	

	Northern Ave From East			Congress St From South			Northern Ave From West			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 05:00 PM										
05:00 PM	0	1	1	0	0	0	1	0	1	2
05:15 PM	0	3	3	0	0	0	0	0	0	3
05:30 PM	0	4	4	1	1	2	2	0	2	8
05:45 PM	0	5	5	0	0	0	3	1	4	9
Total Volume	0	13	13	1	1	2	6	1	7	22
% App. Total	0	100		50	50		85.7	14.3		
PHF	.000	.650	.650	.250	.250	.250	.500	.250	.438	.611

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730003
Site Code : 60730003
Start Date : 8/9/2012
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	05:00 PM			04:45 PM			04:15 PM		
+0 mins.	0	1	1	0	0	0	**4**	0	**4**
+15 mins.	0	3	3	0	0	0	2	**1**	3
+30 mins.	0	4	4	0	0	0	1	1	2
+45 mins.	0	**5**	**5**	**1**	**1**	**2**	1	0	1
Total Volume	0	13	13	1	1	2	8	2	10
% App. Total	0	100		50	50		80	20	
PHF	.000	.650	.650	.250	.250	.250	.500	.500	.625

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Park Lane
City/State : South Boston, MA
Weather : Clear

File Name : 60730004
Site Code : 60730004
Start Date : 8/9/2012
Page No : 1

Groups Printed- Cars - Trucks

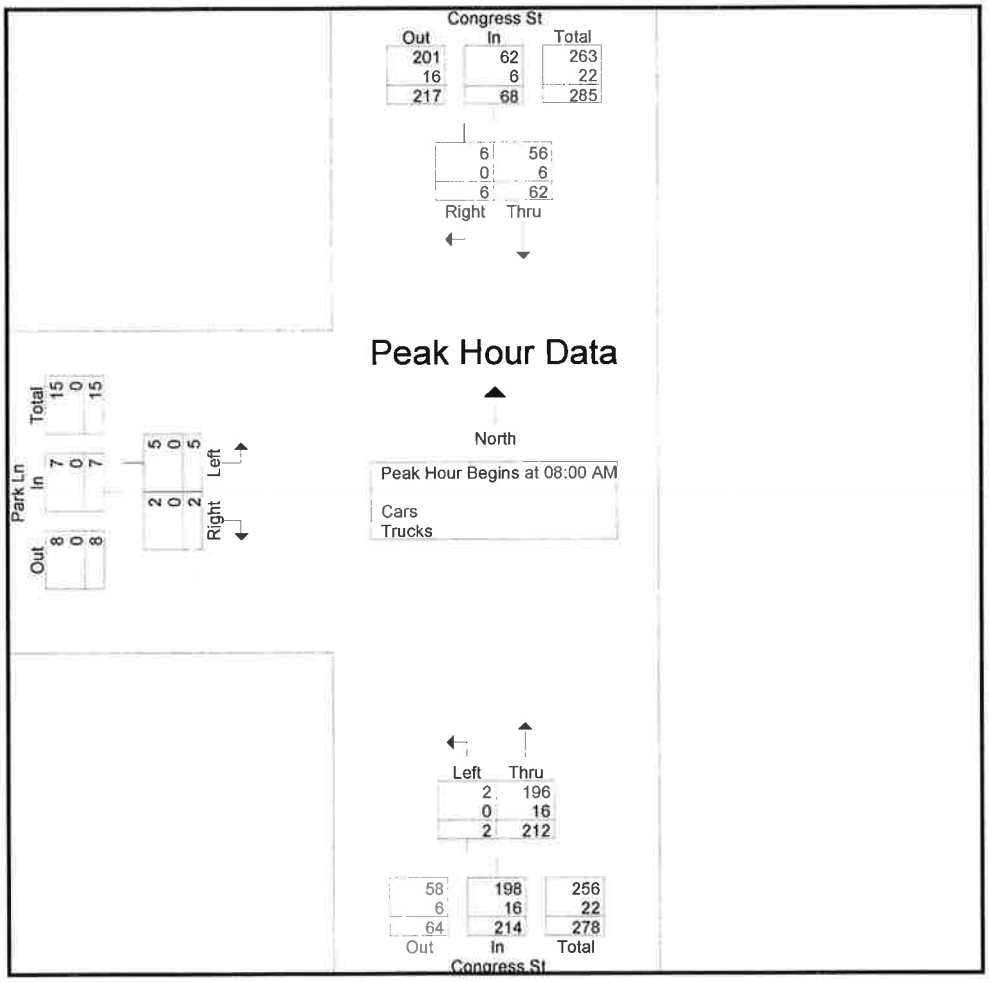
	Congress St From North		Congress St From South		Park Ln From West		
Start Time	Thru	Right	Left	Thru	Left	Right	Int. Total
07:00 AM	13	0	2	35	0	3	53
07:15 AM	17	0	0	32	1	1	51
07:30 AM	13	0	2	57	1	1	74
07:45 AM	18	1	1	49	0	2	71
Total	61	1	5	173	2	7	249
08:00 AM	22	2	1	48	2	0	75
08:15 AM	12	0	0	51	3	1	67
08:30 AM	14	1	0	52	0	1	68
08:45 AM	14	3	1	61	0	0	79
Total	62	6	2	212	5	2	289
Grand Total	123	7	7	385	7	9	538
Apprch %	94.6	5.4	1.8	98.2	43.8	56.2	
Total %	22.9	1.3	1.3	71.6	1.3	1.7	
Cars	109	6	6	350	7	9	487
% Cars	88.6	85.7	85.7	90.9	100	100	90.5
Trucks	14	1	1	35	0	0	51
% Trucks	11.4	14.3	14.3	9.1	0	0	9.5

	Congress St From North			Congress St From South			Park Ln From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 08:00 AM										
08:00 AM	**22**	2	24	**1**	48	49	2	0	2	75
08:15 AM	12	0	12	0	51	51	**3**	**1**	**4**	67
08:30 AM	14	1	15	0	52	52	0	1	1	68
08:45 AM	14	**3**	17	1	**61**	**62**	0	0	0	**79**
Total Volume	62	6	68	2	212	214	5	2	7	289
% App. Total	91.2	8.8		0.9	99.1		71.4	28.6		
PHF	.705	.500	.708	.500	.869	.863	.417	.500	.438	.915
Cars	56	6	62	2	196	198	5	2	7	267
% Cars	90.3	100	91.2	100	92.5	92.5	100	100	100	92.4
Trucks	6	0	6	0	16	16	0	0	0	22
% Trucks	9.7	0	8.8	0	7.5	7.5	0	0	0	7.6

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Park Lane
City/State : South Boston, MA
Weather : Clear

File Name : 60730004
Site Code : 60730004
Start Date : 8/9/2012
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Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:15 AM			08:00 AM			07:30 AM		
+0 mins.	17	0	17	**1**	48	49	1	1	2
+15 mins.	13	0	13	0	51	51	0	**2**	2
+30 mins.	18	1	19	0	52	52	2	0	2
+45 mins.	**22**	**2**	**24**	1	**61**	**62**	**3**	1	**4**
Total Volume	70	3	73	2	212	214	6	4	10
% App. Total	95.9	4.1		0.9	99.1		60	40	
PHF	.795	.375	.760	.500	.869	.863	.500	.500	.625
Cars	62	2	64	2	196	198	6	4	10
% Cars	88.6	66.7	87.7	100	92.5	92.5	100	100	100
Trucks	8	1	9	0	16	16	0	0	0
% Trucks	11.4	33.3	12.3	0	7.5	7.5	0	0	0

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Park Lane
City/State : South Boston, MA
Weather : Clear

File Name : 60730004
Site Code : 60730004
Start Date : 8/9/2012
Page No : 1

Groups Printed- Cars

	Congress St From North		Congress St From South		Park Ln From West		
Start Time	Thru	Right	Left	Thru	Left	Right	Int. Total
07:00 AM	12	0	1	33	0	3	49
07:15 AM	13	0	0	25	1	1	40
07:30 AM	12	0	2	54	1	1	70
07:45 AM	16	0	1	42	0	2	61
Total	53	0	4	154	2	7	220
08:00 AM	21	2	1	48	2	0	74
08:15 AM	12	0	0	45	3	1	61
08:30 AM	13	1	0	48	0	1	63
08:45 AM	10	3	1	55	0	0	69
Total	56	6	2	196	5	2	267
Grand Total	109	6	6	350	7	9	487
Apprch %	94.8	5.2	1.7	98.3	43.8	56.2	
Total %	22.4	1.2	1.2	71.9	1.4	1.8	

	Congress St From North			Congress St From South			Park Ln From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 08:00 AM										
08:00 AM	**21**	2	**23**	**1**	48	49	2	0	2	**74**
08:15 AM	12	0	12	0	45	45	**3**	**1**	**4**	61
08:30 AM	13	1	14	0	48	48	0	1	1	63
08:45 AM	10	**3**	13	1	**55**	**56**	0	0	0	69
Total Volume	56	6	62	2	196	198	5	2	7	267
% App. Total	90.3	9.7		1	99		71.4	28.6		
PHF	.667	.500	.674	.500	.891	.884	.417	.500	.438	.902

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Park Lane
City/State : South Boston, MA
Weather : Clear

File Name : 60730004
Site Code : 60730004
Start Date : 8/9/2012
Page No : 1

Groups Printed- Trucks

	Congress St From North		Congress St From South		Park Ln From West		
Start Time	Thru	Right	Left	Thru	Left	Right	Int. Total
07:00 AM	1	0	1	2	0	0	4
07:15 AM	4	0	0	7	0	0	11
07:30 AM	1	0	0	3	0	0	4
07:45 AM	2	1	0	7	0	0	10
Total	8	1	1	19	0	0	29
08:00 AM	1	0	0	0	0	0	1
08:15 AM	0	0	0	6	0	0	6
08:30 AM	1	0	0	4	0	0	5
08:45 AM	4	0	0	6	0	0	10
Total	6	0	0	16	0	0	22
Grand Total	14	1	1	35	0	0	51
Apprch %	93.3	6.7	2.8	97.2	0	0	
Total %	27.5	2	2	68.6	0	0	

	Congress St From North			Congress St From South			Park Ln From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:00 AM										
07:00 AM	**1**	0	1	**1**	2	3	0	0	0	4
07:15 AM	**4**	0	**4**	0	**7**	**7**	0	0	0	**11**
07:30 AM	1	0	1	0	3	3	0	0	0	4
07:45 AM	2	**1**	3	0	7	7	0	0	0	10
Total Volume	8	1	9	1	19	20	0	0	0	29
% App. Total	88.9	11.1		5	95		0	0		
PHF	.500	.250	.563	.250	.679	.714	.000	.000	.000	.659

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Park Lane
City/State : South Boston, MA
Weather : Clear

File Name : 60730004
Site Code : 60730004
Start Date : 8/9/2012
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Groups Printed- Bikes Peds

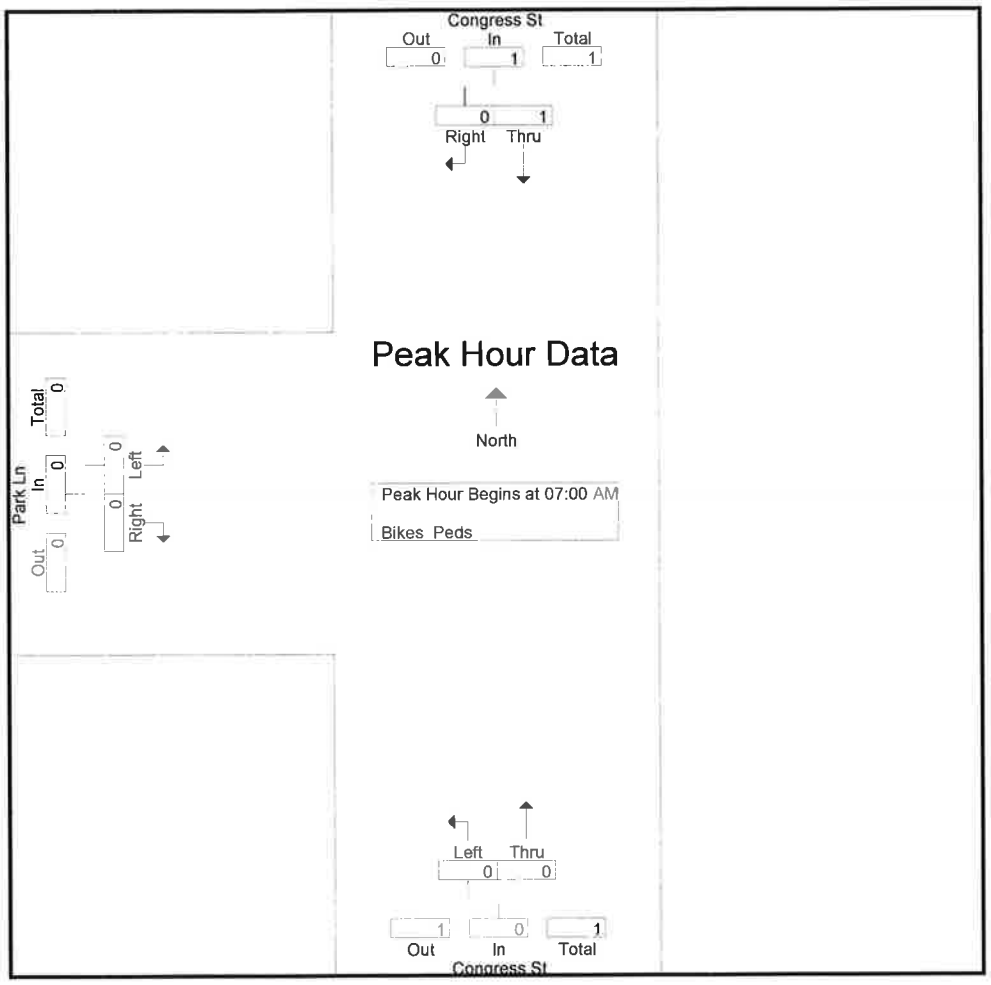
	Congress St From North			Congress St From South			Park Ln From West					
Start Time	Thru	Right	Peds	Left	Thru	Peds	Left	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	0	3	0	0	1	0	0	9	13	0	13
07:15 AM	1	0	0	0	0	1	0	0	6	7	1	8
07:30 AM	0	0	0	0	0	0	0	0	5	5	0	5
07:45 AM	0	0	0	0	0	0	0	0	14	14	0	14
Total	1	0	3	0	0	2	0	0	34	39	1	40
08:00 AM	0	0	5	0	0	2	0	0	9	16	0	16
08:15 AM	0	0	1	0	0	0	0	0	4	5	0	5
08:30 AM	0	0	6	0	1	0	0	0	7	13	1	14
08:45 AM	0	0	0	0	0	0	0	0	10	10	0	10
Total	0	0	12	0	1	2	0	0	30	44	1	45
Grand Total	1	0	15	0	1	4	0	0	64	83	2	85
Apprch %	100	0		0	100		0	0				
Total %	50	0		0	50		0	0		97.6	2.4	

	Congress St From North			Congress St From South			Park Ln From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:00 AM										
07:00 AM	0	0	0	0	0	0	0	0	0	0
07:15 AM	1	0	1	0	0	0	0	0	0	1
07:30 AM	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0
Total Volume	1	0	1	0	0	0	0	0	0	1
% App. Total	100	0		0	0		0	0		
PHF	.250	.000	.250	.000	.000	.000	.000	.000	.000	.250

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Park Lane
City/State : South Boston, MA
Weather : Clear

File Name : 60730004
Site Code : 60730004
Start Date : 8/9/2012
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Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:00 AM			07:45 AM			07:00 AM		
+0 mins.	0	0	0	0	0	0	0	0	0
+15 mins.	1	0	1	0	0	0	0	0	0
+30 mins.	0	0	0	0	0	0	0	0	0
+45 mins.	0	0	0	0	1	1	0	0	0
Total Volume	1	0	1	0	1	1	0	0	0
% App. Total	100	0		0	100		0	0	
PHF	.250	.000	.250	.000	.250	.250	.000	.000	.000

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Park Lane
City/State : South Boston, MA
Weather : Clear

File Name : 60730004
Site Code : 60730004
Start Date : 8/9/2012
Page No : 1

Groups Printed- Cars - Trucks

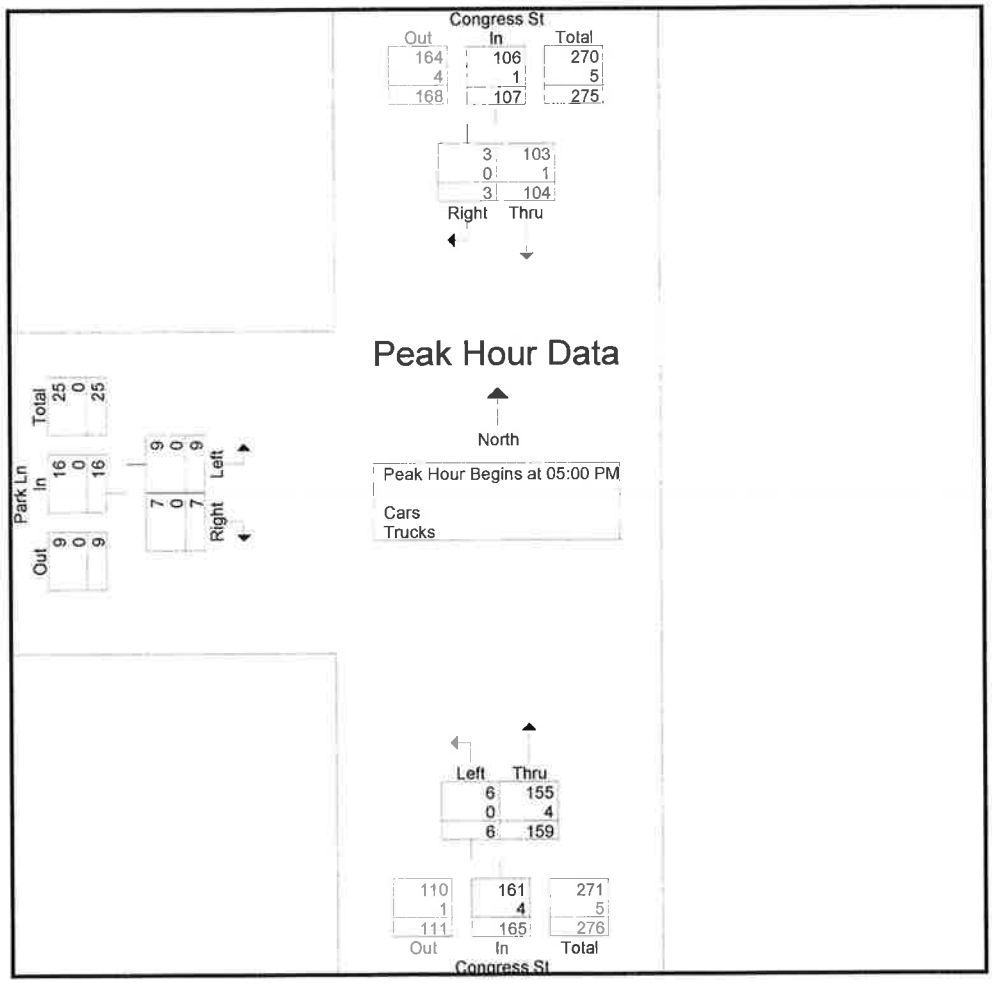
	Congress St From North		Congress St From South		Park Ln From West		
Start Time	Thru	Right	Left	Thru	Left	Right	Int. Total
04:00 PM	15	0	2	36	0	2	55
04:15 PM	14	1	1	34	1	1	52
04:30 PM	20	2	2	35	2	2	63
04:45 PM	21	0	2	39	1	2	65
Total	70	3	7	144	4	7	235
05:00 PM	20	1	1	35	2	2	61
05:15 PM	26	0	1	36	2	3	68
05:30 PM	31	1	2	43	5	2	84
05:45 PM	27	1	2	45	0	0	75
Total	104	3	6	159	9	7	288
Grand Total	174	6	13	303	13	14	523
Apprch %	96.7	3.3	4.1	95.9	48.1	51.9	
Total %	33.3	1.1	2.5	57.9	2.5	2.7	
Cars	170	6	13	286	13	14	502
% Cars	97.7	100	100	94.4	100	100	96
Trucks	4	0	0	17	0	0	21
% Trucks	2.3	0	0	5.6	0	0	4

	Congress St From North			Congress St From South			Park Ln From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 05:00 PM										
05:00 PM	20	**1**	21	1	35	36	2	2	4	61
05:15 PM	26	0	26	1	36	37	2	**3**	5	68
05:30 PM	**31**	1	**32**	**2**	43	45	**5**	2	**7**	**84**
05:45 PM	27	1	28	2	**45**	**47**	0	0	0	75
Total Volume	104	3	107	6	159	165	9	7	16	288
% App. Total	97.2	2.8		3.6	96.4		56.2	43.8		
PHF	.839	.750	.836	.750	.883	.878	.450	.583	.571	.857
Cars	103	3	106	6	155	161	9	7	16	283
% Cars	99.0	100	99.1	100	97.5	97.6	100	100	100	98.3
Trucks	1	0	1	0	4	4	0	0	0	5
% Trucks	1.0	0	0.9	0	2.5	2.4	0	0	0	1.7

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Park Lane
City/State : South Boston, MA
Weather : Clear

File Name : 60730004
Site Code : 60730004
Start Date : 8/9/2012
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	05:00 PM			05:00 PM			04:45 PM		
+0 mins.	20	**1**	21	1	35	36	1	2	3
+15 mins.	26	0	26	1	36	37	2	2	4
+30 mins.	**31**	1	**32**	**2**	43	45	2	**3**	5
+45 mins.	27	1	28	2	**45**	**47**	**5**	2	**7**
Total Volume	104	3	107	6	159	165	10	9	19
% App. Total	97.2	2.8		3.6	96.4		52.6	47.4	
PHF	.839	.750	.836	.750	.883	.878	.500	.750	.679
Cars	103	3	106	6	155	161	10	9	19
% Cars	99	100	99.1	100	97.5	97.6	100	100	100
Trucks	1	0	1	0	4	4	0	0	0
% Trucks	1	0	0.9	0	2.5	2.4	0	0	0

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Park Lane
City/State : South Boston, MA
Weather : Clear

File Name : 60730004
Site Code : 60730004
Start Date : 8/9/2012
Page No : 1

Groups Printed- Cars

	Congress St From North		Congress St From South		Park Ln From West		
Start Time	Thru	Right	Left	Thru	Left	Right	Int. Total
04:00 PM	14	0	2	34	0	2	52
04:15 PM	13	1	1	29	1	1	46
04:30 PM	19	2	2	33	2	2	60
04:45 PM	21	0	2	35	1	2	61
Total	67	3	7	131	4	7	219
05:00 PM	20	1	1	33	2	2	59
05:15 PM	26	0	1	35	2	3	67
05:30 PM	31	1	2	43	5	2	84
05:45 PM	26	1	2	44	0	0	73
Total	103	3	6	155	9	7	283
Grand Total	170	6	13	286	13	14	502
Apprch %	96.6	3.4	4.3	95.7	48.1	51.9	
Total %	33.9	1.2	2.6	57	2.6	2.8	

	Congress St From North			Congress St From South			Park Ln From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 05:00 PM										
05:00 PM	20	**1**	21	1	33	34	2	2	4	59
05:15 PM	26	0	26	1	35	36	2	**3**	5	67
05:30 PM	**31**	1	**32**	**2**	43	45	**5**	2	7	**84**
05:45 PM	26	1	27	2	**44**	**46**	0	0	0	73
Total Volume	103	**3**	106	6	155	161	9	7	16	283
% App. Total	97.2	2.8		3.7	96.3		56.2	43.8		
PHF	.831	.750	.828	.750	.881	.875	.450	.583	.571	.842

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Park Lane
City/State : South Boston, MA
Weather : Clear

File Name : 60730004
Site Code : 60730004
Start Date : 8/9/2012
Page No : 1

Groups Printed- Trucks

	Congress St From North		Congress St From South		Park Ln From West		
Start Time	Thru	Right	Left	Thru	Left	Right	Int. Total
04:00 PM	1	0	0	2	0	0	3
04:15 PM	1	0	0	5	0	0	6
04:30 PM	1	0	0	2	0	0	3
04:45 PM	0	0	0	4	0	0	4
Total	3	0	0	13	0	0	16
05:00 PM	0	0	0	2	0	0	2
05:15 PM	0	0	0	1	0	0	1
05:30 PM	0	0	0	0	0	0	0
05:45 PM	1	0	0	1	0	0	2
Total	1	0	0	4	0	0	5
Grand Total	4	0	0	17	0	0	21
Apprch %	100	0	0	100	0	0	
Total %	19	0	0	81	0	0	

	Congress St From North			Congress St From South			Park Ln From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:00 PM										
04:00 PM	**1**	0	**1**	0	2	2	0	0	0	3
04:15 PM	1	0	1	0	**5**	**5**	0	0	0	**6**
04:30 PM	1	0	1	0	2	2	0	0	0	3
04:45 PM	0	0	0	0	4	4	0	0	0	4
Total Volume	3	0	3	0	13	13	0	0	0	16
% App. Total	100	0		0	100		0	0		
PHF	.750	.000	.750	.000	.650	.650	.000	.000	.000	.667

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Park Lane
City/State : South Boston, MA
Weather : Clear

File Name : 60730004
Site Code : 60730004
Start Date : 8/9/2012
Page No : 1

Groups Printed- Bikes Peds

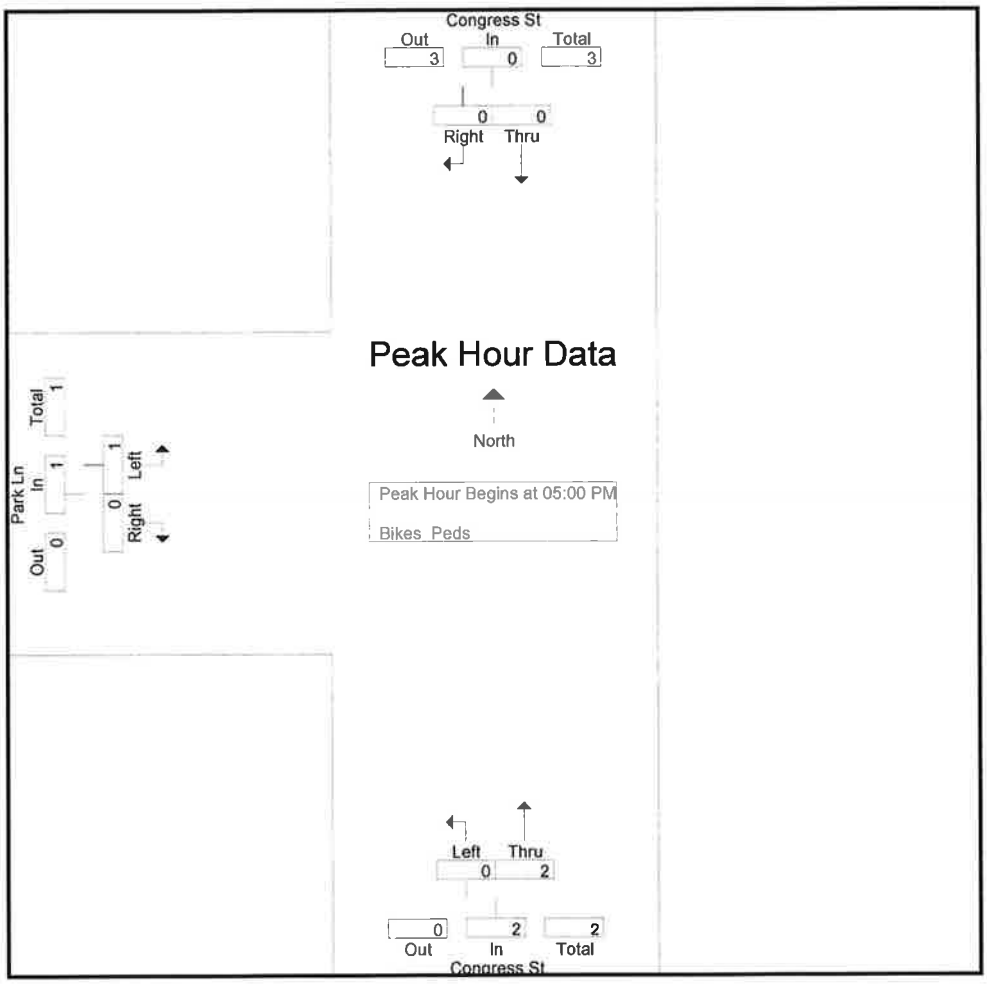
	Congress St From North			Congress St From South			Park Ln From West					
Start Time	Thru	Right	Peds	Left	Thru	Peds	Left	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	13	13	0	13
04:15 PM	1	0	1	0	0	0	0	0	8	9	1	10
04:30 PM	0	0	1	0	0	3	0	0	14	18	0	18
04:45 PM	0	0	1	0	0	0	0	0	3	4	0	4
Total	1	0	3	0	0	3	0	0	38	44	1	45
05:00 PM	0	0	0	0	0	1	1	0	5	6	1	7
05:15 PM	0	0	0	0	0	2	0	0	8	10	0	10
05:30 PM	0	0	0	0	1	1	0	0	17	18	1	19
05:45 PM	0	0	0	0	1	0	0	0	4	4	1	5
Total	0	0	0	0	2	4	1	0	34	38	3	41
Grand Total	1	0	3	0	2	7	1	0	72	82	4	86
Apprch %	100	0		0	100		100	0				
Total %	25	0		0	50		25	0		95.3	4.7	

	Congress St From North			Congress St From South			Park Ln From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 05:00 PM										
05:00 PM	0	0	0	0	0	0	1	0	1	1
05:15 PM	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	1	1	0	0	0	1
05:45 PM	0	0	0	0	1	1	0	0	0	1
Total Volume	0	0	0	0	2	2	1	0	1	3
% App. Total	0	0		0	100		100	0		
PHF	.000	.000	.000	.000	.500	.500	.250	.000	.250	.750

Accurate Counts
978-664-2565

N/S Street : Congress Street
E/W Street : Park Lane
City/State : South Boston, MA
Weather : Clear

File Name : 60730004
Site Code : 60730004
Start Date : 8/9/2012
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Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:00 PM			05:00 PM			04:15 PM		
+0 mins.	0	0	0	0	0	0	0	0	0
+15 mins.	**1**	0	**1**	0	0	0	0	0	0
+30 mins.	0	0	0	0	**1**	**1**	0	0	0
+45 mins.	0	0	0	0	1	1	**1**	0	**1**
Total Volume	1	0	1	0	2	2	1	0	1
% App. Total	100	0		0	100		100	0	
PHF	.250	.000	.250	.000	.500	.500	.250	.000	.250

Accurate Counts
978-664-2565

N/S Street : Haul Road / Private Drive
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730005
Site Code : 60730005
Start Date : 8/9/2012
Page No : 1

Groups Printed- Cars - Trucks

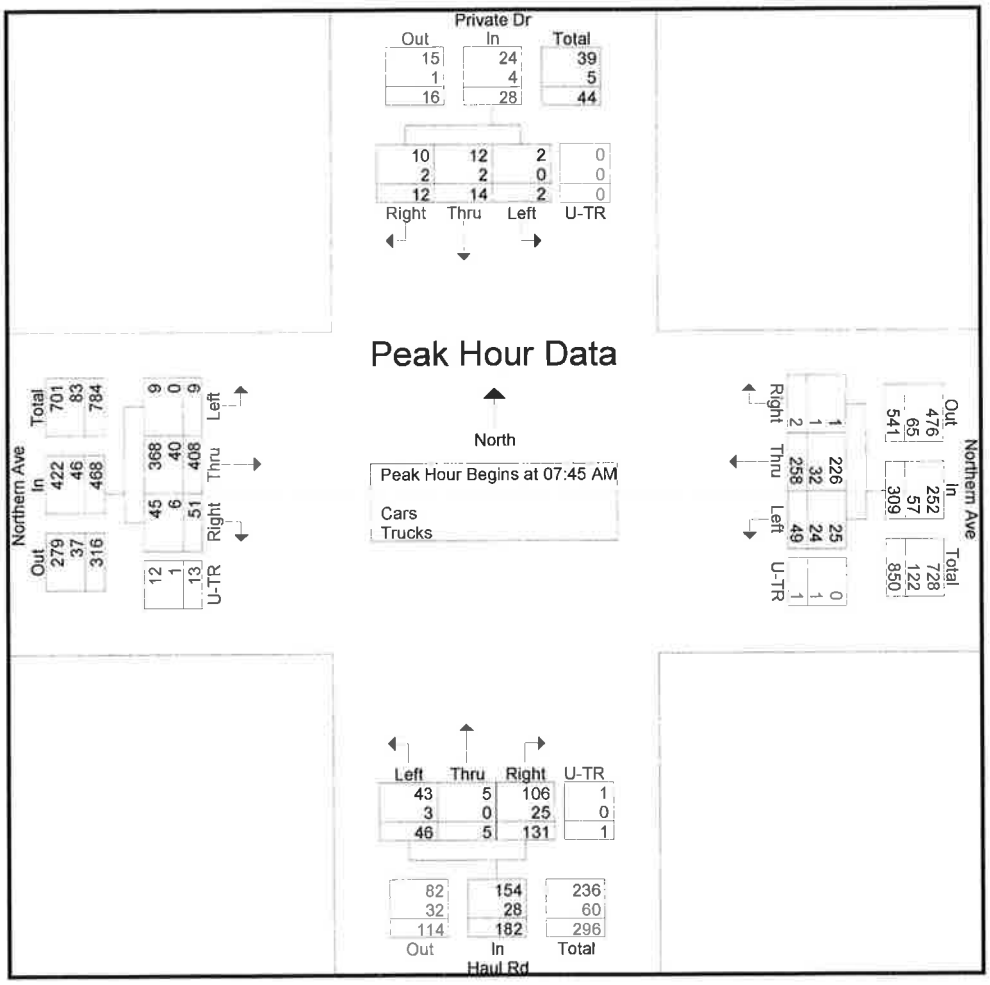
	Private Dr From North				Northern Ave From East				Haul Rd From South				Northern Ave From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
07:00 AM	0	0	3	0	7	49	0	1	5	0	23	0	6	86	9	2	191
07:15 AM	0	2	2	0	6	54	2	0	10	0	31	0	2	89	10	5	213
07:30 AM	1	3	5	0	10	38	0	0	13	2	36	0	6	94	16	5	229
07:45 AM	0	6	2	0	10	54	0	1	7	2	30	0	2	99	9	3	225
Total	1	11	12	0	33	195	2	2	35	4	120	0	16	368	44	15	858
08:00 AM	0	1	3	0	10	62	1	0	12	0	27	0	2	102	7	2	229
08:15 AM	0	2	6	0	15	70	1	0	15	2	41	0	2	105	16	4	279
08:30 AM	2	5	1	0	14	72	0	0	12	1	33	1	3	102	19	4	269
08:45 AM	0	2	0	0	12	59	1	0	9	3	17	0	1	35	4	5	148
Total	2	10	10	0	51	263	3	0	48	6	118	1	8	344	46	15	925
Grand Total	3	21	22	0	84	458	5	2	83	10	238	1	24	712	90	30	1783
Apprch %	6.5	45.7	47.8	0	15.3	83.4	0.9	0.4	25	3	71.7	0.3	2.8	83.2	10.5	3.5	
Total %	0.2	1.2	1.2	0	4.7	25.7	0.3	0.1	4.7	0.6	13.3	0.1	1.3	39.9	5	1.7	
Cars	3	18	19	0	40	399	3	1	73	10	190	1	23	634	79	26	1519
% Cars	100	85.7	86.4	0	47.6	87.1	60	50	88	100	79.8	100	95.8	89	87.8	86.7	85.2
Trucks	0	3	3	0	44	59	2	1	10	0	48	0	1	78	11	4	264
% Trucks	0	14.3	13.6	0	52.4	12.9	40	50	12	0	20.2	0	4.2	11	12.2	13.3	14.8

	Private Dr From North					Northern Ave From East					Haul Rd From South					Northern Ave From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	**6**	2	0	**8**	10	54	0	**1**	65	7	**2**	30	0	39	2	99	9	3	113	225
08:00 AM	0	1	3	0	4	10	62	**1**	0	73	12	0	27	0	39	2	102	7	2	113	229
08:15 AM	0	2	**6**	0	8	**15**	70	1	0	**86**	**15**	2	**41**	0	**58**	2	**105**	16	**4**	127	**279**
08:30 AM	**2**	**5**	1	**0**	**8**	14	**72**	0	0	86	12	1	33	**1**	47	**3**	102	**19**	4	**128**	269
Total Volume	2	14	12	0	28	49	258	2	1	310	46	5	131	1	183	9	408	51	13	481	1002
% App. Total																					
PHF	.250	.583	.500	.000	.875	.817	.896	.500	.250	.901	.767	.625	.799	.250	.789	.750	.971	.671	.813	.939	.898
Cars	2	12	10	0	24	25	226	1	0	252	43	5	106	1	155	9	368	45	12	434	865
% Cars	100	85.7	83.3	0	85.7	51.0	87.6	50.0	0	81.3	93.5	100	80.9	100	84.7	100	90.2	88.2	92.3	90.2	86.3
Trucks	0	2	2	0	4	24	32	1	1	58	3	0	25	0	28	0	40	6	1	47	137
% Trucks	0	14.3	16.7	0	14.3	49.0	12.4	50.0	100	18.7	6.5	0	19.1	0	15.3	0	9.8	11.8	7.7	9.8	13.7

Accurate Counts
978-664-2565

N/S Street : Haul Road / Private Drive
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730005
Site Code : 60730005
Start Date : 8/9/2012
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:30 AM					08:00 AM					07:30 AM					07:45 AM				
+0 mins.	**1**	3	5	0	**9**	10	62	**1**	0	73	13	**2**	36	0	51	2	99	9	3	113
+15 mins.	0	**6**	2	0	8	**15**	70	1	0	**86**	7	2	30	0	39	2	102	7	2	113
+30 mins.	0	1	3	0	4	14	**72**	0	0	86	12	0	27	0	39	2	**105**	16	**4**	127
+45 mins.	0	2	6	0	8	12	59	1	0	72	**15**	2	**41**	0	**58**	**3**	102	**19**	4	**128**
Total Volume	1	12	16	0	29	51	263	3	0	317	47	6	134	0	187	9	408	51	13	481
% App. Total																				
PHF	.250	.500	.667	.000	.806	.850	.913	.750	.000	.922	.783	.750	.817	.000	.806	.750	.971	.671	.813	.939
Cars	1	10	13	0	24	29	233	2	0	264	45	6	112	0	163	9	368	45	12	434
% Cars	100	83.3	81.2	0	82.8	56.9	88.6	66.7	0	83.3	95.7	100	83.6	0	87.2	100	90.2	88.2	92.3	90.2
Trucks	0	2	3	0	5	22	30	1	0	53	2	0	22	0	24	0	40	6	1	47
% Trucks	0	16.7	18.8	0	17.2	43.1	11.4	33.3	0	16.7	4.3	0	16.4	0	12.8	0	9.8	11.8	7.7	9.8

Accurate Counts
978-664-2565

N/S Street : Haul Road / Private Drive
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730005
Site Code : 60730005
Start Date : 8/9/2012
Page No : 1

Groups Printed- Cars

	Private Dr From North				Northern Ave From East				Haul Rd From South				Northern Ave From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
07:00 AM	0	0	3	0	3	39	0	1	5	0	17	0	6	78	7	2	161
07:15 AM	0	2	2	0	2	49	1	0	7	0	26	0	2	78	10	4	183
07:30 AM	1	2	4	0	3	32	0	0	12	2	31	0	5	86	14	5	197
07:45 AM	0	6	1	0	3	46	0	0	6	2	26	0	2	91	8	3	194
Total	1	10	10	0	11	166	1	1	30	4	100	0	15	333	39	14	735
08:00 AM	0	1	3	0	8	57	1	0	12	0	21	0	2	91	6	1	203
08:15 AM	0	1	5	0	6	60	0	0	15	2	34	0	2	90	14	4	233
08:30 AM	2	4	1	0	8	63	0	0	10	1	25	1	3	96	17	4	235
08:45 AM	0	2	0	0	7	53	1	0	6	3	10	0	1	24	3	3	113
Total	2	8	9	0	29	233	2	0	43	6	90	1	8	301	40	12	784
Grand Total	3	18	19	0	40	399	3	1	73	10	190	1	23	634	79	26	1519
Apprch %	7.5	45	47.5	0	9	90.1	0.7	0.2	26.6	3.6	69.3	0.4	3	83.2	10.4	3.4	
Total %	0.2	1.2	1.3	0	2.6	26.3	0.2	0.1	4.8	0.7	12.5	0.1	1.5	41.7	5.2	1.7	

	Private Dr From North					Northern Ave From East					Haul Rd From South					Northern Ave From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	**6**	1	0	7	3	46	0	0	49	6	**2**	26	0	34	2	91	8	3	104	194
08:00 AM	0	1	3	0	4	**8**	57	**1**	0	66	12	0	21	0	33	2	91	6	1	100	203
08:15 AM	0	1	**5**	0	6	6	60	0	0	66	**15**	2	**34**	0	**51**	2	90	14	**4**	110	233
08:30 AM	**2**	4	1	0	7	8	**63**	0	0	**71**	10	1	25	**1**	37	**3**	**96**	**17**	4	**120**	**235**
Total Volume	2	12	10	0	24	25	226	1	0	252	43	5	106	1	155	9	368	45	12	434	865
% App. Total																					
PHF	.250	.500	.500	.000	.857	.781	.897	.250	.000	.887	.717	.625	.779	.250	.760	.750	.958	.662	.750	.904	.920

Accurate Counts
978-664-2565

N/S Street : Haul Road / Private Drive
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730005
Site Code : 60730005
Start Date : 8/9/2012
Page No : 1

Groups Printed- Trucks

	Private Dr From North				Northern Ave From East				Haul Rd From South				Northern Ave From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
07:00 AM	0	0	0	0	4	10	0	0	0	0	6	0	0	8	2	0	30
07:15 AM	0	0	0	0	4	5	1	0	3	0	5	0	0	11	0	1	30
07:30 AM	0	1	1	0	7	6	0	0	1	0	5	0	1	8	2	0	32
07:45 AM	0	0	1	0	7	8	0	1	1	0	4	0	0	8	1	0	31
Total	0	1	2	0	22	29	1	1	5	0	20	0	1	35	5	1	123
08:00 AM	0	0	0	0	2	5	0	0	0	0	6	0	0	11	1	1	26
08:15 AM	0	1	1	0	9	10	1	0	0	0	7	0	0	15	2	0	46
08:30 AM	0	1	0	0	6	9	0	0	2	0	8	0	0	6	2	0	34
08:45 AM	0	0	0	0	5	6	0	0	3	0	7	0	0	11	1	2	35
Total	0	2	1	0	22	30	1	0	5	0	28	0	0	43	6	3	141
Grand Total	0	3	3	0	44	59	2	1	10	0	48	0	1	78	11	4	264
Apprch %	0	50	50	0	41.5	55.7	1.9	0.9	17.2	0	82.8	0	1.1	83	11.7	4.3	
Total %	0	1.1	1.1	0	16.7	22.3	0.8	0.4	3.8	0	18.2	0	0.4	29.5	4.2	1.5	

	Private Dr From North					Northern Ave From East					Haul Rd From South					Northern Ave From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	0	0	0	0	2	5	0	0	7	0	0	6	0	6	0	11	1	1	13	26
08:15 AM	0	1	1	0	2	9	10	1	0	20	0	0	7	0	7	0	15	2	0	17	46
08:30 AM	0	1	0	0	1	6	9	0	0	15	2	0	8	0	10	0	6	2	0	8	34
08:45 AM	0	0	0	0	0	5	6	0	0	11	3	0	7	0	10	0	11	1	2	14	35
Total Volume	0	2	1	0	3	22	30	1	0	53	5	0	28	0	33	0	43	6	3	52	141
% App. Total																					
PHF	.000	.500	.250	.000	.375	.611	.750	.250	.000	.663	.417	.000	.875	.000	.825	.000	.717	.750	.375	.765	.766

Accurate Counts
978-664-2565

N/S Street : Haul Road / Private Drive
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730005
Site Code : 60730005
Start Date : 8/9/2012
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Groups Printed- Bikes Peds

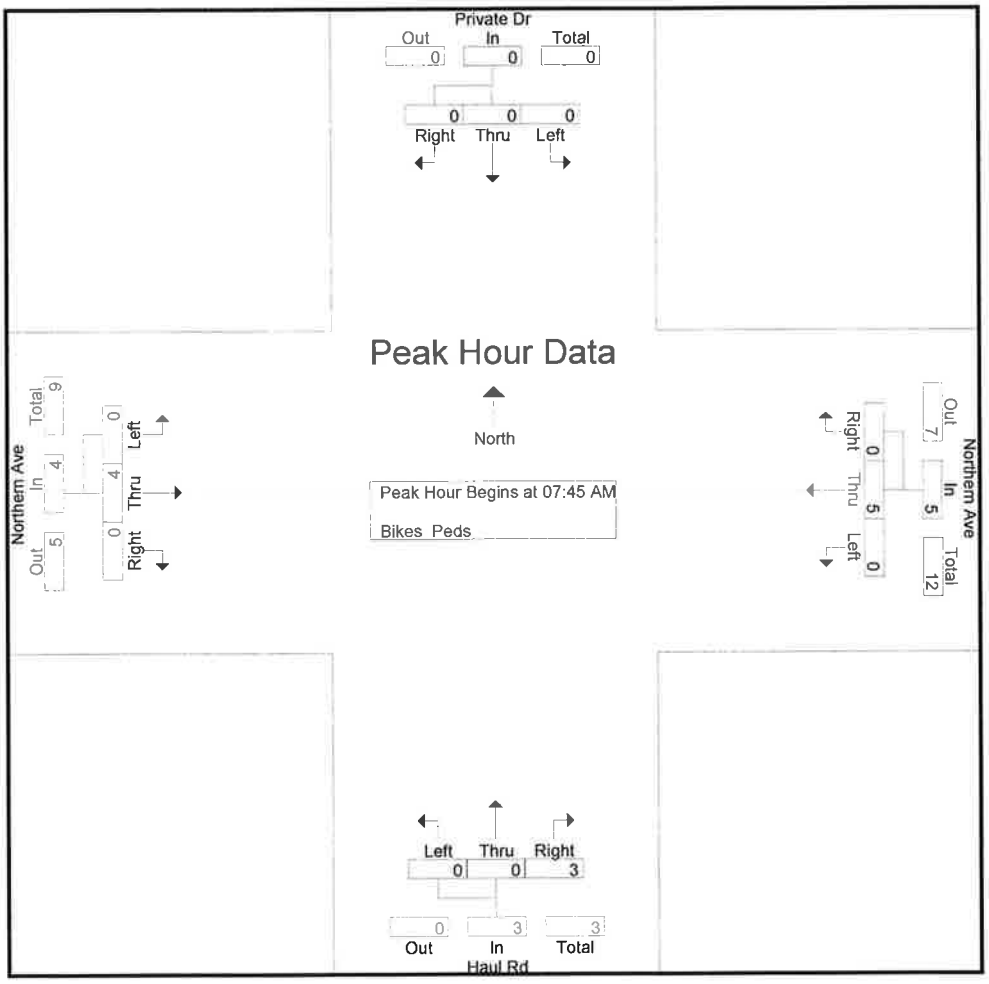
	Private Dr From North				Northern Ave From East				Haul Rd From South				Northern Ave From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	0	0	3	0	0	0	1	0	0	0	3	0	1	0	1	8	1	9
07:15 AM	0	0	0	3	0	1	0	0	0	0	0	5	0	1	0	0	8	2	10
07:30 AM	0	0	0	4	0	0	0	2	0	0	0	5	0	1	0	0	11	1	12
07:45 AM	0	0	0	2	0	1	0	0	0	0	2	2	0	0	0	0	4	3	7
Total	0	0	0	12	0	2	0	3	0	0	2	15	0	3	0	1	31	7	38
08:00 AM	0	0	0	8	0	0	0	2	0	0	0	9	0	1	0	1	20	1	21
08:15 AM	0	0	0	4	0	3	0	1	0	0	1	6	0	0	0	1	12	4	16
08:30 AM	0	0	0	1	0	1	0	0	0	0	0	5	0	3	0	0	6	4	10
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1
Total	0	0	0	13	0	4	0	3	0	0	1	21	0	4	0	2	39	9	48
Grand Total	0	0	0	25	0	6	0	6	0	0	3	36	0	7	0	3	70	16	86
Apprch %	0	0	0		0	100	0		0	0	100		0	100	0				
Total %	0	0	0		0	37.5	0		0	0	18.8		0	43.8	0		81.4	18.6	

	Private Dr From North				Northern Ave From East				Haul Rd From South				Northern Ave From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	0	0	0	0	0	1	0	1	0	0	2	2	0	0	0	0	3
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
08:15 AM	0	0	0	0	0	3	0	3	0	0	1	1	0	0	0	0	4
08:30 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	3	0	3	4
Total Volume	0	0	0	0	0	5	0	5	0	0	3	3	0	4	0	4	12
% App. Total	0	0	0		0	100	0		0	0	100		0	100	0		
PHF	.000	.000	.000	.000	.000	.417	.000	.417	.000	.000	.375	.375	.000	.333	.000	.333	.750

Accurate Counts
978-664-2565

N/S Street : Haul Road / Private Drive
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730005
Site Code : 60730005
Start Date : 8/9/2012
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:00 AM				07:45 AM				07:30 AM				07:45 AM			
+0 mins.	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
+15 mins.	0	0	0	0	0	0	0	0	0	0	2	2	0	1	0	1
+30 mins.	0	0	0	0	0	3	0	3	0	0	0	0	0	0	0	0
+45 mins.	0	0	0	0	0	1	0	1	0	0	1	1	0	3	0	3
Total Volume	0	0	0	0	0	5	0	5	0	0	3	3	0	4	0	4
% App. Total	0	0	0		0	100	0		0	0	100		0	100	0	
PHF	.000	.000	.000	.000	.000	.417	.000	.417	.000	.000	.375	.375	.000	.333	.000	.333

Accurate Counts
978-664-2565

N/S Street : Haul Road / Private Drive
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730005
Site Code : 60730005
Start Date : 8/9/2012
Page No : 1

Groups Printed- Cars - Trucks

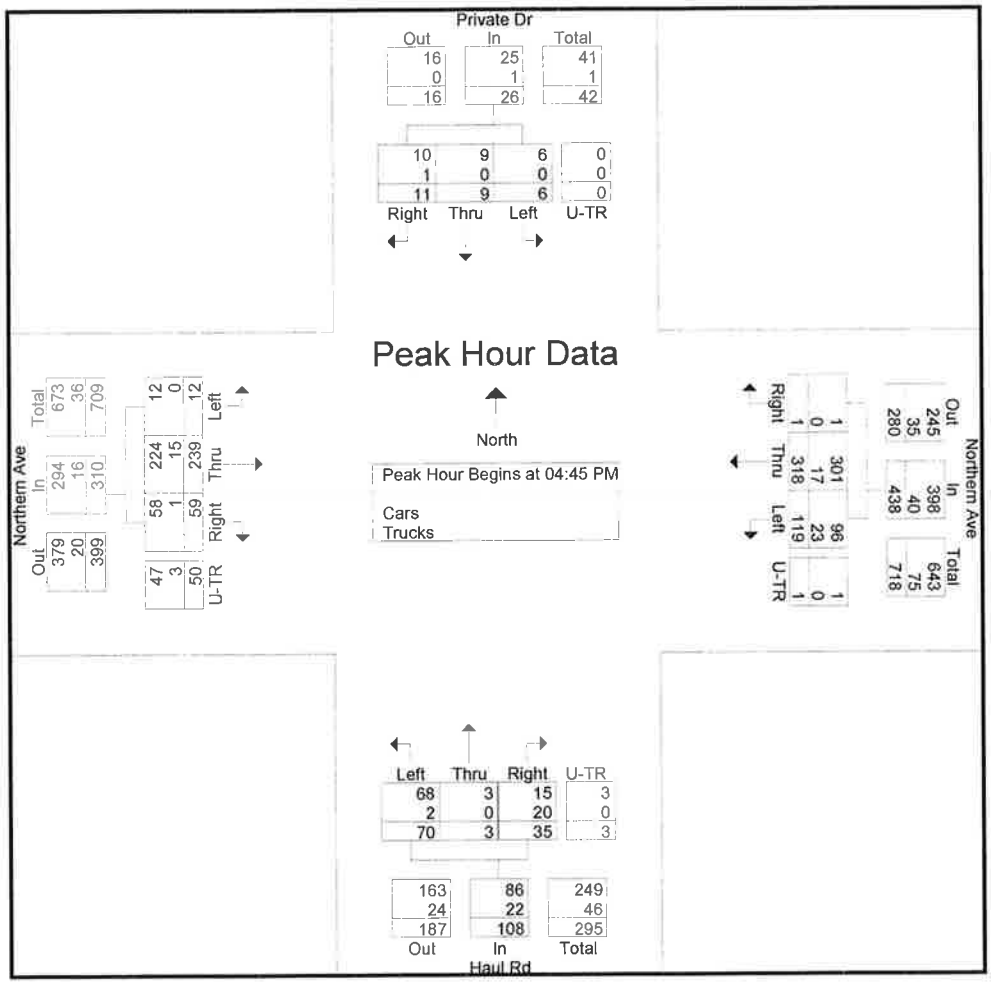
	Private Dr From North				Northern Ave From East				Haul Rd From South				Northern Ave From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
04:00 PM	1	3	4	0	30	66	1	0	4	0	14	1	5	56	13	6	204
04:15 PM	1	1	0	0	27	78	2	0	25	0	12	0	2	48	3	10	209
04:30 PM	2	2	0	0	33	77	2	1	12	0	11	0	1	53	9	8	211
04:45 PM	0	0	1	0	23	71	0	0	15	0	8	0	5	61	9	10	203
Total	4	6	5	0	113	292	5	1	56	0	45	1	13	218	34	34	827
05:00 PM	4	3	5	0	40	102	1	1	20	0	8	1	3	67	10	9	274
05:15 PM	0	5	4	0	24	72	0	0	13	2	8	2	0	54	18	14	216
05:30 PM	2	1	1	0	32	73	0	0	22	1	11	0	4	57	22	17	243
05:45 PM	0	0	2	0	25	58	0	0	12	0	9	2	1	46	14	12	181
Total	6	9	12	0	121	305	1	1	67	3	36	5	8	224	64	52	914
Grand Total	10	15	17	0	234	597	6	2	123	3	81	6	21	442	98	86	1741
Apprch %	23.8	35.7	40.5	0	27.9	71.2	0.7	0.2	57.7	1.4	38	2.8	3.2	68.3	15.1	13.3	
Total %	0.6	0.9	1	0	13.4	34.3	0.3	0.1	7.1	0.2	4.7	0.3	1.2	25.4	5.6	4.9	
Cars	9	15	15	0	191	550	4	2	118	3	39	5	18	416	97	79	1561
% Cars	90	100	88.2	0	81.6	92.1	66.7	100	95.9	100	48.1	83.3	85.7	94.1	99	91.9	89.7
Trucks	1	0	2	0	43	47	2	0	5	0	42	1	3	26	1	7	180
% Trucks	10	0	11.8	0	18.4	7.9	33.3	0	4.1	0	51.9	16.7	14.3	5.9	1	8.1	10.3

	Private Dr From North					Northern Ave From East					Haul Rd From South					Northern Ave From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	0	0	1	0	1	23	71	0	0	94	15	0	8	0	23	**5**	61	9	10	85	203
05:00 PM	**4**	3	**5**	0	**12**	**40**	**102**	**1**	**1**	**144**	20	0	8	1	29	3	**67**	10	9	89	**274**
05:15 PM	0	**5**	4	0	9	24	72	0	0	96	13	**2**	8	**2**	25	0	54	18	14	86	216
05:30 PM	2	1	1	0	4	32	73	0	0	105	**22**	1	**11**	0	**34**	4	57	**22**	**17**	**100**	243
Total Volume	6	9	11	0	26	119	318	1	1	439	70	3	35	3	111	12	239	59	50	360	936
% App. Total																					
PHF	.375	.450	.550	.000	.542	.744	.779	.250	.250	.762	.795	.375	.795	.375	.816	.600	.892	.670	.735	.900	.854
Cars	6	9	10	0	25	96	301	1	1	399	68	3	15	3	89	12	224	58	47	341	854
% Cars	100	100	90.9	0	96.2	80.7	94.7	100	100	90.9	97.1	100	42.9	100	80.2	100	93.7	98.3	94.0	94.7	91.2
Trucks	0	0	1	0	1	23	17	0	0	40	2	0	20	0	22	0	15	1	3	19	82
% Trucks	0	0	9.1	0	3.8	19.3	5.3	0	0	9.1	2.9	0	57.1	0	19.8	0	6.3	1.7	6.0	5.3	8.8

Accurate Counts
978-664-2565

N/S Street : Haul Road / Private Drive
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730005
Site Code : 60730005
Start Date : 8/9/2012
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	05:00 PM					04:15 PM					04:15 PM					04:45 PM				
+0 mins.	**4**	3	**5**	0	**12**	27	78	**2**	0	107	**25**	0	**12**	0	**37**	**5**	61	9	10	85
+15 mins.	0	**5**	4	0	9	33	77	2	**1**	113	12	0	11	0	23	3	**67**	10	9	89
+30 mins.	2	1	1	0	4	23	71	0	0	94	15	0	8	0	23	0	54	18	14	86
+45 mins.	0	0	2	0	2	**40**	**102**	1	1	**144**	20	0	8	1	29	4	57	**22**	**17**	**100**
Total Volume	6	9	12	0	27	123	328	5	2	458	72	0	39	1	112	12	239	59	50	360
% App. Total																				
PHF	.375	.450	.600	.000	.563	.769	.804	.625	.500	.795	.720	.000	.813	.250	.757	.600	.892	.670	.735	.900
Cars	6	9	11	0	26	98	300	3	2	403	68	0	20	1	89	12	224	58	47	341
% Cars	100	100	91.7	0	96.3	79.7	91.5	60	100	88	94.4	0	51.3	100	79.5	100	93.7	98.3	94	94.7
Trucks	0	0	1	0	1	25	28	2	0	55	4	0	19	0	23	0	15	1	3	19
% Trucks	0	0	8.3	0	3.7	20.3	8.5	40	0	12	5.6	0	48.7	0	20.5	0	6.3	1.7	6	5.3

Accurate Counts
978-664-2565

N/S Street : Haul Road / Private Drive
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730005
Site Code : 60730005
Start Date : 8/9/2012
Page No : 1

Groups Printed- Cars

	Private Dr From North				Northern Ave From East				Haul Rd From South				Northern Ave From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
04:00 PM	1	3	3	0	25	60	1	0	4	0	7	1	4	53	13	6	181
04:15 PM	1	1	0	0	20	69	0	0	23	0	5	0	1	42	3	8	173
04:30 PM	1	2	0	0	29	68	2	1	12	0	7	0	0	51	9	6	188
04:45 PM	0	0	1	0	17	66	0	0	13	0	3	0	5	56	8	9	178
Total	3	6	4	0	91	263	3	1	52	0	22	1	10	202	33	29	720
05:00 PM	4	3	4	0	32	97	1	1	20	0	5	1	3	62	10	9	252
05:15 PM	0	5	4	0	21	68	0	0	13	2	4	2	0	53	18	13	203
05:30 PM	2	1	1	0	26	70	0	0	22	1	3	0	4	53	22	16	221
05:45 PM	0	0	2	0	21	52	0	0	11	0	5	1	1	46	14	12	165
Total	6	9	11	0	100	287	1	1	66	3	17	4	8	214	64	50	841
Grand Total	9	15	15	0	191	550	4	2	118	3	39	5	18	416	97	79	1561
Apprch %	23.1	38.5	38.5	0	25.6	73.6	0.5	0.3	71.5	1.8	23.6	3	3	68.2	15.9	13	
Total %	0.6	1	1	0	12.2	35.2	0.3	0.1	7.6	0.2	2.5	0.3	1.2	26.6	6.2	5.1	

	Private Dr From North					Northern Ave From East					Haul Rd From South					Northern Ave From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	0	0	1	0	1	17	66	0	0	83	13	0	3	0	16	**5**	56	8	9	**78**	**178**
05:00 PM	**4**	3	**4**	0	**11**	**32**	**97**	**1**	**1**	**131**	20	0	**5**	1	**26**	3	**62**	10	9	84	**252**
05:15 PM	0	**5**	4	0	9	21	68	0	0	89	13	**2**	4	**2**	21	0	53	18	13	84	203
05:30 PM	**2**	1	1	0	4	26	70	0	0	96	**22**	1	3	0	26	**4**	**53**	**22**	**16**	**95**	221
Total Volume	**6**	9	10	0	25	96	301	**1**	1	399	68	3	15	3	89	12	224	58	47	341	854
% App. Total																					
PHF	.375	.450	.625	.000	.568	.750	.776	.250	.250	.761	.773	.375	.750	.375	.856	.600	.903	.659	.734	.897	.847

Accurate Counts
978-664-2565

N/S Street : Haul Road / Private Drive
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730005
Site Code : 60730005
Start Date : 8/9/2012
Page No : 1

Groups Printed- Trucks

	Private Dr From North				Northern Ave From East				Haul Rd From South				Northern Ave From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
04:00 PM	0	0	1	0	5	6	0	0	0	0	7	0	1	3	0	0	23
04:15 PM	0	0	0	0	7	9	2	0	2	0	7	0	1	6	0	2	36
04:30 PM	1	0	0	0	4	9	0	0	0	0	4	0	1	2	0	2	23
04:45 PM	0	0	0	0	6	5	0	0	2	0	5	0	0	5	1	1	25
Total	1	0	1	0	22	29	2	0	4	0	23	0	3	16	1	5	107
05:00 PM	0	0	1	0	8	5	0	0	0	0	3	0	0	5	0	0	22
05:15 PM	0	0	0	0	3	4	0	0	0	0	4	0	0	1	0	1	13
05:30 PM	0	0	0	0	6	3	0	0	0	0	8	0	0	4	0	1	22
05:45 PM	0	0	0	0	4	6	0	0	1	0	4	1	0	0	0	0	16
Total	0	0	1	0	21	18	0	0	1	0	19	1	0	10	0	2	73
Grand Total	1	0	2	0	43	47	2	0	5	0	42	1	3	26	1	7	180
Apprch %	33.3	0	66.7	0	46.7	51.1	2.2	0	10.4	0	87.5	2.1	8.1	70.3	2.7	18.9	
Total %	0.6	0	1.1	0	23.9	26.1	1.1	0	2.8	0	23.3	0.6	1.7	14.4	0.6	3.9	

	Private Dr From North					Northern Ave From East					Haul Rd From South					Northern Ave From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	1	0	1	5	6	0	0	11	0	0	7	0	7	1	3	0	0	4	23
04:15 PM	0	0	0	0	0	7	9	2	0	18	2	0	7	0	9	1	6	0	2	9	36
04:30 PM	1	0	0	0	1	4	9	0	0	13	0	0	4	0	4	1	2	0	2	5	23
04:45 PM	0	0	0	0	0	6	5	0	0	11	2	0	5	0	7	0	5	1	1	7	25
Total Volume	1	0	1	0	2	22	29	2	0	53	4	0	23	0	27	3	16	1	5	25	107
% App. Total																					
PHF	.250	.000	.250	.000	.500	.786	.806	.250	.000	.736	.500	.000	.821	.000	.750	.750	.667	.250	.625	.694	.743

Accurate Counts
978-664-2565

N/S Street : Haul Road / Private Drive
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730005
Site Code : 60730005
Start Date : 8/9/2012
Page No : 1

Groups Printed- Bikes Peds

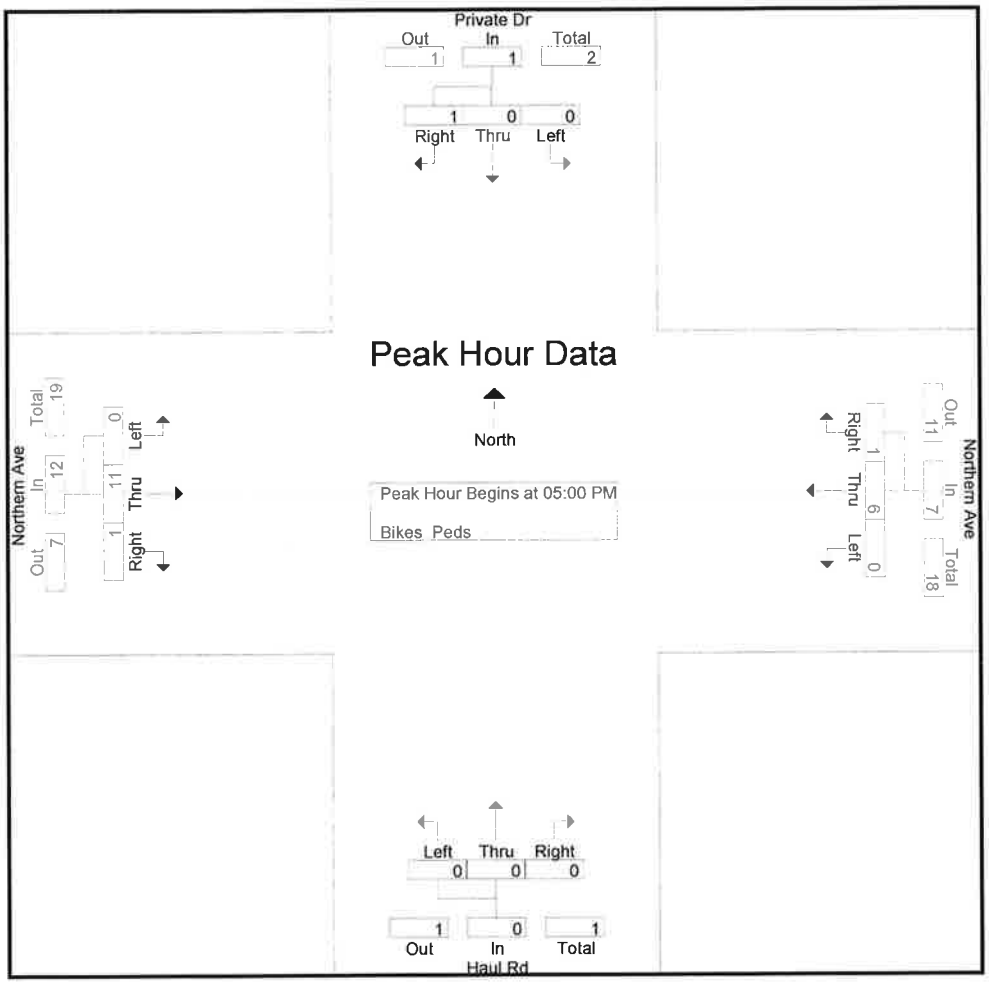
	Private Dr From North				Northern Ave From East				Haul Rd From South				Northern Ave From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	0	0	0	6	0	1	0	0	0	0	0	1	0	2	0	0	7	3	10
04:15 PM	0	0	0	4	0	0	0	0	0	0	0	4	0	1	0	0	8	1	9
04:30 PM	0	0	0	6	0	2	0	0	0	0	0	4	0	0	0	0	10	2	12
04:45 PM	0	0	0	12	0	3	0	0	0	0	0	5	0	0	0	1	18	3	21
Total	0	0	0	28	0	6	0	0	0	0	0	14	0	3	0	1	43	9	52
05:00 PM	0	0	0	26	0	2	0	0	0	0	0	4	0	2	0	0	30	4	34
05:15 PM	0	0	0	6	0	3	1	1	0	0	0	8	0	4	0	1	16	8	24
05:30 PM	0	0	1	5	0	0	0	0	0	0	0	4	0	2	1	0	9	4	13
05:45 PM	0	0	0	6	0	1	0	0	0	0	0	15	0	3	0	2	23	4	27
Total	0	0	1	43	0	6	1	1	0	0	0	31	0	11	1	3	78	20	98
Grand Total	0	0	1	71	0	12	1	1	0	0	0	45	0	14	1	4	121	29	150
Apprch %	0	0	100		0	92.3	7.7		0	0	0		0	93.3	6.7				
Total %	0	0	3.4		0	41.4	3.4		0	0	0		0	48.3	3.4		80.7	19.3	

	Private Dr From North				Northern Ave From East				Haul Rd From South				Northern Ave From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	0	0	0	0	0	2	0	2	0	0	0	0	0	2	0	2	4
05:15 PM	0	0	0	0	0	3	1	4	0	0	0	0	0	4	0	4	8
05:30 PM	0	0	1	1	0	0	0	0	0	0	0	0	0	2	1	3	4
05:45 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	3	0	3	4
Total Volume	0	0	1	1	0	6	1	7	0	0	0	0	0	11	1	12	20
% App. Total	0	0	100		0	85.7	14.3		0	0	0		0	91.7	8.3		
PHF	.000	.000	.250	.250	.000	.500	.250	.438	.000	.000	.000	.000	.000	.688	.250	.750	.625

Accurate Counts
978-664-2565

N/S Street : Haul Road / Private Drive
E/W Street : Northern Avenue
City/State : South Boston, MA
Weather : Clear

File Name : 60730005
Site Code : 60730005
Start Date : 8/9/2012
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:45 PM				04:30 PM				04:00 PM				05:00 PM			
+0 mins.	0	0	0	0	0	2	0	2	0	0	0	0	0	2	0	2
+15 mins.	0	0	0	0	0	**3**	0	3	0	0	0	0	0	**4**	0	4
+30 mins.	0	0	0	0	0	2	0	2	0	0	0	0	0	2	**1**	3
+45 mins.	0	0	**1**	**1**	**0**	3	**1**	**4**	0	0	0	0	0	3	**0**	3
Total Volume	0	0	1	1	0	10	1	11	0	0	0	0	0	11	1	12
% App. Total	0	0	100		0	90.9	9.1		**0**	**0**	**0**		0	91.7	8.3	
PHF	.000	.000	.250	.250	.000	.833	.250	.688	.000	.000	.000	.000	.000	.688	.250	.750

Accurate Counts
978-664-2565

N/S Street : 'D' Street / Fish Pier
E/W Street : Seaport Blvd / Northern Ave
City/State : South Boston, MA
Weather : Clear

File Name : 60730006
Site Code : 60730006
Start Date : 8/9/2012
Page No : 1

Groups Printed- Cars - Trucks

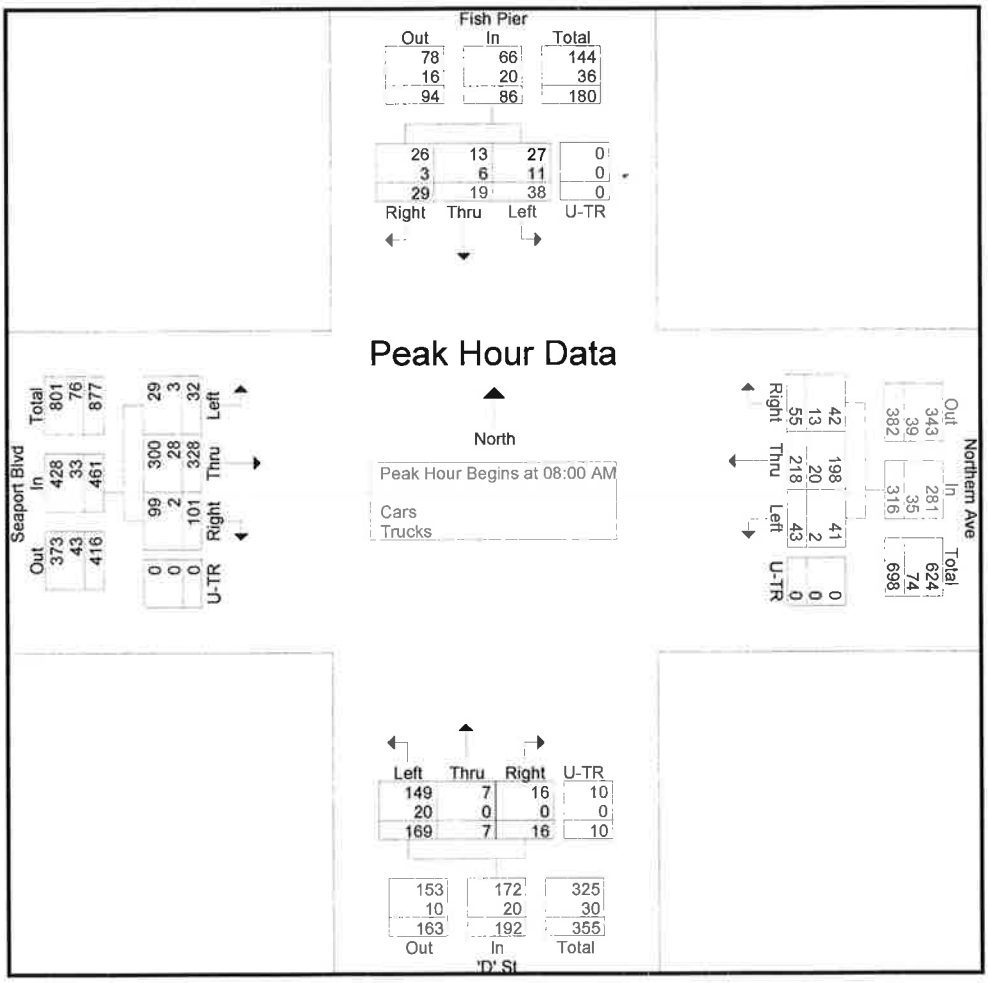
	Fish Pier From North				Northern Ave From East				'D' St From South				Seaport Blvd From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
07:00 AM	7	8	12	0	5	40	11	0	23	3	3	3	9	77	19	0	220
07:15 AM	5	2	4	0	6	56	13	0	29	1	5	5	7	83	18	0	234
07:30 AM	15	8	4	0	9	38	11	0	28	1	4	1	9	79	22	0	229
07:45 AM	7	1	6	0	12	48	13	0	34	0	3	0	9	76	21	0	230
Total	34	19	26	0	32	182	48	0	114	5	15	9	34	315	80	0	913
08:00 AM	9	4	7	0	10	51	15	0	47	4	4	2	7	83	37	0	280
08:15 AM	12	6	6	0	11	59	10	0	41	1	1	0	7	66	25	0	245
08:30 AM	10	4	10	0	11	61	13	0	40	0	6	5	12	86	24	0	282
08:45 AM	7	5	6	0	11	47	17	0	41	2	5	3	6	93	15	0	258
Total	38	19	29	0	43	218	55	0	169	7	16	10	32	328	101	0	1065
Grand Total	72	38	55	0	75	400	103	0	283	12	31	19	66	643	181	0	1978
Apprch %	43.6	23	33.3	0	13	69.2	17.8	0	82	3.5	9	5.5	7.4	72.2	20.3	0	
Total %	3.6	1.9	2.8	0	3.8	20.2	5.2	0	14.3	0.6	1.6	1	3.3	32.5	9.2	0	
Cars	56	29	48	0	69	354	78	0	240	12	27	19	60	596	175	0	1763
% Cars	77.8	76.3	87.3	0	92	88.5	75.7	0	84.8	100	87.1	100	90.9	92.7	96.7	0	89.1
Trucks	16	9	7	0	6	46	25	0	43	0	4	0	6	47	6	0	215
% Trucks	22.2	23.7	12.7	0	8	11.5	24.3	0	15.2	0	12.9	0	9.1	7.3	3.3	0	10.9

	Fish Pier From North					Northern Ave From East					'D' St From South					Seaport Blvd From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	9	4	7	0	20	10	51	15	0	76	**47**	**4**	4	2	**57**	7	83	**37**	0	**127**	280
08:15 AM	**12**	**6**	6	0	**24**	**11**	59	10	0	80	41	1	1	0	43	7	66	25	0	98	245
08:30 AM	10	4	**10**	0	24	11	**61**	13	0	**85**	40	0	**6**	**5**	51	**12**	86	24	0	122	**282**
08:45 AM	7	5	6	0	18	11	47	**17**	0	75	41	2	**5**	3	**51**	**6**	93	15	0	114	258
Total Volume	38	19	29	0	86	43	218	55	0	316	169	7	16	10	202	32	328	101	0	461	1065
% App. Total																					
PHF	.792	.792	.725	.000	.896	.977	.893	.809	.000	.929	.899	.438	.667	.500	.886	.667	.882	.682	.000	.907	.944
Cars	27	13	26	0	66	41	198	42	0	281	149	7	16	10	182	29	300	99	0	428	957
% Cars	71.1	68.4	89.7	0	76.7	95.3	90.8	76.4	0	88.9	88.2	100	100	100	90.1	90.6	91.5	98.0	0	92.8	89.9
Trucks	11	6	3	0	20	2	20	13	0	35	20	0	0	0	20	3	28	2	0	33	108
% Trucks	28.9	31.6	10.3	0	23.3	4.7	9.2	23.6	0	11.1	11.8	0	0	0	9.9	9.4	8.5	2.0	0	7.2	10.1

Accurate Counts
978-664-2565

N/S Street : 'D' Street / Fish Pier
E/W Street : Seaport Blvd / Northern Ave
City/State : South Boston, MA
Weather : Clear

File Name : 60730006
Site Code : 60730006
Start Date : 8/9/2012
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	08:00 AM					08:00 AM					08:00 AM					08:00 AM				
+0 mins.	9	4	7	0	20	10	51	15	0	76	**47**	**4**	4	2	**57**	7	83	**37**	0	**127**
+15 mins.	**12**	**6**	6	0	**24**	**11**	59	10	0	80	41	1	1	0	43	7	66	25	0	98
+30 mins.	10	4	**10**	0	24	11	**61**	13	0	**85**	40	0	**6**	**5**	51	**12**	86	24	0	122
+45 mins.	7	5	6	0	18	11	47	**17**	0	75	**41**	**2**	**5**	**3**	**51**	6	**93**	**15**	0	114
Total Volume	38	19	29	0	86	43	218	55	0	316	169	7	16	10	202	32	328	101	0	461
% App. Total																				
PHF	.792	.792	.725	.000	.896	.977	.893	.809	.000	.929	.899	.438	.667	.500	.886	.667	.882	.682	.000	.907
Cars	27	13	26	0	66	41	198	42	0	281	149	7	16	10	182	29	300	99	0	428
% Cars	71.1	68.4	89.7	0	76.7	95.3	90.8	76.4	0	88.9	88.2	100	100	100	90.1	90.6	91.5	98	0	92.8
Trucks	11	6	3	0	20	2	20	13	0	35	20	0	0	0	20	3	28	2	0	33
% Trucks	28.9	31.6	10.3	0	23.3	4.7	9.2	23.6	0	11.1	11.8	0	0	0	9.9	9.4	8.5	2	0	7.2

Accurate Counts
978-664-2565

N/S Street : 'D' Street / Fish Pier
E/W Street : Seaport Blvd / Northern Ave
City/State : South Boston, MA
Weather : Clear

File Name : 60730006
Site Code : 60730006
Start Date : 8/9/2012
Page No : 1

Groups Printed- Cars

	Fish Pier From North				Northern Ave From East				'D' St From South				Seaport Blvd From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
07:00 AM	5	6	9	0	5	31	8	0	20	3	1	3	7	72	19	0	189
07:15 AM	3	2	3	0	4	50	9	0	24	1	3	5	6	80	16	0	206
07:30 AM	14	7	4	0	8	31	10	0	22	1	4	1	9	74	21	0	206
07:45 AM	7	1	6	0	11	44	9	0	25	0	3	0	9	70	20	0	205
Total	29	16	22	0	28	156	36	0	91	5	11	9	31	296	76	0	806
08:00 AM	8	3	6	0	10	47	13	0	45	4	4	2	6	74	37	0	259
08:15 AM	7	4	6	0	11	52	8	0	34	1	1	0	6	57	25	0	212
08:30 AM	8	3	9	0	10	54	9	0	33	0	6	5	11	80	23	0	251
08:45 AM	4	3	5	0	10	45	12	0	37	2	5	3	6	89	14	0	235
Total	27	13	26	0	41	198	42	0	149	7	16	10	29	300	99	0	957
Grand Total	56	29	48	0	69	354	78	0	240	12	27	19	60	596	175	0	1763
Apprch %	42.1	21.8	36.1	0	13.8	70.7	15.6	0	80.5	4	9.1	6.4	7.2	71.7	21.1	0	
Total %	3.2	1.6	2.7	0	3.9	20.1	4.4	0	13.6	0.7	1.5	1.1	3.4	33.8	9.9	0	

	Fish Pier From North					Northern Ave From East					'D' St From South					Seaport Blvd From West					
Start Time	Left	Thru	Right	U-TR	App Total	Left	Thru	Right	U-TR	App Total	Left	Thru	Right	U-TR	App Total	Left	Thru	Right	U-TR	App Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	**8**	3	6	0	17	10	47	**13**	0	70	**45**	**4**	4	2	**55**	6	74	**37**	0	**117**	**259**
08:15 AM	7	**4**	6	0	17	**11**	52	8	0	71	34	1	1	0	36	6	57	25	0	88	212
08:30 AM	8	3	**9**	0	**20**	10	**54**	9	0	**73**	33	0	**6**	**5**	44	**11**	80	23	0	114	251
08:45 AM	4	3	5	0	12	10	45	12	0	67	37	2	5	3	47	6	**89**	14	0	109	235
Total Volume	27	13	26	0	66	41	198	42	0	281	149	7	16	10	182	29	300	99	0	428	957
% App. Total																					
PHF	.844	.813	.722	.000	.825	.932	.917	.808	.000	.962	.828	.438	.667	.500	.827	.659	.843	.669	.000	.915	.924

Accurate Counts
978-664-2565

N/S Street : 'D' Street / Fish Pier
E/W Street : Seaport Blvd / Northern Ave
City/State : South Boston, MA
Weather : Clear

File Name : 60730006
Site Code : 60730006
Start Date : 8/9/2012
Page No : 1

Groups Printed- Trucks

	Fish Pier From North				Northern Ave From East				'D' St From South				Seaport Blvd From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
07:00 AM	2	2	3	0	0	9	3	0	3	0	2	0	2	5	0	0	31
07:15 AM	2	0	1	0	2	6	4	0	5	0	2	0	1	3	2	0	28
07:30 AM	1	1	0	0	1	7	1	0	6	0	0	0	0	5	1	0	23
07:45 AM	0	0	0	0	1	4	4	0	9	0	0	0	0	6	1	0	25
Total	5	3	4	0	4	26	12	0	23	0	4	0	3	19	4	0	107
08:00 AM	1	1	1	0	0	4	2	0	2	0	0	0	1	9	0	0	21
08:15 AM	5	2	0	0	0	7	2	0	7	0	0	0	1	9	0	0	33
08:30 AM	2	1	1	0	1	7	4	0	7	0	0	0	1	6	1	0	31
08:45 AM	3	2	1	0	1	2	5	0	4	0	0	0	0	4	1	0	23
Total	11	6	3	0	2	20	13	0	20	0	0	0	3	28	2	0	108
Grand Total	16	9	7	0	6	46	25	0	43	0	4	0	6	47	6	0	215
Apprch %	50	28.1	21.9	0	7.8	59.7	32.5	0	91.5	0	8.5	0	10.2	79.7	10.2	0	
Total %	7.4	4.2	3.3	0	2.8	21.4	11.6	0	20	0	1.9	0	2.8	21.9	2.8	0	

	Fish Pier From North					Northern Ave From East					'D' St From South					Seaport Blvd From West					
Start Time	Left	Thru	Right	U-TR	App Total	Left	Thru	Right	U-TR	App Total	Left	Thru	Right	U-TR	App Total	Left	Thru	Right	U-TR	App Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	0	0	0	0	1	4	4	0	9	9	0	0	0	9	0	6	1	0	7	25
08:00 AM	1	1	1	0	3	0	4	2	0	6	2	0	0	0	2	1	9	0	0	10	21
08:15 AM	5	2	0	0	7	0	7	2	0	9	7	0	0	0	7	1	9	0	0	10	33
08:30 AM	2	1	1	0	4	1	7	4	0	12	7	0	0	0	7	1	6	1	0	8	31
Total Volume	8	4	2	0	14	2	22	12	0	36	25	0	0	0	25	3	30	2	0	35	110
% App. Total																					
PHF	.400	.500	.500	.000	.500	.500	.786	.750	.000	.750	.694	.000	.000	.000	.694	.750	.833	.500	.000	.875	.833

Accurate Counts
978-664-2565

N/S Street : 'D' Street / Fish Pier
E/W Street : Seaport Blvd / Northern Ave
City/State : South Boston, MA
Weather : Clear

File Name : 60730006
Site Code : 60730006
Start Date : 8/9/2012
Page No : 1

Groups Printed- Bikes Peds

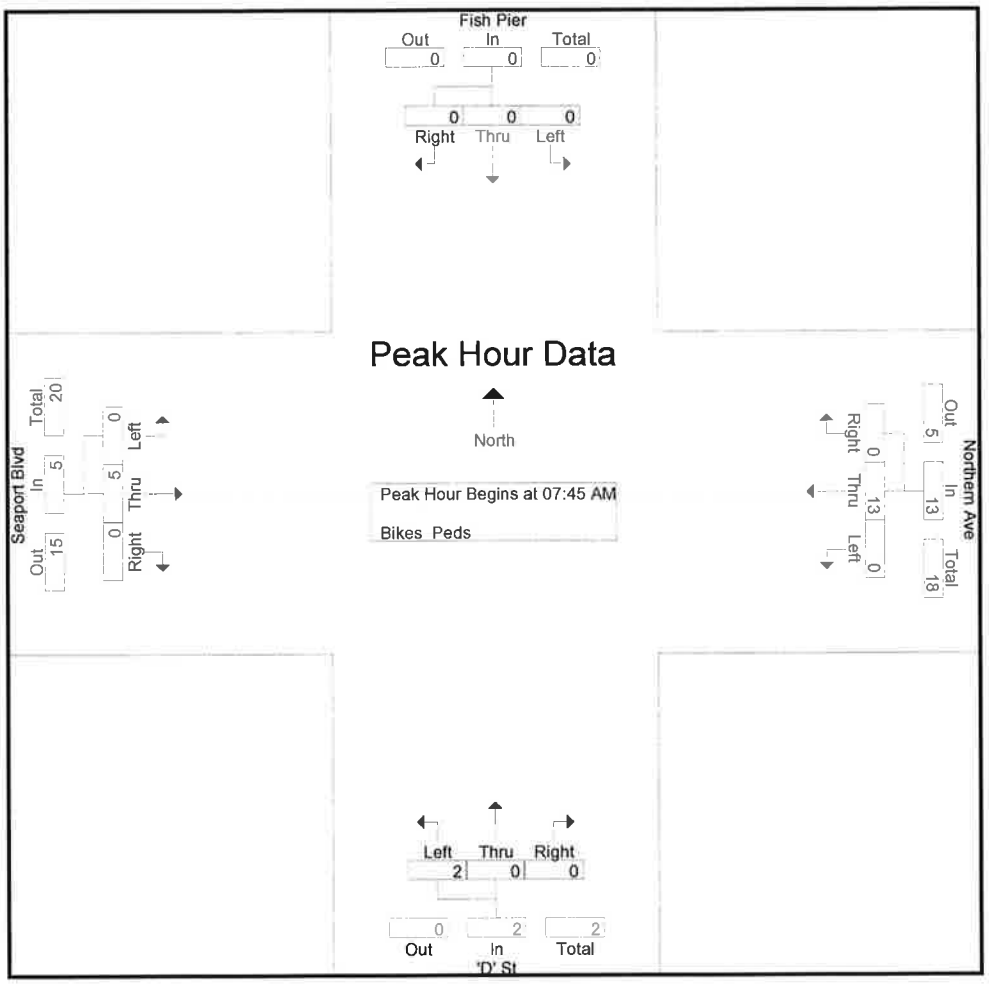
	Fish Pier From North				Northern Ave From East				'D' St From South				Seaport Blvd From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	0	0	5	0	1	0	0	0	0	0	11	0	2	0	3	19	3	22
07:15 AM	1	0	0	10	0	0	0	0	0	1	0	4	1	1	0	4	18	4	22
07:30 AM	0	0	0	7	0	0	0	0	0	0	0	6	0	1	0	2	15	1	16
07:45 AM	0	0	0	11	0	5	0	0	1	0	0	4	0	2	0	2	17	8	25
Total	1	0	0	33	0	6	0	0	1	1	0	25	1	6	0	11	69	16	85
08:00 AM	0	0	0	5	0	1	0	0	0	0	0	7	0	0	0	1	13	1	14
08:15 AM	0	0	0	9	0	4	0	0	1	0	0	6	0	1	0	3	18	6	24
08:30 AM	0	0	0	16	0	3	0	0	0	0	0	10	0	2	0	2	28	5	33
08:45 AM	0	0	0	11	0	1	0	0	0	0	0	5	2	1	0	8	24	4	28
Total	0	0	0	41	0	9	0	0	1	0	0	28	2	4	0	14	83	16	99
Grand Total	1	0	0	74	0	15	0	0	2	1	0	53	3	10	0	25	152	32	184
Apprch %	100	0	0		0	100	0		66.7	33.3	0		23.1	76.9	0				
Total %	3.1	0	0		0	46.9	0		6.2	3.1	0		9.4	31.2	0		82.6	17.4	

	Fish Pier From North				Northern Ave From East				'D' St From South				Seaport Blvd From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	0	0	0	0	0	5	0	5	1	0	0	1	0	2	0	2	8
08:00 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
08:15 AM	0	0	0	0	0	4	0	4	1	0	0	1	0	1	0	1	6
08:30 AM	0	0	0	0	0	3	0	3	0	0	0	0	0	2	0	2	5
Total Volume	0	0	0	0	0	13	0	13	2	0	0	2	0	5	0	5	20
% App. Total	0	0	0		0	100	0		100	0	0		0	100	0		
PHF	.000	.000	.000	.000	.000	.650	.000	.650	.500	.000	.000	.500	.000	.625	.000	.625	.625

Accurate Counts
978-664-2565

N/S Street : 'D' Street / Fish Pier
E/W Street : Seaport Blvd / Northern Ave
City/State : South Boston, MA
Weather : Clear

File Name : 60730006
Site Code : 60730006
Start Date : 8/9/2012
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:00 AM				07:45 AM				07:00 AM				07:00 AM			
+0 mins.	0	0	0	0	0	**5**	0	**5**	0	0	0	0	0	**2**	0	**2**
+15 mins.	**1**	0	0	**1**	0	1	0	1	0	**1**	0	**1**	**1**	1	0	2
+30 mins.	0	0	0	0	0	4	0	4	0	0	0	0	0	1	0	1
+45 mins.	0	0	0	0	0	3	0	3	**1**	0	0	1	0	2	0	2
Total Volume	1	0	0	1	0	13	0	13	1	1	0	2	1	6	0	7
% App. Total	100	0	0		0	100	0		50	50	0		14.3	85.7	0	
PHF	.250	.000	.000	.250	.000	.650	.000	.650	.250	.250	.000	.500	.250	.750	.000	.875

Accurate Counts
978-664-2565

N/S Street : 'D' Street / Fish Pier
E/W Street : Seaport Blvd / Northern Ave
City/State : South Boston, MA
Weather : Clear

File Name : 60730006
Site Code : 60730006
Start Date : 8/9/2012
Page No : 1

Groups Printed- Cars - Trucks

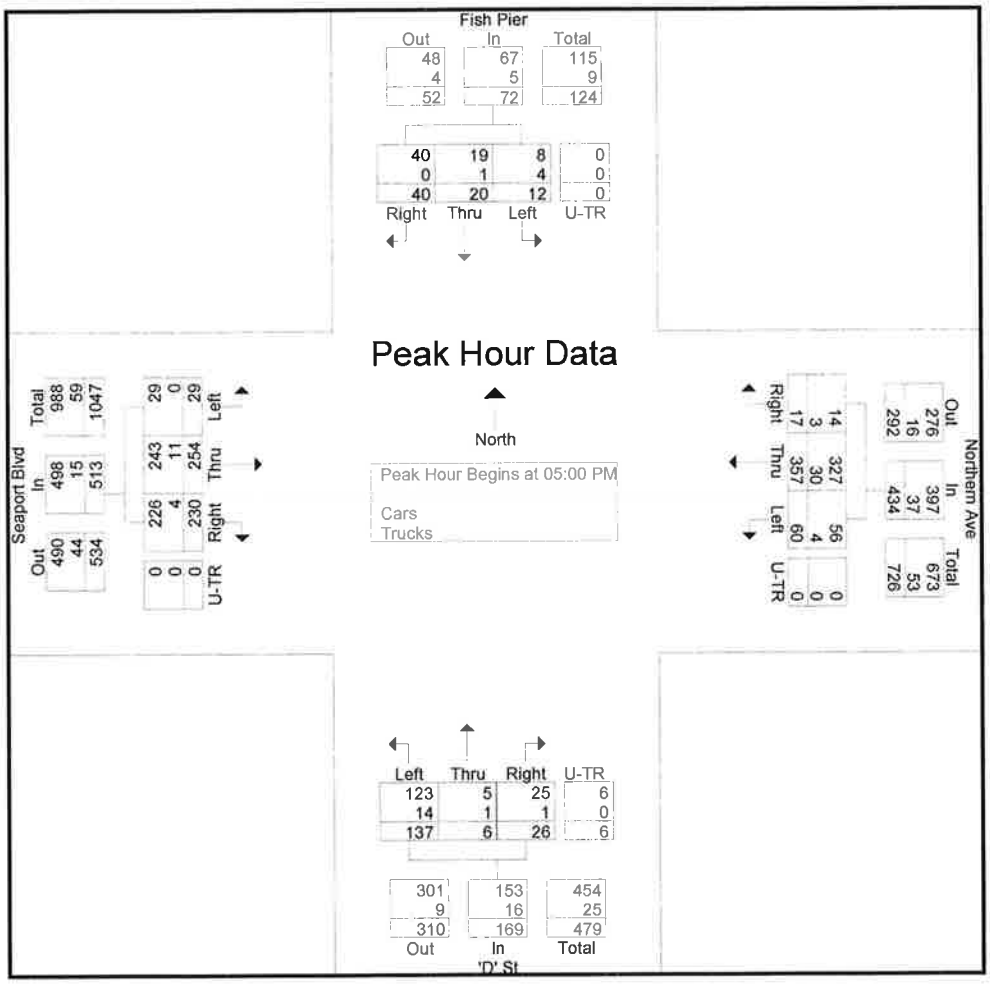
	Fish Pier From North				Northern Ave From East				'D' St From South				Seaport Blvd From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
04:00 PM	4	7	16	0	15	96	7	0	27	2	2	5	3	77	57	0	318
04:15 PM	7	8	8	0	7	65	5	0	27	2	1	2	7	74	47	0	260
04:30 PM	4	11	6	0	18	67	4	0	23	2	0	1	5	63	50	0	254
04:45 PM	4	7	6	0	13	90	4	0	19	4	3	1	6	48	40	0	245
Total	19	33	36	0	53	318	20	0	96	10	6	9	21	262	194	0	1077
05:00 PM	4	7	11	0	14	97	5	0	38	2	7	3	6	70	60	0	324
05:15 PM	2	5	10	0	11	76	5	0	19	3	5	0	6	61	44	0	247
05:30 PM	4	3	11	0	22	86	5	0	43	1	3	3	8	66	56	0	311
05:45 PM	2	5	8	0	13	98	2	0	37	0	11	0	9	57	70	0	312
Total	12	20	40	0	60	357	17	0	137	6	26	6	29	254	230	0	1194
Grand Total	31	53	76	0	113	675	37	0	233	16	32	15	50	516	424	0	2271
Apprch %	19.4	33.1	47.5	0	13.7	81.8	4.5	0	78.7	5.4	10.8	5.1	5.1	52.1	42.8	0	
Total %	1.4	2.3	3.3	0	5	29.7	1.6	0	10.3	0.7	1.4	0.7	2.2	22.7	18.7	0	
Cars	23	50	75	0	106	609	30	0	209	14	31	15	49	485	420	0	2116
% Cars	74.2	94.3	98.7	0	93.8	90.2	81.1	0	89.7	87.5	96.9	100	98	94	99.1	0	93.2
Trucks	8	3	1	0	7	66	7	0	24	2	1	0	1	31	4	0	155
% Trucks	25.8	5.7	1.3	0	6.2	9.8	18.9	0	10.3	12.5	3.1	0	2	6	0.9	0	6.8

	Fish Pier From North					Northern Ave From East					'D' St From South					Seaport Blvd From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	**4**	7	**11**	0	**22**	14	97	**5**	0	**116**	38	2	7	**3**	**50**	6	**70**	60	0	**136**	**324**
05:15 PM	2	5	10	0	17	11	76	5	0	92	19	**3**	5	0	27	6	61	44	0	111	247
05:30 PM	4	3	11	0	18	**22**	86	5	0	113	**43**	1	**3**	3	50	8	66	56	0	130	311
05:45 PM	2	5	8	0	15	13	**98**	2	0	113	37	0	**11**	0	48	**9**	**57**	**70**	0	**136**	312
Total Volume	12	20	40	0	72	60	357	17	0	434	137	6	26	6	175	29	254	230	0	513	1194
% App. Total																					
PHF	.750	.714	.909	.000	.818	.682	.911	.850	.000	.935	.797	.500	.591	.500	.875	.806	.907	.821	.000	.943	.921
Cars	8	19	40	0	67	56	327	14	0	397	123	5	25	6	159	29	243	226	0	498	1121
% Cars	66.7	95.0	100	0	93.1	93.3	91.6	82.4	0	91.5	89.8	83.3	96.2	100	90.9	100	95.7	98.3	0	97.1	93.9
Trucks	4	1	0	0	5	4	30	3	0	37	14	1	1	0	16	0	11	4	0	15	73
% Trucks	33.3	5.0	0	0	6.9	6.7	8.4	17.6	0	8.5	10.2	16.7	3.8	0	9.1	0	4.3	1.7	0	2.9	6.1

Accurate Counts
978-664-2565

N/S Street : 'D' Street / Fish Pier
E/W Street : Seaport Blvd / Northern Ave
City/State : South Boston, MA
Weather : Clear

File Name : 60730006
Site Code : 60730006
Start Date : 8/9/2012
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:00 PM					05:00 PM					05:00 PM					05:00 PM				
+0 mins.	4	7	**16**	0	**27**	14	97	**5**	0	**116**	38	2	7	**3**	**50**	6	**70**	60	0	**136**
+15 mins.	7	8	8	0	23	11	76	5	0	92	19	**3**	5	0	27	6	61	44	0	111
+30 mins.	4	**11**	6	0	21	**22**	86	5	0	113	**43**	1	3	3	50	8	66	56	0	130
+45 mins.	4	7	6	0	17	13	**98**	2	0	113	37	0	**11**	0	48	**9**	57	**70**	0	136
Total Volume	19	33	36	0	88	60	357	17	0	434	137	**6**	26	6	175	29	254	230	0	513
% App. Total																				
PHF	.679	.750	.563	.000	.815	.682	.911	.850	.000	.935	.797	.500	.591	.500	.875	.806	.907	.821	.000	.943
Cars	15	31	35	0	81	56	327	14	0	397	123	5	25	6	159	29	243	**226**	**0**	**498**
% Cars	78.9	93.9	97.2	0	92	93.3	91.6	82.4	0	91.5	89.8	83.3	96.2	100	90.9	100	95.7	98.3	0	97.1
Trucks	4	2	1	0	7	4	30	3	0	37	14	1	1	0	16	0	11	4	0	15
% Trucks	21.1	6.1	2.8	0	8	6.7	8.4	17.6	0	8.5	10.2	16.7	3.8	0	9.1	0	4.3	1.7	0	2.9

Accurate Counts
978-664-2565

N/S Street : 'D' Street / Fish Pier
E/W Street : Seaport Blvd / Northern Ave
City/State : South Boston, MA
Weather : Clear

File Name : 60730006
Site Code : 60730006
Start Date : 8/9/2012
Page No : 1

Groups Printed- Cars

	Fish Pier From North				Northern Ave From East				'D' St From South				Seaport Blvd From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
04:00 PM	4	6	16	0	14	83	5	0	24	2	2	5	3	72	57	0	293
04:15 PM	6	7	8	0	7	60	4	0	26	2	1	2	7	68	47	0	245
04:30 PM	3	11	6	0	18	61	3	0	18	1	0	1	5	61	50	0	238
04:45 PM	2	7	5	0	11	78	4	0	18	4	3	1	5	41	40	0	219
Total	15	31	35	0	50	282	16	0	86	9	6	9	20	242	194	0	995
05:00 PM	3	7	11	0	12	86	3	0	35	1	7	3	6	67	58	0	299
05:15 PM	1	5	10	0	10	70	4	0	15	3	5	0	6	58	43	0	230
05:30 PM	2	2	11	0	22	80	5	0	39	1	3	3	8	63	56	0	295
05:45 PM	2	5	8	0	12	91	2	0	34	0	10	0	9	55	69	0	297
Total	8	19	40	0	56	327	14	0	123	5	25	6	29	243	226	0	1121
Grand Total	23	50	75	0	106	609	30	0	209	14	31	15	49	485	420	0	2116
Apprch %	15.5	33.8	50.7	0	14.2	81.7	4	0	77.7	5.2	11.5	5.6	5.1	50.8	44	0	
Total %	1.1	2.4	3.5	0	5	28.8	1.4	0	9.9	0.7	1.5	0.7	2.3	22.9	19.8	0	

	Fish Pier From North					Northern Ave From East					'D' St From South					Seaport Blvd From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	**3**	**7**	**11**	0	**21**	12	86	3	0	101	35	1	7	**3**	**46**	6	**67**	58	0	131	**299**
05:15 PM	1	5	10	0	16	10	70	4	0	84	15	**3**	5	0	23	6	58	43	0	107	230
05:30 PM	2	2	11	0	15	**22**	80	**5**	0	**107**	**39**	1	3	3	46	8	63	56	0	127	295
05:45 PM	2	5	8	0	15	12	**91**	2	0	105	34	0	**10**	0	44	**9**	55	**69**	0	**133**	297
Total Volume	8	19	40	0	67	56	327	14	0	397	123	5	25	6	159	29	243	226	0	498	1121
% App. Total																					
PHF	.667	.679	.909	.000	.798	.636	.898	.700	.000	.928	.788	.417	.625	.500	.864	.806	.907	.819	.000	.936	.937

Accurate Counts
978-664-2565

N/S Street : 'D' Street / Fish Pier
E/W Street : Seaport Blvd / Northern Ave
City/State : South Boston, MA
Weather : Clear

File Name : 60730006
Site Code : 60730006
Start Date : 8/9/2012
Page No : 1

Groups Printed- Trucks

	Fish Pier From North				Northern Ave From East				'D' St From South				Seaport Blvd From West				
Start Time	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Left	Thru	Right	U-TR	Int. Total
04:00 PM	0	1	0	0	1	13	2	0	3	0	0	0	0	5	0	0	25
04:15 PM	1	1	0	0	0	5	1	0	1	0	0	0	0	6	0	0	15
04:30 PM	1	0	0	0	0	6	1	0	5	1	0	0	0	2	0	0	16
04:45 PM	2	0	1	0	2	12	0	0	1	0	0	0	1	7	0	0	26
Total	4	2	1	0	3	36	4	0	10	1	0	0	1	20	0	0	82
05:00 PM	1	0	0	0	2	11	2	0	3	1	0	0	0	3	2	0	25
05:15 PM	1	0	0	0	1	6	1	0	4	0	0	0	0	3	1	0	17
05:30 PM	2	1	0	0	0	6	0	0	4	0	0	0	0	3	0	0	16
05:45 PM	0	0	0	0	1	7	0	0	3	0	1	0	0	2	1	0	15
Total	4	1	0	0	4	30	3	0	14	1	1	0	0	11	4	0	73
Grand Total	8	3	1	0	7	66	7	0	24	2	1	0	1	31	4	0	155
Apprch %	66.7	25	8.3	0	8.8	82.5	8.8	0	88.9	7.4	3.7	0	2.8	86.1	11.1	0	
Total %	5.2	1.9	0.6	0	4.5	42.6	4.5	0	15.5	1.3	0.6	0	0.6	20	2.6	0	

	Fish Pier From North					Northern Ave From East					'D' St From South					Seaport Blvd From West					
Start Time	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	U-TR	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	1	0	0	0	1	0	6	1	0	7	5	1	0	0	6	0	2	0	0	2	16
04:45 PM	**2**	0	**1**	0	**3**	**2**	**12**	0	0	14	1	0	0	0	1	**1**	7	0	0	**8**	**26**
05:00 PM	1	0	0	0	1	2	11	**2**	0	15	3	1	0	0	4	0	3	**2**	0	5	25
05:15 PM	1	0	0	0	1	1	6	1	0	8	4	0	0	0	**4**	0	**3**	1	0	4	17
Total Volume	5	0	1	0	6	5	35	4	0	44	13	2	0	0	15	1	15	3	0	19	84
% App. Total																					
PHF	.625	.000	.250	.000	.500	.625	.729	.500	.000	.733	.650	.500	.000	.000	.625	.250	.536	.375	.000	.594	.808

Accurate Counts
978-664-2565

N/S Street : 'D' Street / Fish Pier
E/W Street : Seaport Blvd / Northern Ave
City/State : South Boston, MA
Weather : Clear

File Name : 60730006
Site Code : 60730006
Start Date : 8/9/2012
Page No : 1

Groups Printed- Bikes Peds

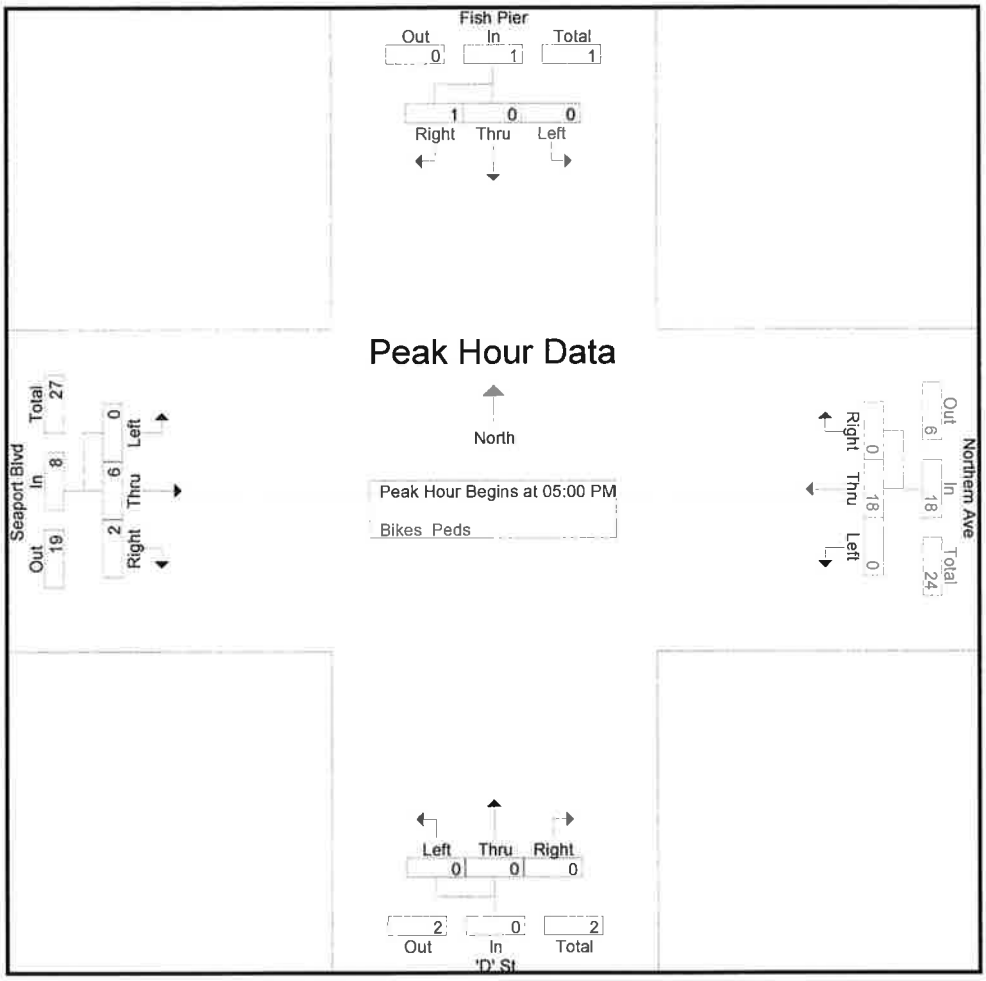
	Fish Pier From North				Northern Ave From East				'D' St From South				Seaport Blvd From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	0	0	0	44	0	0	0	0	0	0	0	12	0	0	0	7	63	0	63
04:15 PM	0	0	0	34	0	1	0	3	0	0	0	13	0	2	0	12	62	3	65
04:30 PM	0	1	1	33	0	4	0	0	0	1	0	17	0	3	0	5	55	10	65
04:45 PM	0	0	0	34	0	1	0	2	0	0	0	7	0	4	0	5	48	5	53
Total	0	1	1	145	0	6	0	5	0	1	0	49	0	9	0	29	228	18	246
05:00 PM	0	0	1	32	0	2	0	4	0	0	0	17	0	2	0	8	61	5	66
05:15 PM	0	0	0	50	0	5	0	2	0	0	0	22	0	1	0	6	80	6	86
05:30 PM	0	0	0	52	0	4	0	0	0	0	0	17	0	1	1	7	76	6	82
05:45 PM	0	0	0	52	0	7	0	2	0	0	0	11	0	2	1	13	78	10	88
Total	0	0	1	186	0	18	0	8	0	0	0	67	0	6	2	34	295	27	322
Grand Total	0	1	2	331	0	24	0	13	0	1	0	116	0	15	2	63	523	45	568
Apprch %	0	33.3	66.7		0	100	0		0	100	0		0	88.2	11.8				
Total %	0	2.2	4.4		0	53.3	0		0	2.2	0		0	33.3	4.4		92.1	7.9	

	Fish Pier From North				Northern Ave From East				'D' St From South				Seaport Blvd From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	0	0	**1**	**1**	0	2	0	2	0	0	0	0	0	**2**	0	2	5
05:15 PM	0	0	0	0	0	5	0	5	0	0	0	0	0	1	0	1	6
05:30 PM	0	0	0	0	0	4	0	4	0	0	0	0	0	1	**1**	2	6
05:45 PM	0	0	0	0	0	**7**	0	**7**	0	0	0	0	0	2	1	**3**	**10**
Total Volume	0	0	1	1	0	18	0	18	0	0	0	0	0	6	2	8	27
% App. Total	0	0	100		0	100	0		0	0	0		0	75	25		
PHF	.000	.000	.250	.250	.000	.643	.000	.643	.000	.000	.000	.000	.000	.750	.500	.667	.675

Accurate Counts
978-664-2565

N/S Street : 'D' Street / Fish Pier
E/W Street : Seaport Blvd / Northern Ave
City/State : South Boston, MA
Weather : Clear

File Name : 60730006
Site Code : 60730006
Start Date : 8/9/2012
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:15 PM				05:00 PM				04:00 PM				04:15 PM			
+0 mins.	0	0	0	0	0	2	0	2	0	0	0	0	0	2	0	2
+15 mins.	0	**1**	**1**	**2**	0	5	0	5	0	0	0	0	0	3	0	3
+30 mins.	0	0	0	0	0	4	0	4	0	**1**	0	**1**	0	**4**	0	**4**
+45 mins.	0	0	1	1	0	**7**	0	**7**	0	0	0	0	0	2	0	2
Total Volume	0	1	2	3	0	18	0	18	0	1	0	1	0	11	0	11
% App. Total	0	33.3	66.7		0	100	0		0	100	0		0	100	0	
PHF	.000	.250	.500	.375	.000	.643	.000	.643	.000	.250	.000	.250	.000	.688	.000	.688

SEASONAL ADJUSTMENT DATA

MASSACHUSETTS HIGHWAY DEPARTMENT - STATEWIDE TRAFFIC DATA COLLECTION

2007 WEEKDAY SEASONAL FACTORS *

* Note: These are weekday factors. The average of the factors for the year will not equal 1, as weekend data are not considered.

FACTOR GROUP	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
GROUP 1 - WEST INTERSTATE	0.95	0.91	0.85	0.85	0.87	0.86	0.91	0.96	0.90	0.88	0.90	0.91
GROUP 2 - RURAL MAJOR COLLECTOR (R-5)	1.11	1.07	1.07	0.98	0.92	0.88	0.88	0.86	0.89	0.93	1.01	1.04
GROUP 3A - RECREATIONAL **(1-4) See below	1.26	1.20	1.18	1.04	0.96	0.86	0.78	0.79	0.93	0.99	1.07	1.12
GROUP 3B - RECREATIONAL ***(5) See below	1.22	1.18	1.20	1.04	0.96	0.88	0.73	0.74	0.99	1.02	1.12	1.17
GROUP 4 - I-495 INTERSTATE	1.05	1.03	1.03	0.95	0.93	0.87	0.86	0.83	0.89	0.93	0.93	0.96
GROUP 5 - EAST INTERSTATE	1.02	0.99	0.97	0.94	0.95	0.91	0.92	0.92	0.94	0.94	0.98	0.99
GROUP 6 - URBAN ARTERIALS, COLLECTORS & RURAL ARTERIALS (R-2, R-3)	1.03	0.99	0.97	0.92	0.91	0.90	0.92	0.91	0.92	0.93	0.97	0.97
GROUP 7 - I-84 PROXIMITY (STA. 17)	0.84	1.15	1.17	1.08	1.10	1.02	1.01	0.96	1.06	1.06	1.11	1.15
GROUP 8 - I-295 PROXIMITY (STA. 6590)	0.95	1.01	0.96	0.92	0.89	0.88	0.91	0.86	0.91	0.93	0.95	0.92
GROUP 9 - I-195 PROXIMITY (STA. 7)	1.10	1.03	1.00	0.94	0.91	0.87	0.84	0.82	0.88	0.93	1.03	0.99

RECREATIONAL: (ALL YEARS)

**GROUP 3A:

1. CAPE COD (ALL TOWNS)
2. PLYMOUTH(SOUTH OF RTE 3A)

7014, 7079,7080,7090,7091,7092,7093,7094,7095,7096,7097,7108,7178

3. MARTHA'S VINEYARD
4. NANTUCKET

***GROUP 3B:

5. PERMANENTS 2 & 189

1066,1067,1083,1084,1085,1086,1087,1088,1089,1090,1091,1092, 1093,1094,1095,1096,1097,1098,1099,1100,1101,1102,1103,1104, 1105,1106,1107,1108,1113,1114,1116,2196,2197,2198

2007 AXLE CORRECTION FACTORS

ROAD INVENTORY FUNCTIONAL CLASSIFICATION	AXLE CORRECTION FACTOR
RURAL	
1	0.90
2	0.93
3	0.98
0,5,6	0.98
URBAN	
1	0.96
2,3	0.97
5	0.99
0,6	0.99
I-84	0.83

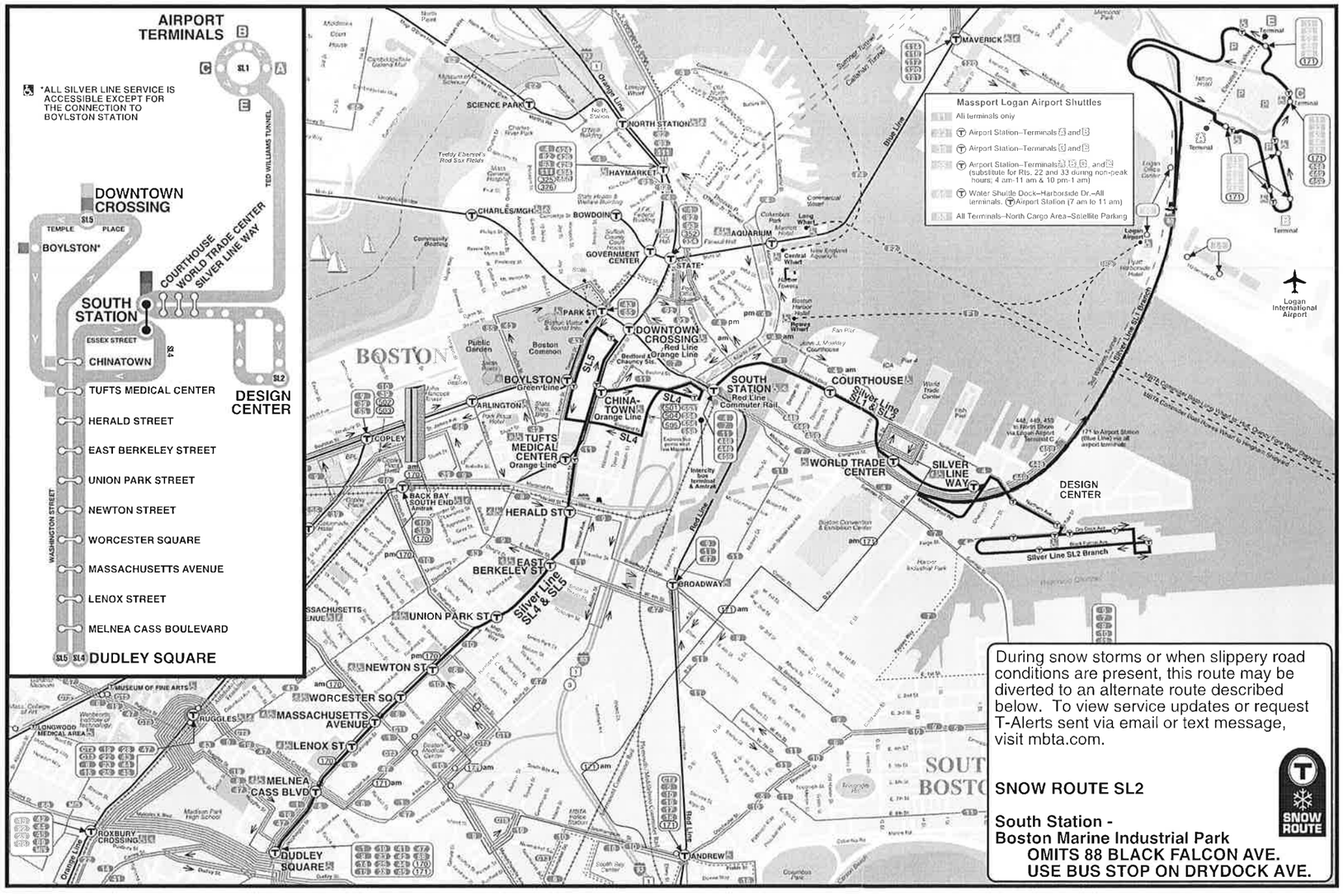
Apply I-84 factor to stations: 3290,3921,3929

ROUND OFF

0 - 999.....10
> 1,000.....100

PUBLIC TRANSPORTATION SCHEDULES

Silver Line



During snow storms or when slippery road conditions are present, this route may be diverted to an alternate route described below. To view service updates or request T-Alerts sent via email or text message, visit mbta.com.

SNOW ROUTE SL2

South Station -
Boston Marine Industrial Park
OMITS 88 BLACK FALCON AVE.
USE BUS STOP ON DRYDOCK AVE.

SILVER LINE

FALL September 1, 2012 - December 28, 2012

SL1 Logan Airport - South Station

SL2 Design Center - South Station

SL4 Dudley Station - South Station
at Essex Street

SL5 Dudley Station - Downtown Crossing
at Temple Place

Serving: Federal Courthouse, World Trade Ctr., Silver Line Way, all Logan Airport terminals, Dudley Sta. and connection to the Red Line



Arrive times are approximate, subject to traffic.

Customer Service/Travel Info 617-222-3200
Toll Free.....1-800-392-6100
Hearing Impaired (TTY).....617-222-5146

For more schedule or travel information, visit:
www.mbta.com

Massachusetts Bay Transportation Authority

massDOT Massachusetts Department of Transportation

SL1 WEEKDAY

Leave South Station	Arrive World Trade Ctr.	Lv/Arrive Logan Term. A	Arrive Logan Term. E	Arrive South Station
.....	.....	5:38A	5:47A	6:01A
5:40A	5:44A	5:55	6:04	6:18
5:50	5:54	6:05	6:14	6:28
Every 15 Minutes				
6:50	6:54	7:05	7:14	7:28
7:00	7:04	7:15	7:24	7:38
Every 10 Minutes				
12:00N	**12:04P**	**12:15P**	**12:24P**	**12:38P**
Every 10 Minutes				
8:00P	**8:04P**	**8:15P**	**8:26P**	**8:40P**
Every 12 Minutes				
11:36P	**11:40P**	**11:51P**	12:02A	12:16A
11:48	**11:52**	12:03A	12:14	c 12:28
12:00M	12:04A	12:15	12:26	de12:40
12:15A	12:19	12:30	12:41	12:55
12:30	12:34	12:45	12:56	1:10

SL1 SATURDAY

Leave South Station	Arrive World Trade Ctr.	Lv/Arrive Logan Term. A	Arrive Logan Term. E	Arrive South Station
.....	.....	5:33A	5:41A	5:54A
5:35A	5:39A	5:50	5:58	6:11
5:45	5:49	6:00	6:08	6:21
6:00	6:04	6:15	6:23	6:36
Every 12 Minutes				
12:00N	**12:04P**	**12:15P**	**12:26P**	**12:39P**
Every 12 Minutes				
11:36P	**11:40P**	**11:51P**	12:00M	12:13A
11:48	**11:52**	12:03A	12:12A	c 12:25
12:00M	12:04A	12:15	12:24	de12:37
12:15A	12:19	12:30	12:39	12:52
12:30	12:34	12:45	12:54	1:07

SL1 SUNDAY

Leave South Station	Arrive Trade Ctr.	Lv/Arrive Logan Term. A	Arrive Logan Term. E	Arrive South Station
.....	.....	5:50A	5:57A	6:11A
.....	.....	6:00	6:07	6:21
.....	.....	6:15	6:22	6:36
6:12A	6:16A	6:27	6:34	6:48
6:24	6:28	6:39	6:46	7:00
6:36	6:40	6:51	6:58	7:12
6:48	6:52	7:03	7:10	7:24
7:00	7:04	7:15	7:22	7:36
Every 12 Minutes				
12:00N	**12:04P**	**12:15P**	**12:25P**	**12:39P**
Every 8 Minutes				
11:44P	**11:48P**	**11:59P**	12:10A	12:24A
11:52	**11:56**	12:07A	12:18	c 12:32
12:00M	12:04A	12:15	12:26	de 12:40
12:10A	12:14	12:25	12:36	12:50
12:20	12:24	12:35	12:46	1:00
12:30	12:34	12:45	12:56	1:10

c - Last connection for Red Line to Braintree.
d - Last connection for Red Line to Alewife.
e - Last connection for Red Line to Ashmont.
w- Waits for last train to arrive at South Station.

SL2 WEEKDAY

INBOUND		OUTBOUND	
Leave Design Center	Arrive South Station	Leave South Station	Arrive Design Center
6:03A	6:12A	5:45A	5:59A
6:17	6:26	5:55	6:09
6:22	6:31	6:03	6:17
6:32	6:41	6:13	6:27
6:37	6:46	6:18	6:32
6:47	6:56	6:28	6:42
6:52	7:01	6:33	6:47
6:57	7:06	6:38	6:52
7:02	7:11	6:43	6:57
7:07	7:16	6:48	7:02
Every 5 Minutes		*Every 5 Minutes*	
9:17	9:26	9:08	9:22
9:24	9:33	9:18	9:32
9:34	9:43	9:28	9:42
9:44	9:53	9:35	9:49
9:54	10:03	9:45	9:59
10:04	10:13	9:55	10:09
10:14	10:23	10:05	10:19
10:24	10:33	10:15	10:29
10:34	10:43	10:25	10:39
10:44	10:53	10:35	10:49
10:54	11:03	10:45	10:59
11:04	11:13	10:55	11:09
11:14	11:23	11:05	11:19
11:24	11:33	11:15	11:29
11:34	11:43	11:25	11:39
11:44	11:53	11:35	11:49
11:54	**12:03P**	11:45	11:59
		11:55	**12:09P**
12:04P	**12:13P**	**12:05P**	**12:19P**
12:14	**12:23**	**12:15**	**12:25**
12:24	**12:33**	**12:25**	**12:35**
12:29	**12:43**	**12:35**	**12:45**
Every 10 Minutes		***Every 10 Minutes***	
3:59	**4:14**	**4:15**	**4:25**
4:07	**4:22**	**4:23**	**4:33**
4:12	**4:27**	**4:28**	**4:38**
4:17	**4:32**	**4:33**	**4:43**
4:22	**4:37**	**4:38**	**4:48**
4:27	**4:42**	***Every 5 Minutes***	
4:32	**4:47**	**7:03**	**7:13**
4:37	**4:52**	**7:08**	**7:18**
4:42	**4:57**	**7:13**	**7:23**
4:47	**5:02**	**7:18**	**7:28**
Every 5 Minutes		**7:23**	**7:33**
7:07	**7:21**	**7:33**	**7:43**
7:14	**7:28**	**7:43**	**7:53**
7:23	**7:37**	**7:53**	**8:03**
7:32	**7:46**	**8:02**	**8:12**
7:38	**7:52**	***Every 15 Minutes***	
7:47	**7:59**	**11:02**	**11:12**
7:56	**8:10**	**11:17**	**11:27**
8:05	**8:19**	**11:32**	**11:42**
8:15	**8:28**	**11:47**	**11:57**
Every 15 Minutes		12:02A	12:12A
11:15	**11:28**	12:17	12:27
11:30	**11:43**	12:32	12:42
11:45	**11:58**	w 12:50	1:00
12:00M	12:13A		
12:15A	12:28		
12:30	12:43		

SL2 SATURDAY

INBOUND		OUTBOUND	
Leave Design Center	Arrive South Station	Leave South Station	Arrive Design Center
6:10A	6:19A	5:50A	6:05A
6:25	6:34	6:05	6:20
6:40	6:49	6:20	6:35
6:55	7:04	6:35	6:50
7:10	7:19	6:50	7:05
Every 15 Minutes		7:05	7:20
11:10	11:19	*Every 15 Minutes*	
11:25	11:34	11:05	11:20
11:40	11:49	11:20	11:35
11:55	**12:04P**	11:35	11:50
		11:50	**12:05P**
12:10P	**12:19P**		
12:20	**12:34**	**12:05P**	**12:15P**
Every 15 Minutes		**12:20**	**12:30**
10:20	**10:33**	***Every 15 Minutes***	
10:35	**10:48**	**10:20**	**10:30**
10:50	**11:03**	**10:35**	**10:45**
11:05	**11:18**	**10:50**	**11:00**
11:20	**11:33**	**11:05**	**11:15**
11:35	**11:48**	**11:20**	**11:30**
11:50	12:03A	**11:35**	**11:45**
12:05A	12:18	**11:50**	12:00M
12:35	12:48	12:20A	12:30A
		w12:48	12:58

SL2 SUNDAY

INBOUND		OUTBOUND	
Leave Design Center	Arrive South Station	Leave South Station	Arrive Design Center
6:50A	7:04A	6:35A	6:45A
Every 15 Minutes		*Every 15 Minutes*	
11:50	**12:04P**	11:50	**12:00P**
12:05P	**12:19P**	**12:05P**	**12:15P**
Every 15 Minutes		***Every 15 Minutes***	
4:50	**5:04**	**5:05**	**5:15**
5:04	**5:18**	**5:19**	**5:29**
5:20	**5:34**	**5:35**	**5:45**
Every 15 Minutes		***Every 15 Minutes***	
6:50	**7:04**	**7:05**	**7:15**
7:04	**7:18**	**7:19**	**7:29**
7:20	**7:34**	**7:35**	**7:45**
Every 15 Minutes		***Every 15 Minutes***	
8:50	**9:03**	**9:05**	**9:15**
9:04	**9:17**	**9:19**	**9:29**
9:20	**9:33**	**9:35**	**9:45**
Every 15 Minutes		***Every 15 Minutes***	
10:50	**11:03**	**11:05**	**11:15**
11:05	**11:18**	**11:19**	**11:29**
11:20	**11:33**	**11:35**	**11:45**
11:45	**11:58**	**11:59**	12:09A
12:10A	12:23A	12:24A	12:34
12:34	12:47	w12:48	12:58

WEEKDAY/SATURDAY NOTE (SL2): Before noon, SL2 loops the Design Ctr. on the outbound trip. After noon, SL2 makes the loop on the inbound trip.

Additional Waterfront service: Runs every 5 min. between So. Station & Silver Line Way during weekday peak periods.

SL4 WEEKDAY

INBOUND		OUTBOUND	
Leave Dudley Station	Arrive Essex St at South Station	Leave Essex St at South Station	Arrive Dudley Station
5:20A	5:33A	5:40A	5:52A
5:40	5:53	6:00	6:12
6:00	6:13	6:15	6:30
6:16	6:29	6:30	6:45
6:30	6:45	6:40	6:55
6:39	6:54	6:50	7:05
6:49	7:04	7:00	7:15
6:57	7:12	7:10	7:25
7:07	7:22	7:20	7:35
7:15	7:30	7:28	7:43
7:25	7:41	7:38	7:53
7:33	7:49	7:46	8:01
7:43	7:59	7:56	8:11
7:51	8:08	8:04	8:19
8:01	8:20	8:14	8:29
8:09	8:28	8:22	8:38
8:19	8:38	8:32	8:50
8:27	8:46	8:40	8:58
8:37	8:56	8:50	9:08
8:45	9:04	8:58	9:16
8:54	9:13	9:06	9:24
9:06	9:25	9:15	9:33
9:21	9:40	9:27	9:45
9:30	9:49	*Every 15 Min. or less*	
Every 15 Min. or less		11:51	**12:11P**
11:54	**12:13P**		
		12:06P	**12:26P**
12:06P	**12:25P**	**12:15**	**12:35**
12:21	**12:40**	**12:27**	**12:47**
12:30	**12:49**	**12:42**	**1:02**
12:42	**1:02**	**12:51**	**1:11**
12:57	**1:15**	**1:04**	**1:24**
1:06	**1:25**	**1:19**	**1:39**
1:21	**1:40**	**1:29**	**1:49**
1:30	**1:49**	**1:44**	**2:04**
1:45	**2:04**	***Every 15 Min. or less***	
Every 15 Min. or less		**3:19**	**3:39**
3:52	**4:11**	**3:26**	**3:46**
3:59	**4:18**	**3:37**	**3:57**
4:10	**4:29**	**3:44**	**4:04**
4:17	**4:36**	**3:55**	**4:15**
4:28	**4:47**	***Every 11 Min. or less***	
Every 11 Min. or less		**6:26**	**6:44**
6:05	**6:22**	**6:37**	**6:55**
6:16	**6:32**	**6:46**	**7:04**
6:26	**6:42**	**6:57**	**7:15**
6:37	**6:53**	**7:06**	**7:24**
6:45	**7:01**	**7:15**	**7:33**
6:55	**7:10**	**7:30**	**7:44**
7:10	**7:25**	**7:45**	**7:59**
7:25	**7:40**	**8:00**	**8:14**
7:40	**7:55**	**8:15**	**8:28**
7:55	**8:08**	***Every 20 Minutes***	
8:15	**8:28**	**11:55**	12:08A
Every 20 Minutes		12:20A	12:32
11:55	12:07A		
12:20A	12:32		

ALL BUSES ARE ACCESSIBLE TO PERSONS WITH DISABILITIES.

Silver Line

SL4 SATURDAY

INBOUND		OUTBOUND	
Leave Dudley Station	Arrive Essex St at South Sta.	Leave Essex St at South Sta.	Arrive Dudley Station
5:20A	5:32A	5:40A	5:52A
5:40	5:52	6:00	6:12
6:00	6:12	6:20	6:32
Every 15 Minutes		*Every 15 Minutes*	
11:00	11:17	11:05	11:22
11:15	11:32	11:20	11:37
11:30	11:47	11:35	11:52
11:45	**12:02P**	11:50	**12:07P**
12:00N	**12:17P**	**12:05P**	**12:22P**
12:15	**12:32**	**12:20**	**12:37**
12:30	**12:47**	**12:35**	**12:52**
12:45	**1:02**	**12:50**	**1:07**
1:00	**1:17**	**1:05**	**1:22**
Every 15 Minutes		***Every 15 Minutes***	
7:00	**7:14**	**8:05**	**8:19**
7:15	**7:29**	**8:20**	**8:34**
7:30	**7:44**	**8:40**	**8:54**
7:45	**7:59**	**9:00**	**9:14**
8:00	**8:13**	***Every 20 Minutes***	
Every 20 Minutes		**11:00**	**11:13**
11:00	**11:12**	**11:20**	**11:33**
11:20	**11:32**	**11:40**	**11:53**
11:40	**11:52**	12:00M	12:13A
12:00M	12:12A	12:20A	12:33
12:20A	12:32	12:40	12:53

SL4 SUNDAY

INBOUND		OUTBOUND	
Leave Dudley Station	Arrive Essex St at South Sta.	Leave Essex St at South Sta.	Arrive Dudley Station
6:00A	6:12A	6:20A	6:32A
6:15	6:27	6:35	6:47
Every 15 Minutes		*Every 15 Minutes*	
11:30	11:45	11:35	11:50
11:45	**12:00N**	11:50	**12:05P**
12:00N	**12:15P**	**12:05P**	**12:20P**
12:15P	**12:30**	**12:20**	**12:35**
Every 15 Minutes		***Every 15 Minutes***	
7:45	**7:57**	**8:05**	**8:17**
8:00	**8:12**	**8:20**	**8:32**
8:20	**8:32**	**8:40**	**8:52**
Every 20 Minutes		***Every 20 Minutes***	
11:00	**11:12**	**11:20**	**11:32**
11:20	**11:32**	**11:40**	**11:52**
11:40	**11:52**	12:00M	12:12A
12:00M	12:12A	12:20A	12:32
12:20A	12:32	12:40	12:52

Fall 2012 Holidays:
Sept. 3 - See Sunday
Oct. 8 - See Weekday
Nov. 12 - See Weekday
Nov. 22 - See Sunday
Dec. 25 - See Sunday

SL5 WEEKDAY

INBOUND		OUTBOUND	
Leave Dudley Station	Arrive Temple Pl at Downtown	Leave Temple Pl at Downtown	Arrive Dudley Station
5:15A	5:28A	5:30A	5:41A
5:27	5:40	5:46	5:57
5:37	5:50	5:52	6:03
5:47	6:00	6:06	6:17
5:57	6:10	6:12	6:25
6:06	6:19	6:21	6:35
6:13	6:26	6:28	6:42
6:24	6:38	6:39	6:53
6:33	6:47	6:48	7:02
6:42	6:56	6:57	7:11
6:46	7:00	7:05	7:19
6:53	7:07	7:14	7:28
7:00	7:14	7:18	7:32
Every 4 - 7 Minutes		*Every 4 - 8 Minutes*	
8:41	9:00	9:02	9:18
8:49	9:09	9:13	9:29
9:00	9:19	9:22	9:38
Every 6 - 11 Minutes		*Every 6 - 11 Minutes*	
11:40	**11:58P**	11:46	**12:04P**
11:49	**12:08**	11:56	12:15
12:00N	**12:20P**	**12:02P**	**12:21P**
Every 5 - 11 Minutes		***Every 5 - 11 Minutes***	
3:02	**3:21**	**3:23**	**3:42**
Every 5 - 7 Minutes		***Every 5 - 7 Minutes***	
6:08	**6:25**	**6:31**	**6:47**
6:13	**6:30**	**6:36**	**6:52**
Every 10 Min. or less		***Every 10 Min. or less***	
9:00	**9:13**	**9:08**	**9:22**
9:12	**9:25**	**9:18**	**9:32**
9:24	**9:36**	**9:28**	**9:42**
9:38	**9:50**	**9:38**	**9:52**
9:48	**10:00**	**9:50**	**10:04**
10:00	**10:12**	**10:02**	**10:16**
Every 15 Min. or less		***Every 15 Min. or less***	
11:48	12:00M	12:02A	12:13A
12:03A	12:15A	12:17	12:28
12:18	12:30	12:32	12:43
12:33	12:45	12:47	12:58
12:48	1:00	w 1:02	1:13

SL5 SATURDAY

INBOUND		OUTBOUND	
Leave Dudley Station	Arrive Temple Pl at Downtown	Leave Temple Pl at Downtown	Arrive Dudley Station
5:19A	5:31A	5:34A	5:45A
5:27	5:39	5:44	5:55
5:35	5:47	5:50	6:01
Every 12 Min. or less		*Every 12 Min. or less*	
11:48	**12:04P**	11:45	**12:01P**
11:57	**12:13**	11:57	**12:13**
12:04P	**12:20P**	**12:09P**	**12:25P**
Every 10 Min. or less		***Every 10 Min. or less***	
5:11	**5:20**	**5:08**	**5:24**
Every 11 Min. or less		***Every 11 Min. or less***	
11:42	**11:54**	**11:56**	12:09A
11:49	12:01A	12:05A	12:18
11:56	12:08	12:13	12:26
12:07A	12:19	12:24	12:37
12:16	12:28	12:30	12:43
12:25	12:37	12:39	12:52
12:34	12:46	12:48	1:01
12:46	12:58	w 1:00	1:13

SL5 SUNDAY

INBOUND		OUTBOUND	
Leave Dudley Station	Arrive Temple Pl at Downtown	Leave Temple Pl at Downtown	Arrive Dudley Station
6:00A	6:12A	6:15A	6:26A
Every 10 Min. Until		*Every 10 - 11 Minutes*	
11:30	11:45	11:49	**12:03P**
11:39	11:54	11:58	**12:12P**
11:48	**12:03P**	**12:07P**	**12:21P**
11:56	**12:11**	***Every 7 - 9 Minutes***	
12:04P	**12:19P**	**11:52**	12:03A
Every 8 - 9 Minutes		12:02A	12:13
11:55	12:07A	12:12	12:23
12:04A	12:16	12:22	12:33
12:13	12:25	12:32	12:43
12:25	12:37	w12:47	12:58

FARES

Paying with...	1-Veh. Trip SL1, SL2 or Subway	2-Veh. Trip Local Bus + SL1 or SL2	1-Bus Trip SL4, SL5 or Local Bus	2-Bus Trip SL4, SL5 + Local Bus	2 Veh. Trip SL1 or SL2 + Subway
CharlieCard	$2.00	$2.00	$1.50	$1.50	$2.00
CharlieTicket	$2.50	$4.50	$2.00	$2.00	$4.50
Cash on board	$2.50	$4.50	$2.00	$4.00	$4.50
Student CharlieCard*	$1.00	$1.00	$0.75	$0.75	$1.00
Senior/TAP CharlieCard**	$1.00	$1.00	$0.75	$0.75	$1.00

Children under 12 ride free when accompanied by an adult.
Blind Access CharlieCard holders ride free, if using a guide, the guide rides free.

VALID PASSES on SL1, SL2: LinkPass ($70/mo.); Senior/TAP Pass** ($28/mo.); Student Pass* ($25/mo.M-F only or $28/mo. 7 days); express bus, commuter rail, and boat passes.

VALID PASSES on SL4, SL5: Local Bus Pass ($48/mo.); LinkPass ($70/mo.); Student Pass* ($25/mo.M-F only or $28/mo. 7 days); Senior/TAP Pass** ($28/mo.); and express bus, zoned, interzoned, and boat passes

* Available to students through participating middle schools and high schools.
**Available to Medicare cardholders, seniors 65+, and persons with disabilities.

Massachusetts Bay Transportation Authority

Silver Line Way Station

Silver Line Way at Pumphouse Rd. between Massport Haul Rd. and D Street, South Boston Waterfront

This MBTA station is accessible (Accessibility Key)

Street level

Parking

Parking Spaces: N/A

Average Weekday Availability:

Parking Rate: N/A

Accessible Spaces: N/A

Bike Spaces: N/A

Managed By:N/A

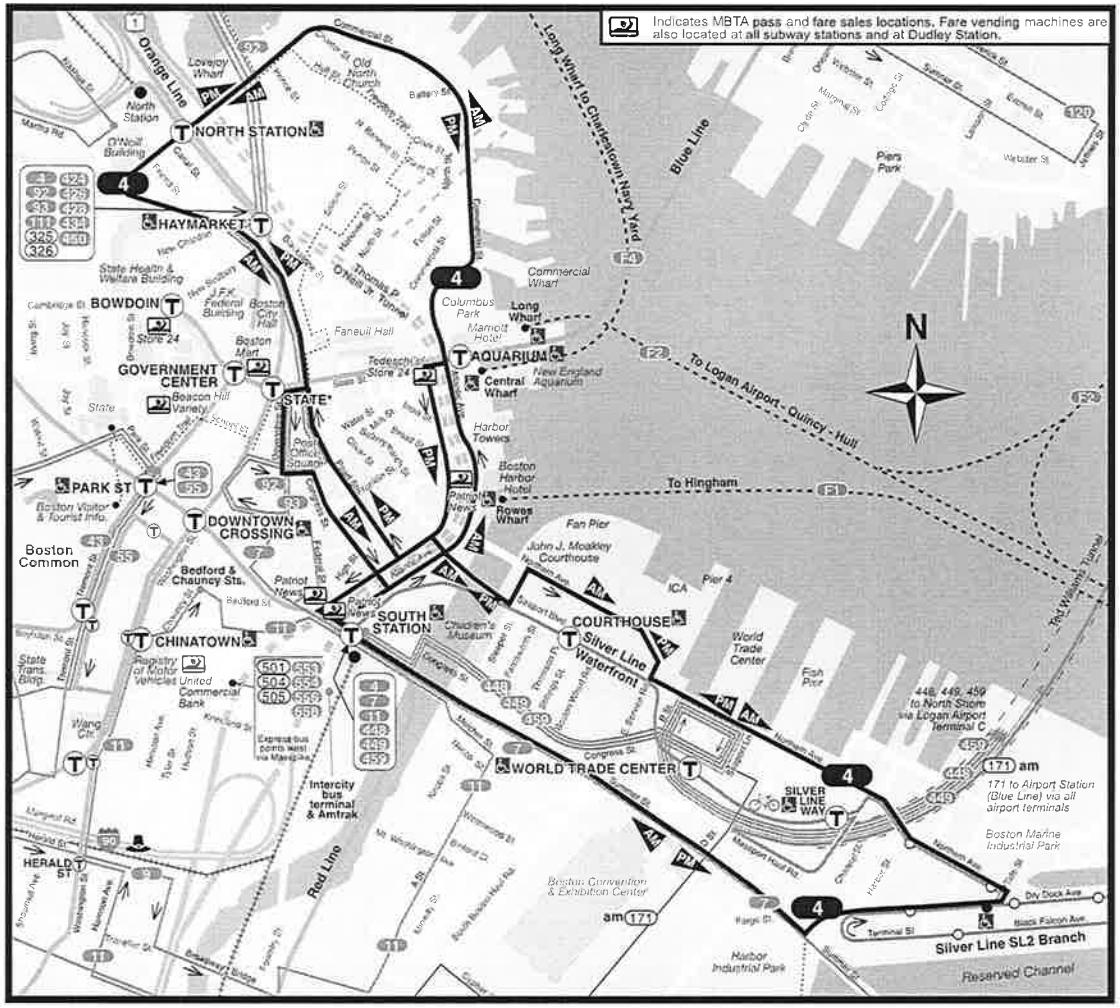
Comments:
No MBTA parking. Street or private parking may exist.

Subway Lines

Silver Line



Route 4 *North Station - Tide Street* *via World Trade Center*



schedule change

4

FALL September 1, 2012 - December 28, 2012

North Station - Tide Street

via World Trade Center

Serving: Federal Court House, Children's Museum, Quincy Market and connections to the Red, Green, Blue, Orange & Silver Lines and Commuter Rail



Arrive times are approximate, subject to traffic.

Customer Service/Travel Info 617-222-3200
Toll Free.....1-800-392-6100
Hearing Impaired (TTY).....617-222-5146

For more schedule or travel information, visit:
www.mbta.com

Massachusetts Bay Transportation Authority

massDOT Massachusetts Department of Transportation

WEEKDAY

INBOUND				OUTBOUND			
Leave North Station	Arrive South Station	Arrive World Trade Ctr.	Arrive Tide Street	Leave Tide Street	Arrive World Trade Ctr.	Arrive South Station	Arrive North Station
6:44A	.....	6:58A	7:01A	6:25A	.....	6:28A	6:39A
7:08	.....	7:22	7:25	6:49	.....	6:52	7:03
7:21	.....	7:35	7:38	7:01	.....	7:04	7:15
7:33	.....	7:47	7:51	7:14	.....	7:17	7:28
7:45	.....	8:01	8:05	7:25	.....	7:28	7:39
7:58	.....	8:14	8:18	7:38	.....	7:41	7:55
8:13	.....	8:34	8:38	7:51	.....	7:54	8:09
8:28	.....	8:49	8:53	8:05	.....	8:08	8:23
8:44	.....	9:03	9:06	8:18	.....	8:21	8:36
9:05	.....	9:21	9:24	8:38	.....	8:41	8:56
3:52P	**4:07P**	**.....**	**4:17P**	**3:30P**	**3:31P**	**.....**	**3:52P**
4:12	**4:27**	**.....**	**4:37**	**3:50**	**3:51**	**.....**	**4:12**
4:32	**4:47**	**.....**	**4:57**	**4:10**	**4:11**	**.....**	**4:32**
4:52	**5:07**	**.....**	**5:17**	**4:30**	**4:31**	**.....**	**4:52**
5:12	**5:27**	**.....**	**5:37**	**4:50**	**4:51**	**.....**	**5:12**
5:32	**5:47**	**.....**	**5:57**	**5:10**	**5:11**	**.....**	**5:32**
5:52	**6:07**	**.....**	**6:17**	**5:30**	**5:31**	**.....**	**5:52**
6:12	**6:27**	**.....**	**6:37**	**5:50**	**5:51**	**.....**	**6:12**
6:32	**6:47**	**.....**	**6:57**	**6:10**	**6:11**	**.....**	**6:32**

ALL BUSES ARE ACCESSIBLE TO PERSONS WITH DISABILITIES.

Route 4
North Station - Tide Street via World Trade Center

NO SERVICE ON WEEKENDS OR HOLIDAYS

For Weekend service to the South Boston Waterfront, please use the Silver Line, which serves South Station, Courthouse, World Trade Center, Silver Line Way, and the Boston Marine Industrial Park.

FARES

Paying with...	1-bus trip	2-bus trip	Bus + subway trip
CharlieCard	$1.50	$1.50	$2.00
CharlieTicket	$2.00	$2.00	$4.50
Cash onboard	$2.00	$4.00	$4.50
Student CharlieCard*	$0.75	$0.75	$1.00
Senior/TAP CharlieCard**	$0.75	$0.75	$1.00

Children under 12 ride free when accompanied by an adult.
Blind Access CharlieCard holders ride free; if using a guide, the guide rides free.

VALID PASSES: Local Bus Pass ($48/mo.); LinkPass ($70/mo.); Senior/TAP Pass** ($28/mo.); Student Pass* ($25/mo. M-F only or $28/mo. 7 days); express bus, commuter rail, and boat passes.

* Available to students through participating middle schools and high schools.
** Available to Medicare cardholders, seniors 65+ and persons with disabilities.

Fall 2012 Holidays

Oct. 8: See Sat. Sept. 3, Nov. 22, Dec. 25: See Sun. Nov. 12: See Weekday

MASSDOT CRASH RATE WORKSHEETS

Moving Massachusetts Forward. massDOT Highway

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : **Boston** COUNT DATE : Aug-12

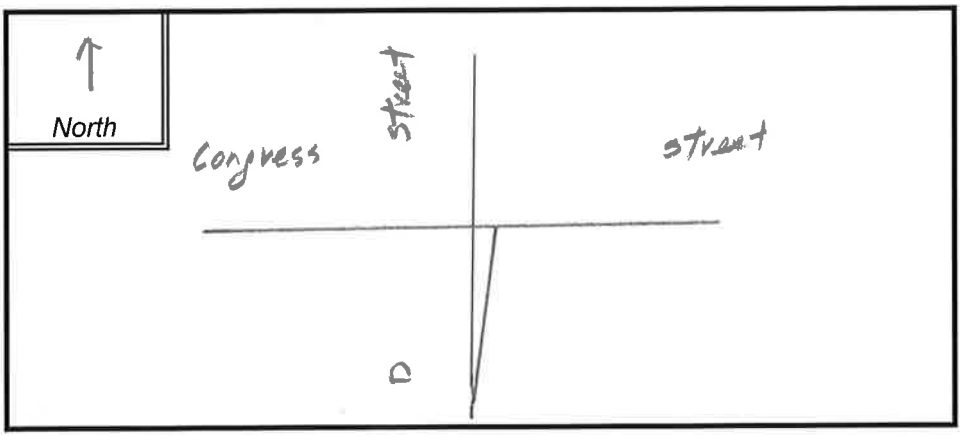
DISTRICT : 6 UNSIGNALIZED : [ ] SIGNALIZED : [X]

~ INTERSECTION DATA ~

MAJOR STREET : Congress Street

MINOR STREET(S) : D Street

INTERSECTION DIAGRAM
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	NB	SB		
PEAK HOURLY VOLUMES (PM) :	721	304	405	420		**1,850**

" K " FACTOR : **0.090**

INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **20,556**

TOTAL # OF CRASHES : 8

OF YEARS : 3

AVERAGE # OF CRASHES PER YEAR (**A**) : **2.67**

CRASH RATE CALCULATION : **0.36**

RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : Below District 6 crash rate

Project Title & Date: Proposed Mixed-Use Development - 12/12/12

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : **Boston** COUNT DATE : Aug-12

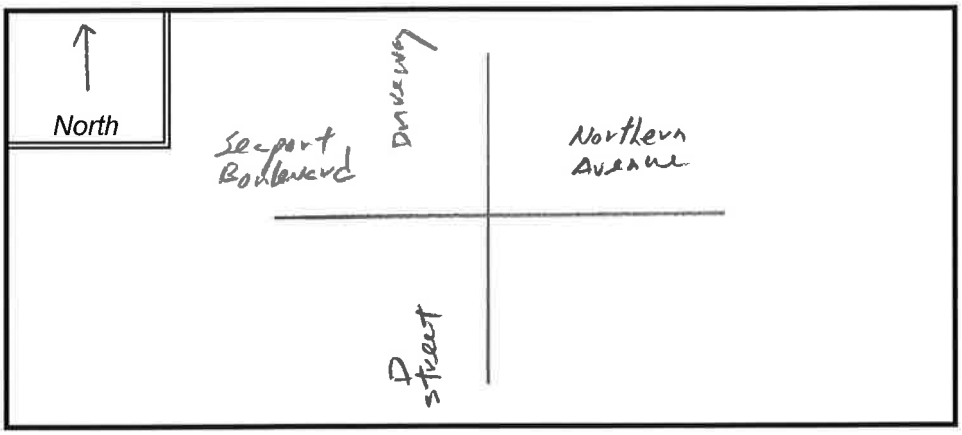
DISTRICT : 6 UNSIGNALIZED : [ ] SIGNALIZED : [X]

~ INTERSECTION DATA ~

MAJOR STREET : Seaport Boulevard/Northern Avenue

MINOR STREET(S) : D Street

INTERSECTION DIAGRAM
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	NB	SB		
PEAK HOURLY VOLUMES (PM) :	513	434	175	72		**1,194**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **13,267**

TOTAL # OF CRASHES : 2 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **0.67**

CRASH RATE CALCULATION : **0.14** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : Below District 6 crash rate

Project Title & Date: Proposed Mixed-Use Development - 12/12/12

Moving Massachusetts Forward
massDOT
Highway

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : **Boston** COUNT DATE : Aug-12

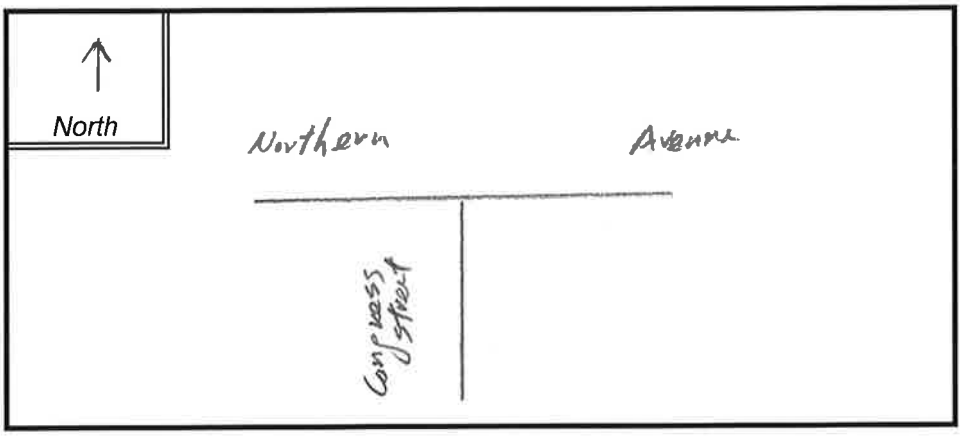
DISTRICT : 6 UNSIGNALIZED : X SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : Seaport Boulevard/Northern Avenue

MINOR STREET(S) : Congress Street

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	NB	SB		
PEAK HOURLY VOLUMES (PM) :	268	446	157	0		**871**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **9,678**

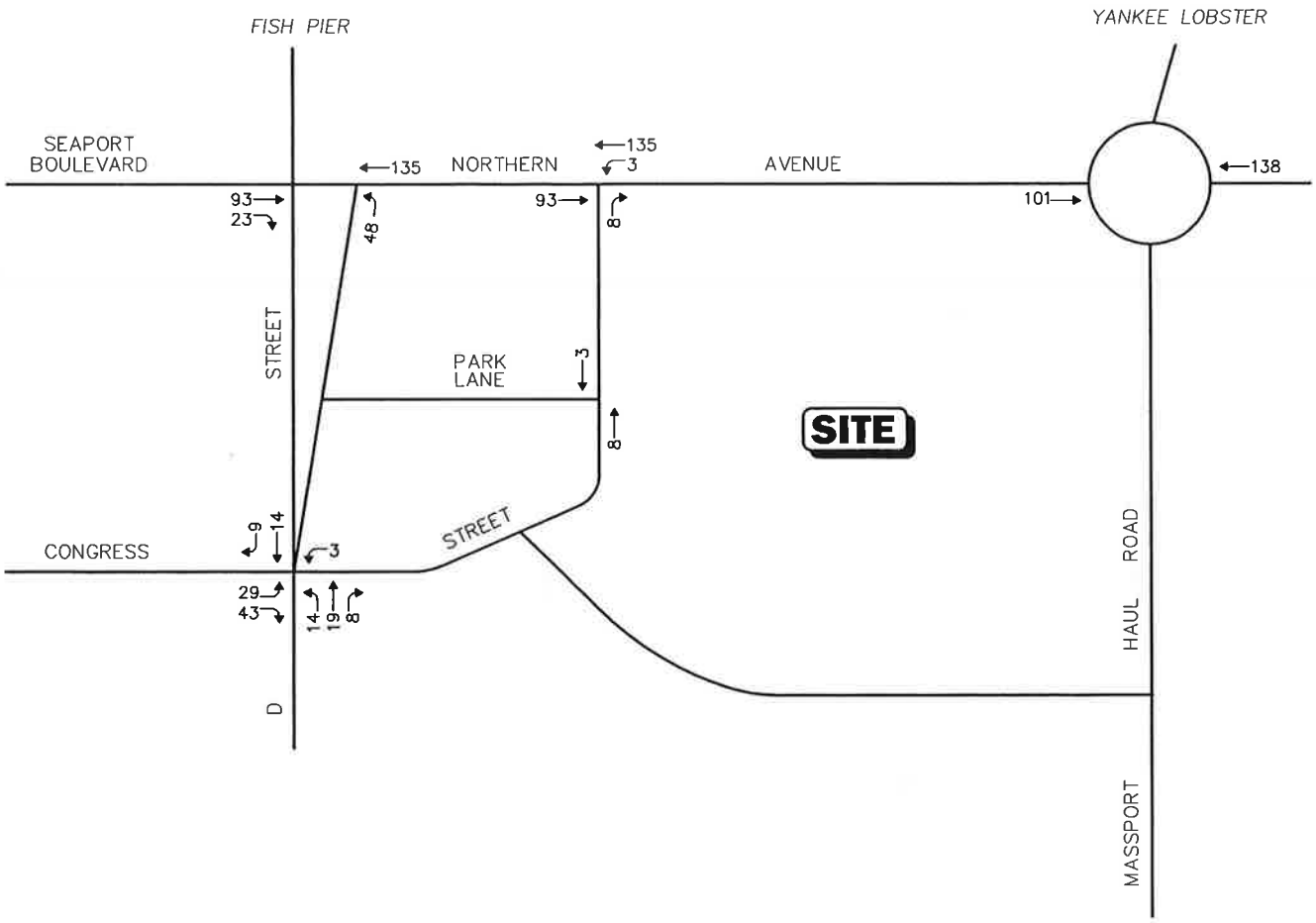
TOTAL # OF CRASHES : 2 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **0.67**

CRASH RATE CALCULATION : **0.19** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : Below District 6 crash rate

Project Title & Date: Proposed Mixed-Use Development - 12/12/12

TOTAL BACKGROUND DEVELOPMENT TRAFFIC-VOLUME NETWORKS



Not To Scale

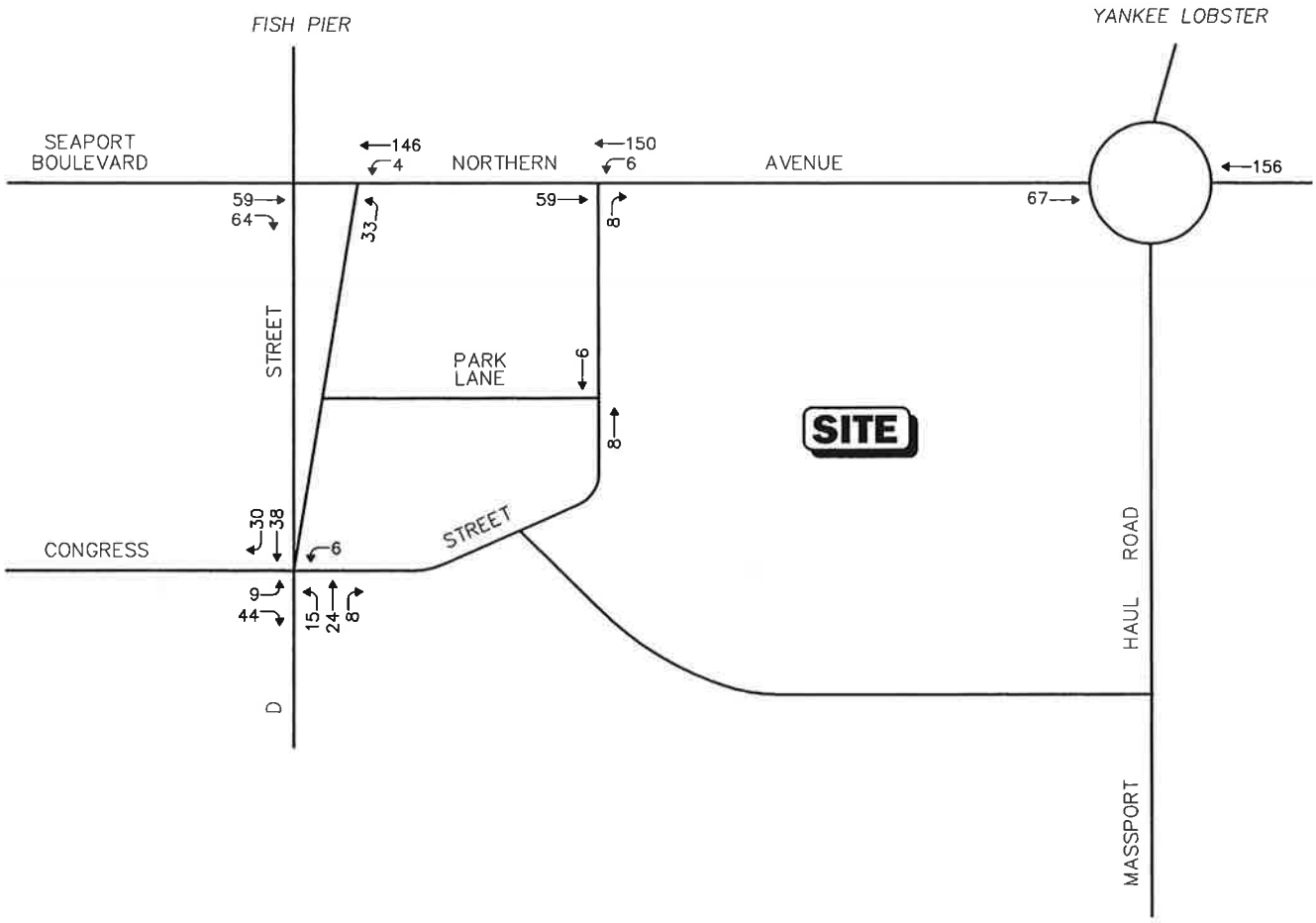
Figure A-1

Total Background Developments
Weekday Morning
Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners

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Not To Scale

Figure A-2

Total Background Developments
Weekday Evening
Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners

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TRIP-GENERATION CALCULATIONS

Institute of Transportation Engineers (ITE)
Trip Generation, 9 th Edition
Land Use Code (LUC) 222 - High-Rise Apartment

Average Vehicle Trips Ends vs: Dwelling Units
Independent Variable (X): 304

AVERAGE WEEKDAY DAILY

Ln T = 0.83 Ln (X) + 2.50
Ln T = 0.83 Ln 304 + (2.50)
Ln T = 7.25
T = 1401.27
T = 1,402 vehicle trips
with 50% (701 vpd) entering and 50% (701 vpd) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

Ln T = 0.99 Ln (X) - 1.14
Ln T = 0.99 Ln 304 - (1.14)
Ln T = 4.52
T = 91.82
T = 92 vehicle trips
with 25% (23 vph) entering and 75% (69 vph) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 0.32 * (X) + 12.30
T = 0.32 * 304 + (12.30)
T = 109.58
T = 110 vehicle trips
with 61% (67 vph) entering and 39% (43 vph) exiting.

Institute of Transportation Engineers (ITE)
Trip Generation, 9th Edition
Land Use Code (LUC) 310 - Hotel

Average Vehicle Trips Ends vs: Rooms
Independent Variable (X): 247

AVERAGE WEEKDAY DAILY

T = 8.95 * (X) - 373.16
T = 8.95 * 247 -373.16
T = 1837.49
T = 1,838 vehicle trips
with 50% (919 vpd) entering and 50% (919 vpd) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 0.53 * (X)
T = 0.53 * 247
T = 130.91
T = 131.00 vehicle trips
with 59% (77 vpd) entering and 41% (54 vpd) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 0.60 * (X)
T = 0.60 * 247
T = 148.20
T = 148 vehicle trips
with 51% (75 vpd) entering and 49% (73 vpd) exiting.

Institute of Transportation Engineers (ITE)
Trip Generation, 9 th Edition
Land Use Code (LUC) 710 - General Office Building

Average Vehicle Trips Ends vs: 1,000 Square Feet Gross Floor Area
Independent Variable (X): 16.200

AVERAGE WEEKDAY DAILY

T = 11.03 * (X)
T = 11.03 * 16.200
T = 178.69
T = 180 vehicle trips
with 50% (90 vpd) entering and 50% (90 vpd) exiting.

WEEKDAY MORNING PEAK HOUR

T = 1.56 * (X)
T = 1.56 * 16.200
T = 25.27
T = 25 vehicle trips
with 88% (22 vph) entering and 12% (3 vph) exiting.

WEEKDAY EVENING PEAK HOUR

T = 1.49 * (X)
T = 1.49 * 16.2
T = 24.14
T = 24 vehicle trips
with 17% (4 vph) entering and 83% (20 vph) exiting.

Institute of Transportation Engineers (ITE)
Trip Generation, 9 th Edition
Land Use Code (LUC) 820 - Shopping Center

Average Vehicle Trips Ends vs: 1,000 Square Feet Gross Leasable Area
Independent Variable (X): 17.198

Average Weekday Daily

T = 42.70 * X
T = 42.70 * 17.198
T = 734.35
T = 734 vehicle trips
with 50% (367 vpd) entering and 50% (367 vpd) exiting.

Weekday Morning Peak Hour Of Adjacent Street Traffic

T = 0.96 * (X)
T = 0.96 * 17.198
T = 16.51
T = 17 vehicle trips
with 62% (11 vph) entering and 38% (6 vph) exiting.

Weekday Evening Peak Hour Of Adjacent Street Traffic

T = 3.71 * X
T = 3.71 * 17.198
T = 63.80
T = 64 vehicle trips
with 48% (31 vph) entering and 52% (33 vph) exiting.

Institute of Transportation Engineers (ITE)
Trip Generation, 9 th Edition
Land Use Code (LUC) 931 - Quality Restaurant

Average Vehicle Trips Ends vs: 1000 SF Gross Floor Area
Independent Variable (X): 7.787

AVERAGE WEEKDAY DAILY

T = 89.95 * (X)
T = 89.95 * 7.787
T = 700.44
T = 700 vehicle trips
with 50% (350 vpd) entering and 50% (350 vpd) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 0.81 * (X)
T = 0.81 * 7.787
T = 6.31
T = 6 vehicle trips
with 50% (3 vph) entering and 50% (3 vph) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 7.49 * (X)
T = 7.49 * 7.787
T = 58.32
T = 58 vehicle trips
with 67% (39 vph) entering and 33% (19 vph) exiting.

Table A
PARCEL K
RESIDENTIAL TRIP GENERATION SUMMARY

Time Period/Direction	ITE Trips[a]	Person Trips: Total Person Trips[b]	Person Trips: Automobile Trips (34%)	Person Trips: Transit Trips (24%)	Person Trips: Pedestrian/ Bicycle Trips (42%)	Vehicle Trips: (A) Automobile Trips[c]
Average Weekday Daily:						
Entering	701	841	286	202	353	239
Exiting	701	841	286	202	353	239
Total	1,402	1,682	572	404	706	478
Weekday Morning Peak Hour:						
Entering	23	27	9	7	11	8
Exiting	69	83	28	20	35	23
Total	92	110	37	27	46	31
Weekday Evening Peak Hour:						
Entering	67	80	27	19	34	23
Exiting	43	52	18	13	21	15
Total	110	132	45	32	55	38

[a]Based on ITE LUC 222, *High-Rise Apartment; 304 units.*
[b]ITE vehicle trips x 1.2.
[c]Automobile person trips ÷ 1.2.

Table B
PARCEL K
HOTEL TRIP GENERATION SUMMARY

Time Period/Direction	ITE Trips[a]	Person Trips: Total Person Trips[b]	Person Trips: Automobile Trips (35%)	Person Trips: Transit Trips (22%)	Person Trips: Pedestrian/ Bicycle Trips (43%)	Vehicle Trips: (A) Automobile Trips[c]
Average Weekday Daily:						
Entering	919	1,654	579	364	711	322
Exiting	919	1,654	579	364	711	322
Total	1,838	3,308	1,158	728	1,422	644
Weekday Morning Peak Hour:						
Entering	77	139	48	31	60	27
Exiting	54	97	34	21	42	19
Total	131	236	82	52	102	46
Weekday Evening Peak Hour:						
Entering	75	135	47	30	58	26
Exiting	73	131	46	29	56	26
Total	148	266	93	59	114	52

[a]Based on ITE LUC 310, *Hotel; 247 rooms.*
[b]ITE vehicle trips x 1.8.
[c]Automobile person trips ÷ 1.8.

Table C
PARCEL K
OFFICE TRIP GENERATION SUMMARY

Time Period/Direction	ITE Trips[a]	Person Trips: Total Person Trips[b]	Person Trips: Automobile Trips (60%)	Person Trips: Transit Trips (17%)	Person Trips: Pedestrian/ Bicycle Trips (23%)	Vehicle Trips: (A) Automobile Trips[c]
Average Weekday Daily:						
Entering	90	108	65	18	25	54
Exiting	90	108	65	18	25	54
Total	180	216	130	36	50	108
Weekday Morning Peak Hour:						
Entering	22	26	16	4	6	13
Exiting	3	4	2	1	1	2
Total	25	30	18	5	7	15
Weekday Evening Peak Hour:						
Entering	4	5	3	1	1	2
Exiting	20	24	14	4	6	12
Total	24	29	17	5	7	14

[a]Based on ITE LUC 710, *General Office Building; 16,200 sf.*
[b]ITE vehicle trips x 1.2.
[c]Automobile person trips ÷ 1.2.

Table D
PARCEL K
RETAIL TRIP GENERATION SUMMARY

Time Period/Direction	ITE Trips[a]	Person Trips: Total Person Trips[b]	Person Trips: Automobile Trips (40%)	Person Trips: Transit Trips (6%)	Person Trips: Pedestrian/ Bicycle Trips (54%)	Vehicle Trips: (A) Automobile Trips[c]	Vehicle Trips: (B = A x 0.25) Pass-By Trips (25%)	Vehicle Trips: (C = A-B) New Trips
Average Weekday Daily:								
Entering	367	551	221	33	297	148	37	111
Exiting	367	551	221	33	297	148	37	111
Total	734	1,102	442	66	594	296	74	222
Weekday Morning Peak Hour:								
Entering	11	17	7	1	9	5	1	4
Exiting	6	9	3	1	5	2	1	1
Total	17	26	10	2	14	7	2	5
Weekday Evening Peak Hour:								
Entering	31	46	18	3	25	12	3	9
Exiting	33	50	20	3	27	13	3	10
Total	64	96	38	6	52	25	6	19

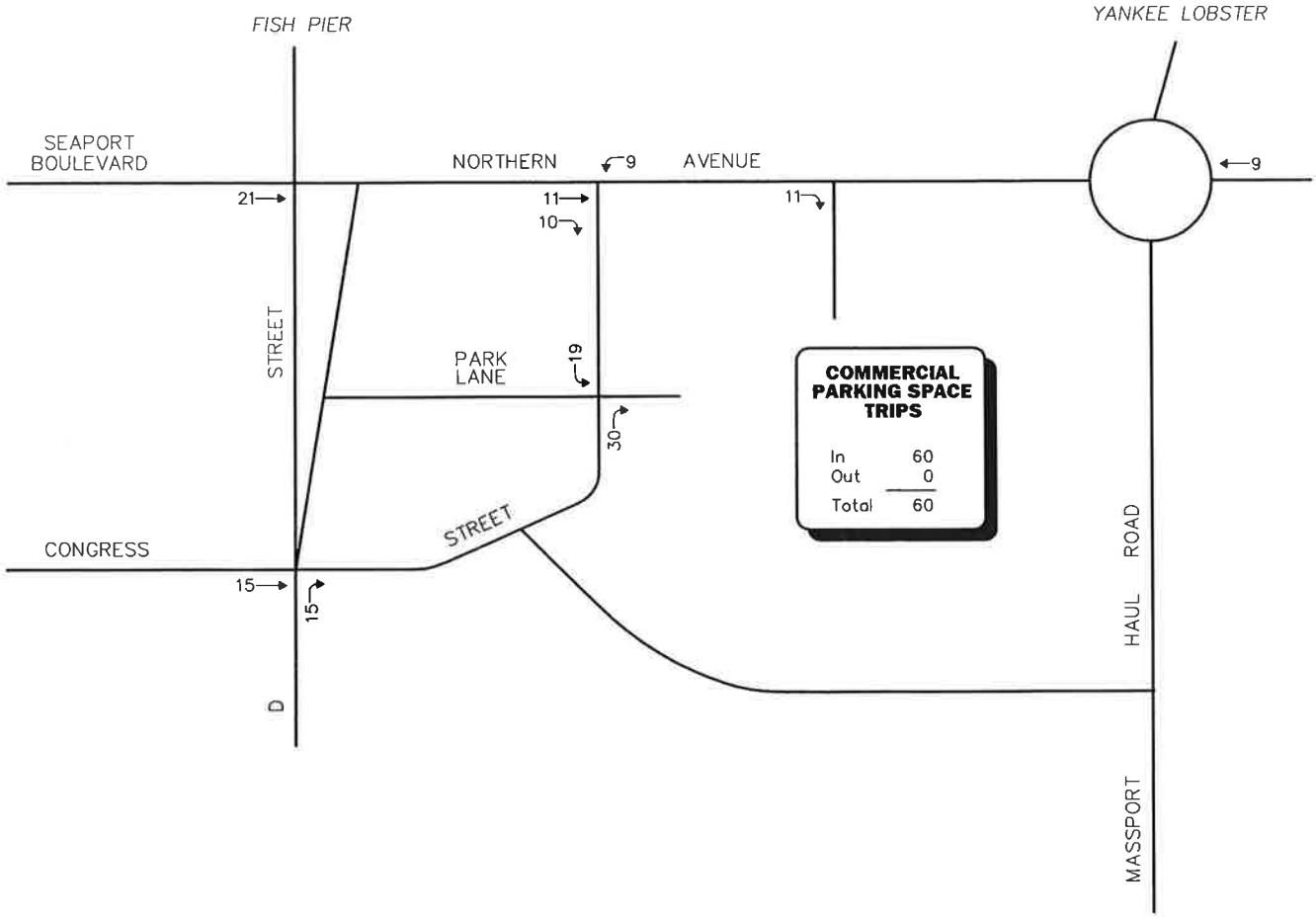
[a]Based on ITE LUC 820, *Shopping Center; 17,198 sf.*
[b]ITE vehicle trips x 1.5.
[c]Automobile person trips ÷ 1.5.

Table E
PARCEL K
RESTAURANT TRIP GENERATION SUMMARY

Time Period/Direction	ITE Trips[a]	Person Trips: Total Person Trips[b]	Person Trips: Automobile Trips (40%)	Person Trips: Transit Trips (6%)	Person Trips: Pedestrian/ Bicycle Trips (54%)	Vehicle Trips: (A) Automobile Trips[c]	Vehicle Trips: (B = A x 0.10) Pass-By Trips (10%)	Vehicle Trips: (C = A-B) New Trips
Average Weekday Daily:								
Entering	350	525	210	32	283	140	35	105
Exiting	350	525	210	32	283	140	35	105
Total	700	1,050	420	64	566	280	70	210
Weekday Morning Peak Hour:								
Entering	3	5	2	0	3	2	0	2
Exiting	3	4	2	0	2	1	0	1
Total	6	9	4	0	5	3	0	3
Weekday Evening Peak Hour:								
Entering	39	59	24	3	32	16	3	13
Exiting	19	28	11	2	15	7	3	4
Total	58	87	35	5	47	23	6	17

[a]Based on ITE LUC 931, *Quality Restaurant; 7,787 sf.*
[b]ITE vehicle trips x 1.5.
[c]Automobile person trips ÷ 1.5.

COMMERCIAL PARKING SPACE TRIP DISTRIBUTION



Not To Scale

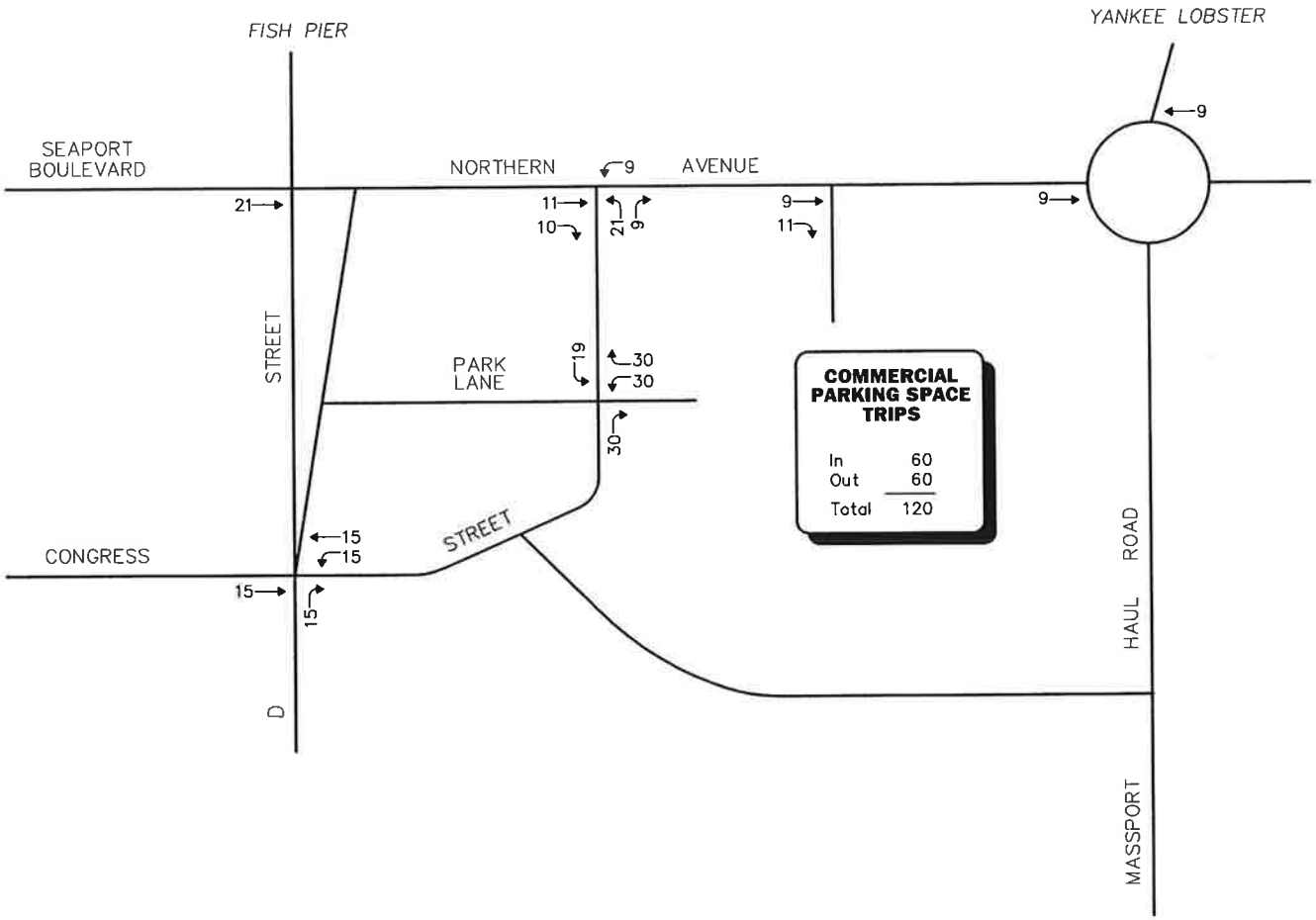
Figure A-3

Commercial Parking Space Trip Distribution Weekday Morning Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners

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Not To Scale

Figure A-4

Commercial Parking Space Trip Distribution Weekday Evening Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners

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CAPACITY ANALYSIS WORKSHEETS

Congress Street at D Street
Seaport Boulevard and Northern Avenue at D Street Southbound
Seaport Boulevard and Northern Avenue at D Street Northbound
Northern Avenue at Congress Street
Congress Street at Park Lane and the Project Driveway
Northern Avenue at Haul Road
Northern Avenue at the Project Driveway

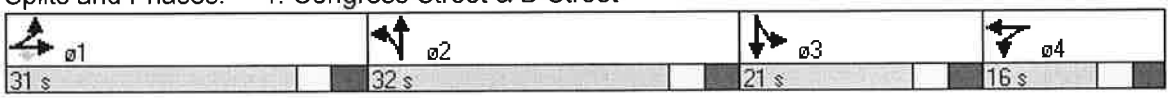
Congress Street at D Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↱		↕		↰	↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50		50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1350			1150			1485			400	
Travel Time (s)		30.7			26.1			33.8			9.1	
Volume (vph)	80	273	339	61	106	68	379	137	35	21	118	19
Lane Group Flow (vph)	0	429	323	0	297	0	221	420	0	0	200	0
Turn Type	Split		Perm	Split			Split			Split		
Protected Phases	1	1		4	4		2	2		3	3	
Permitted Phases			1									
Detector Phases	1	1	1	4	4		2	2		3	3	
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0	22.0	16.0	16.0		22.0	22.0		21.0	21.0	
Total Split (s)	31.0	31.0	31.0	16.0	16.0	0.0	32.0	32.0	0.0	21.0	21.0	0.0
Total Split (%)	31.0%	31.0%	31.0%	16.0%	16.0%	0.0%	32.0%	32.0%	0.0%	21.0%	21.0%	0.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lead/Lag	Lead	Lead	Lead	Lag	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	C-Max	C-Max		None	None		None	None	
v/c Ratio		0.69	0.61		0.39		0.69	0.66			0.49	
Control Delay		37.2	7.8		30.9		40.5	36.3			29.5	
Queue Delay		0.0	0.0		0.0		0.0	0.0			0.0	
Total Delay		37.2	7.8		30.9		40.5	36.3			29.5	
Queue Length 50th (ft)		134	0		68		141	129			49	
Queue Length 95th (ft)		179	79		108		204	162			64	
Internal Link Dist (ft)		1270			1070			1405			320	
Turn Bay Length (ft)												
Base Capacity (vph)		745	567		759		398	791			516	
Starvation Cap Reductn		0	0		0		0	0			0	
Spillback Cap Reductn		0	0		0		0	0			0	
Storage Cap Reductn		0	0		0		0	0			0	
Reduced v/c Ratio		0.58	0.57		0.39		0.56	0.53			0.39	

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 60 (60%), Referenced to phase 4:WBTL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated

Splits and Phases: 1: Congress Street & D Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0			4.0	
Lane Util. Factor		0.91	0.91		0.95		0.91	0.91			0.95	
Frt		0.98	0.85		0.96		1.00	0.99			0.98	
Flt Protected		0.99	1.00		0.99		0.95	0.97			0.99	
Satd. Flow (prot)		2729	1225		2812		1421	2799			2970	
Flt Permitted		0.99	1.00		0.99		0.95	0.97			0.99	
Satd. Flow (perm)		2729	1225		2812		1421	2799			2970	
Volume (vph)	80	273	339	61	106	68	379	137	35	21	118	19
Peak-hour factor, PHF	0.92	0.92	0.92	0.79	0.79	0.79	0.86	0.86	0.86	0.79	0.79	0.79
Adj. Flow (vph)	87	297	368	77	134	86	441	159	41	27	149	24
RTOR Reduction (vph)	0	9	250	0	37	0	0	9	0	0	11	0
Lane Group Flow (vph)	0	420	73	0	260	0	221	411	0	0	189	0
Heavy Vehicles (%)	20%	9%	8%	11%	10%	6%	4%	8%	17%	0%	9%	0%
Turn Type	Split		Perm	Split			Split			Split		
Protected Phases	1	1		4	4		2	2		3	3	
Permitted Phases			1									
Actuated Green, G (s)		20.6	20.6		23.6		20.4	20.4			11.4	
Effective Green, g (s)		22.6	22.6		25.6		22.4	22.4			13.4	
Actuated g/C Ratio		0.23	0.23		0.26		0.22	0.22			0.13	
Clearance Time (s)		6.0	6.0		6.0		6.0	6.0			6.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		617	277		720		318	627			398	
v/s Ratio Prot		c0.15			c0.09		c0.16	0.15			c0.06	
v/s Ratio Perm			0.06									
v/c Ratio		0.68	0.26		0.36		0.69	0.66			0.47	
Uniform Delay, d1		35.4	31.9		30.5		35.7	35.3			40.0	
Progression Factor		1.00	1.00		1.00		1.00	1.00			0.74	
Incremental Delay, d2		3.1	0.5		1.4		6.5	2.5			0.9	
Delay (s)		38.5	32.4		31.9		42.1	37.8			30.5	
Level of Service		D	C		C		D	D			C	
Approach Delay (s)		35.9			31.9			39.3			30.5	
Approach LOS		D			C			D			C	

Intersection Summary			
HCM Average Control Delay	35.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	52.7%	ICU Level of Service	A
Analysis Period (min)	15		

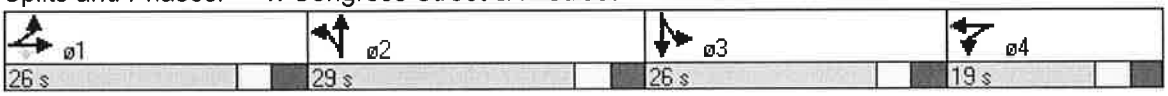
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↱		↕		↰	↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50		50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1350			1150			1485			400	
Travel Time (s)		30.7			26.1			33.8			9.1	
Volume (vph)	106	174	441	113	162	29	220	182	3	18	375	27
Lane Group Flow (vph)	0	429	390	0	345	0	144	296	0	0	507	0
Turn Type	Split		Perm	Split			Split			Split		
Protected Phases	1	1		4	4		2	2		3	3	
Permitted Phases			1									
Detector Phases	1	1	1	4	4		2	2		3	3	
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0	22.0	16.0	16.0		22.0	22.0		21.0	21.0	
Total Split (s)	26.0	26.0	26.0	19.0	19.0	0.0	29.0	29.0	0.0	26.0	26.0	0.0
Total Split (%)	26.0%	26.0%	26.0%	19.0%	19.0%	0.0%	29.0%	29.0%	0.0%	26.0%	26.0%	0.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lead/Lag	Lead	Lead	Lead	Lag	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	C-Max	C-Max		None	None		None	None	
v/c Ratio		0.73	0.68		0.45		0.57	0.57			0.73	
Control Delay		39.0	9.5		36.2		40.3	38.6			42.8	
Queue Delay		0.0	0.0		0.0		0.0	0.0			0.0	
Total Delay		39.0	9.5		36.2		40.3	38.6			42.8	
Queue Length 50th (ft)		125	0		99		94	96			162	
Queue Length 95th (ft)		176	83		154		150	130			201	
Internal Link Dist (ft)		1270			1070			1405			320	
Turn Bay Length (ft)												
Base Capacity (vph)		640	592		762		362	740			737	
Starvation Cap Reductn		0	0		0		0	0			0	
Spillback Cap Reductn		0	0		0		0	0			0	
Storage Cap Reductn		0	0		0		0	0			0	
Reduced v/c Ratio		0.67	0.66		0.45		0.40	0.40			0.69	

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 14 (14%), Referenced to phase 4:WBTL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated

Splits and Phases: 1: Congress Street & D Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0			4.0	
Lane Util. Factor		0.91	0.91		0.95		0.91	0.91			0.95	
Frt		0.96	0.85		0.99		1.00	1.00			0.99	
Flt Protected		0.99	1.00		0.98		0.95	0.98			1.00	
Satd. Flow (prot)		2764	1310		3093		1449	2957			3157	
Flt Permitted		0.99	1.00		0.98		0.95	0.98			1.00	
Satd. Flow (perm)		2764	1310		3093		1449	2957			3157	
Volume (vph)	106	174	441	113	162	29	220	182	3	18	375	27
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.92	0.92	0.92	0.83	0.83	0.83
Adj. Flow (vph)	120	198	501	128	184	33	239	198	3	22	452	33
RTOR Reduction (vph)	0	33	311	0	7	0	0	1	0	0	5	0
Lane Group Flow (vph)	0	396	79	0	338	0	144	295	0	0	502	0
Heavy Vehicles (%)	10%	8%	1%	3%	1%	0%	2%	4%	10%	8%	1%	7%
Turn Type	Split		Perm	Split			Split			Split		
Protected Phases	1	1		4	4		2	2		3	3	
Permitted Phases			1									
Actuated Green, G (s)		18.2	18.2		22.4		15.5	15.5			19.9	
Effective Green, g (s)		20.2	20.2		24.4		17.5	17.5			21.9	
Actuated g/C Ratio		0.20	0.20		0.24		0.18	0.18			0.22	
Clearance Time (s)		6.0	6.0		6.0		6.0	6.0			6.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		558	265		755		254	517			691	
v/s Ratio Prot		c0.14			c0.11		0.10	c0.10			c0.16	
v/s Ratio Perm			0.06									
v/c Ratio		0.71	0.30		0.45		0.57	0.57			0.73	
Uniform Delay, d1		37.2	33.9		32.1		37.8	37.8			36.3	
Progression Factor		1.00	1.00		1.00		1.00	1.00			1.06	
Incremental Delay, d2		4.2	0.6		1.9		2.9	1.5			3.8	
Delay (s)		41.4	34.5		34.0		40.7	39.3			42.1	
Level of Service		D	C		C		D	D			D	
Approach Delay (s)		38.1			34.0			39.8			42.1	
Approach LOS		D			C			D			D	

Intersection Summary			
HCM Average Control Delay	38.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	58.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↱		↕		↰	↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50		50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1350			1150			1485			400	
Travel Time (s)		30.7			26.1			33.8			9.1	
Volume (vph)	111	281	393	67	109	70	413	160	44	21	120	28
Lane Group Flow (vph)	0	469	384	0	312	0	243	474	0	0	214	0
Turn Type	Split		Perm	Split			Split			Split		
Protected Phases	1	1		4	4		2	2		3	3	
Permitted Phases			1									
Detector Phases	1	1	1	4	4		2	2		3	3	
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0	22.0	16.0	16.0		22.0	22.0		21.0	21.0	
Total Split (s)	31.0	31.0	31.0	16.0	16.0	0.0	32.0	32.0	0.0	21.0	21.0	0.0
Total Split (%)	31.0%	31.0%	31.0%	16.0%	16.0%	0.0%	32.0%	32.0%	0.0%	21.0%	21.0%	0.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lead/Lag	Lead	Lead	Lead	Lag	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	C-Max	C-Max		None	None		None	None	
v/c Ratio		0.72	0.66		0.45		0.72	0.71			0.52	
Control Delay		38.1	8.3		33.6		41.6	36.9			26.6	
Queue Delay		0.0	0.0		0.0		0.0	0.0			0.0	
Total Delay		38.1	8.3		33.6		41.6	36.9			26.6	
Queue Length 50th (ft)		145	0		77		156	147			52	
Queue Length 95th (ft)		200	89		#116		226	185			53	
Internal Link Dist (ft)		1270			1070			1405			320	
Turn Bay Length (ft)												
Base Capacity (vph)		739	611		693		398	791			519	
Starvation Cap Reductn		0	0		0		0	0			0	
Spillback Cap Reductn		0	0		0		0	0			0	
Storage Cap Reductn		0	0		0		0	0			0	
Reduced v/c Ratio		0.63	0.63		0.45		0.61	0.60			0.41	

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 60 (60%), Referenced to phase 4:WBTL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Congress Street & D Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↱		↕		↰	↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0			4.0	
Lane Util. Factor		0.91	0.91		0.95		0.91	0.91			0.95	
Frt		0.99	0.85		0.96		1.00	0.98			0.98	
Flt Protected		0.99	1.00		0.99		0.95	0.98			0.99	
Satd. Flow (prot)		2712	1225		2811		1421	2793			2960	
Flt Permitted		0.99	1.00		0.99		0.95	0.98			0.99	
Satd. Flow (perm)		2712	1225		2811		1421	2793			2960	
Volume (vph)	111	281	393	67	109	70	413	160	44	21	120	28
Peak-hour factor, PHF	0.92	0.92	0.92	0.79	0.79	0.79	0.86	0.86	0.86	0.79	0.79	0.79
Adj. Flow (vph)	121	305	427	85	138	89	480	186	51	27	152	35
RTOR Reduction (vph)	0	8	293	0	38	0	0	9	0	0	16	0
Lane Group Flow (vph)	0	461	91	0	274	0	243	465	0	0	198	0
Heavy Vehicles (%)	20%	9%	8%	11%	10%	6%	4%	8%	17%	0%	9%	0%
Turn Type	Split		Perm	Split			Split			Split		
Protected Phases	1	1		4	4		2	2		3	3	
Permitted Phases			1									
Actuated Green, G (s)		21.8	21.8		21.3		21.6	21.6			11.3	
Effective Green, g (s)		23.8	23.8		23.3		23.6	23.6			13.3	
Actuated g/C Ratio		0.24	0.24		0.23		0.24	0.24			0.13	
Clearance Time (s)		6.0	6.0		6.0		6.0	6.0			6.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		645	292		655		335	659			394	
v/s Ratio Prot		c0.17			c0.10		c0.17	0.17			c0.07	
v/s Ratio Perm			0.07									
v/c Ratio		0.72	0.31		0.42		0.73	0.71			0.50	
Uniform Delay, d1		35.0	31.4		32.6		35.2	35.0			40.3	
Progression Factor		1.00	1.00		1.00		1.00	1.00			0.67	
Incremental Delay, d2		3.8	0.6		2.0		7.6	3.4			0.9	
Delay (s)		38.8	32.0		34.6		42.8	38.5			28.1	
Level of Service		D	C		C		D	D			C	
Approach Delay (s)		35.7			34.6			39.9			28.1	
Approach LOS		D			C			D			C	

Intersection Summary			
HCM Average Control Delay	36.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↱		↕		↰	↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50		50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1350			1150			1485			400	
Travel Time (s)		30.7			26.1			33.8			9.1	
Volume (vph)	117	179	498	123	167	30	241	212	11	18	424	58
Lane Group Flow (vph)	0	457	445	0	364	0	165	339	0	0	603	0
Turn Type	Split		Perm	Split			Split			Split		
Protected Phases	1	1		4	4		2	2		3	3	
Permitted Phases			1									
Detector Phases	1	1	1	4	4		2	2		3	3	
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0	22.0	16.0	16.0		22.0	22.0		21.0	21.0	
Total Split (s)	26.0	26.0	26.0	19.0	19.0	0.0	29.0	29.0	0.0	26.0	26.0	0.0
Total Split (%)	26.0%	26.0%	26.0%	19.0%	19.0%	0.0%	29.0%	29.0%	0.0%	26.0%	26.0%	0.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lead/Lag	Lead	Lead	Lead	Lag	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	C-Max	C-Max		None	None		None	None	
v/c Ratio		0.76	0.72		0.57		0.61	0.61			0.79	
Control Delay		40.4	10.0		41.0		40.7	38.3			45.1	
Queue Delay		0.0	0.0		0.0		0.0	0.0			0.0	
Total Delay		40.4	10.0		41.0		40.7	38.3			45.1	
Queue Length 50th (ft)		135	0		114		107	109			192	
Queue Length 95th (ft)		189	91		#173		169	146			#243	
Internal Link Dist (ft)		1270			1070			1405			320	
Turn Bay Length (ft)												
Base Capacity (vph)		641	635		642		362	739			774	
Starvation Cap Reductn		0	0		0		0	0			0	
Spillback Cap Reductn		0	0		0		0	0			0	
Storage Cap Reductn		0	0		0		0	0			0	
Reduced v/c Ratio		0.71	0.70		0.57		0.46	0.46			0.78	

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 14 (14%), Referenced to phase 4:WBTL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Congress Street & D Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↱		↕		↰	↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0			4.0	
Lane Util. Factor		0.91	0.91		0.95		0.91	0.91			0.95	
Frt		0.96	0.85		0.99		1.00	0.99			0.98	
Flt Protected		0.99	1.00		0.98		0.95	0.99			1.00	
Satd. Flow (prot)		2760	1310		3091		1449	2945			3126	
Flt Permitted		0.99	1.00		0.98		0.95	0.99			1.00	
Satd. Flow (perm)		2760	1310		3091		1449	2945			3126	
Volume (vph)	117	179	498	123	167	30	241	212	11	18	424	58
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.92	0.92	0.92	0.83	0.83	0.83
Adj. Flow (vph)	133	203	566	140	190	34	262	230	12	22	511	70
RTOR Reduction (vph)	0	34	354	0	7	0	0	2	0	0	10	0
Lane Group Flow (vph)	0	423	91	0	357	0	165	337	0	0	593	0
Heavy Vehicles (%)	10%	8%	1%	3%	1%	0%	2%	4%	10%	8%	1%	7%
Turn Type	Split		Perm	Split			Split			Split		
Protected Phases	1	1		4	4		2	2		3	3	
Permitted Phases			1									
Actuated Green, G (s)		18.5	18.5		18.5		16.8	16.8			22.2	
Effective Green, g (s)		20.5	20.5		20.5		18.8	18.8			24.2	
Actuated g/C Ratio		0.20	0.20		0.20		0.19	0.19			0.24	
Clearance Time (s)		6.0	6.0		6.0		6.0	6.0			6.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		566	269		634		272	554			756	
v/s Ratio Prot		c0.15			c0.12		0.11	c0.11			c0.19	
v/s Ratio Perm			0.07									
v/c Ratio		0.75	0.34		0.56		0.61	0.61			0.78	
Uniform Delay, d1		37.3	34.0		35.7		37.2	37.2			35.5	
Progression Factor		1.00	1.00		1.00		1.00	1.00			1.07	
Incremental Delay, d2		5.3	0.8		3.6		3.8	1.9			5.2	
Delay (s)		42.7	34.7		39.3		41.0	39.1			43.2	
Level of Service		D	C		D		D	D			D	
Approach Delay (s)		38.7			39.3			39.7			43.2	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM Average Control Delay	40.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	64.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↱		↕		↰	↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50		50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1350			1150			1485			400	
Travel Time (s)		30.7			26.1			33.8			9.1	
Volume (vph)	111	297	393	81	123	70	413	160	60	21	120	28
Lane Group Flow (vph)	0	476	395	0	348	0	251	485	0	0	214	0
Turn Type	Split		Perm	Split			Split			Split		
Protected Phases	1	1		4	4		2	2		3	3	
Permitted Phases			1									
Detector Phases	1	1	1	4	4		2	2		3	3	
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0	22.0	16.0	16.0		22.0	22.0		21.0	21.0	
Total Split (s)	31.0	31.0	31.0	16.0	16.0	0.0	32.0	32.0	0.0	21.0	21.0	0.0
Total Split (%)	31.0%	31.0%	31.0%	16.0%	16.0%	0.0%	32.0%	32.0%	0.0%	21.0%	21.0%	0.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lead/Lag	Lead	Lead	Lead	Lag	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	C-Max	C-Max		None	None		None	None	
v/c Ratio		0.73	0.67		0.52		0.73	0.71			0.51	
Control Delay		38.4	8.4		37.0		42.1	36.6			26.6	
Queue Delay		0.0	0.0		0.0		0.0	0.0			0.0	
Total Delay		38.4	8.4		37.0		42.1	36.6			26.6	
Queue Length 50th (ft)		148	0		95		160	148			52	
Queue Length 95th (ft)		203	92		#152		234	187			54	
Internal Link Dist (ft)		1270			1070			1405			320	
Turn Bay Length (ft)												
Base Capacity (vph)		740	619		665		398	788			519	
Starvation Cap Reductn		0	0		0		0	0			0	
Spillback Cap Reductn		0	0		0		0	0			0	
Storage Cap Reductn		0	0		0		0	0			0	
Reduced v/c Ratio		0.64	0.64		0.52		0.63	0.62			0.41	

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 60 (60%), Referenced to phase 4:WBTL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Congress Street & D Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↱		↕		↰	↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0			4.0	
Lane Util. Factor		0.91	0.91		0.95		0.91	0.91			0.95	
Frt		0.99	0.85		0.96		1.00	0.98			0.98	
Flt Protected		0.99	1.00		0.99		0.95	0.98			0.99	
Satd. Flow (prot)		2723	1225		2818		1421	2769			2960	
Flt Permitted		0.99	1.00		0.99		0.95	0.98			0.99	
Satd. Flow (perm)		2723	1225		2818		1421	2769			2960	
Volume (vph)	111	297	393	81	123	70	413	160	60	21	120	28
Peak-hour factor, PHF	0.92	0.92	0.92	0.79	0.79	0.79	0.86	0.86	0.86	0.79	0.79	0.79
Adj. Flow (vph)	121	323	427	103	156	89	480	186	70	27	152	35
RTOR Reduction (vph)	0	5	301	0	30	0	0	14	0	0	16	0
Lane Group Flow (vph)	0	471	94	0	318	0	251	471	0	0	198	0
Heavy Vehicles (%)	20%	9%	8%	11%	10%	6%	4%	8%	17%	0%	9%	0%
Turn Type	Split		Perm	Split			Split			Split		
Protected Phases	1	1		4	4		2	2		3	3	
Permitted Phases			1									
Actuated Green, G (s)		21.9	21.9		20.6		22.0	22.0			11.5	
Effective Green, g (s)		23.9	23.9		22.6		24.0	24.0			13.5	
Actuated g/C Ratio		0.24	0.24		0.23		0.24	0.24			0.14	
Clearance Time (s)		6.0	6.0		6.0		6.0	6.0			6.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		651	293		637		341	665			400	
v/s Ratio Prot		c0.17			c0.11		c0.18	0.17			c0.07	
v/s Ratio Perm			0.08									
v/c Ratio		0.72	0.32		0.50		0.74	0.71			0.49	
Uniform Delay, d1		35.0	31.4		33.8		35.1	34.8			40.1	
Progression Factor		1.00	1.00		1.00		1.00	1.00			0.68	
Incremental Delay, d2		4.0	0.6		2.8		8.0	3.5			0.9	
Delay (s)		39.0	32.0		36.5		43.1	38.3			28.1	
Level of Service		D	C		D		D	D			C	
Approach Delay (s)		35.8			36.5			39.9			28.1	
Approach LOS		D			D			D			C	

Intersection Summary			
HCM Average Control Delay	36.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	58.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↱		↕		↰	↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50		50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1350			1150			1485			400	
Travel Time (s)		30.7			26.1			33.8			9.1	
Volume (vph)	117	216	498	158	202	30	241	212	48	18	424	58
Lane Group Flow (vph)	0	463	481	0	444	0	180	364	0	0	603	0
Turn Type	Split		Perm	Split			Split			Split		
Protected Phases	1	1		4	4		2	2		3	3	
Permitted Phases			1									
Detector Phases	1	1	1	4	4		2	2		3	3	
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0	22.0	16.0	16.0		22.0	22.0		21.0	21.0	
Total Split (s)	26.0	26.0	26.0	19.0	19.0	0.0	29.0	29.0	0.0	26.0	26.0	0.0
Total Split (%)	26.0%	26.0%	26.0%	19.0%	19.0%	0.0%	29.0%	29.0%	0.0%	26.0%	26.0%	0.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lead/Lag	Lead	Lead	Lead	Lag	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	C-Max	C-Max		None	None		None	None	
v/c Ratio		0.77	0.73		0.72		0.64	0.63			0.80	
Control Delay		42.9	10.4		47.0		41.1	36.9			46.2	
Queue Delay		0.0	0.0		0.0		0.0	0.0			0.0	
Total Delay		42.9	10.4		47.0		41.1	36.9			46.2	
Queue Length 50th (ft)		144	0		146		117	112			193	
Queue Length 95th (ft)		198	95		#237		183	152			#243	
Internal Link Dist (ft)		1270			1070			1405			320	
Turn Bay Length (ft)												
Base Capacity (vph)		630	663		613		362	734			763	
Starvation Cap Reductn		0	0		0		0	0			0	
Spillback Cap Reductn		0	0		0		0	0			0	
Storage Cap Reductn		0	0		0		0	0			0	
Reduced v/c Ratio		0.73	0.73		0.72		0.50	0.50			0.79	

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 14 (14%), Referenced to phase 4:WBTL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Congress Street & D Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↱		↕		↰	↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0			4.0	
Lane Util. Factor		0.91	0.91		0.95		0.91	0.91			0.95	
Frt		0.97	0.85		0.99		1.00	0.98			0.98	
Flt Protected		0.99	1.00		0.98		0.95	0.99			1.00	
Satd. Flow (prot)		2781	1310		3094		1449	2884			3126	
Flt Permitted		0.99	1.00		0.98		0.95	0.99			1.00	
Satd. Flow (perm)		2781	1310		3094		1449	2884			3126	
Volume (vph)	117	216	498	158	202	30	241	212	48	18	424	58
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.92	0.92	0.92	0.83	0.83	0.83
Adj. Flow (vph)	133	245	566	180	230	34	262	230	52	22	511	70
RTOR Reduction (vph)	0	18	380	0	6	0	0	14	0	0	10	0
Lane Group Flow (vph)	0	445	101	0	438	0	180	350	0	0	593	0
Heavy Vehicles (%)	10%	8%	1%	3%	1%	0%	2%	4%	10%	8%	1%	7%
Turn Type	Split		Perm	Split			Split			Split		
Protected Phases	1	1		4	4		2	2		3	3	
Permitted Phases			1									
Actuated Green, G (s)		19.0	19.0		17.7		17.5	17.5			21.8	
Effective Green, g (s)		21.0	21.0		19.7		19.5	19.5			23.8	
Actuated g/C Ratio		0.21	0.21		0.20		0.20	0.20			0.24	
Clearance Time (s)		6.0	6.0		6.0		6.0	6.0			6.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		584	275		610		283	562			744	
v/s Ratio Prot		c0.16			c0.14		c0.12	0.12			c0.19	
v/s Ratio Perm			0.08									
v/c Ratio		0.76	0.37		0.72		0.64	0.62			0.80	
Uniform Delay, d1		37.1	33.8		37.6		37.0	36.9			35.8	
Progression Factor		1.00	1.00		1.00		1.00	1.00			1.07	
Incremental Delay, d2		5.8	0.8		7.1		4.6	2.2			5.8	
Delay (s)		43.0	34.6		44.7		41.6	39.0			44.3	
Level of Service		D	C		D		D	D			D	
Approach Delay (s)		38.7			44.7			39.9			44.3	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM Average Control Delay	41.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	68.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

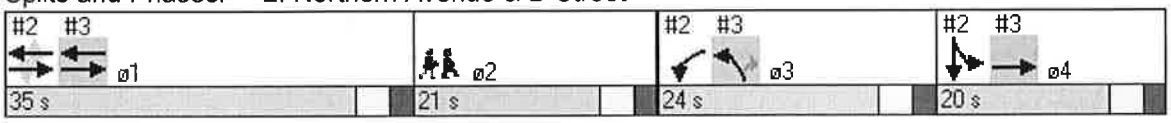
Seaport Boulevard and Northern Avenue at D Street Southbound

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	11	12	12	12	12	12	12	12
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50					50	50	
Trailing Detector (ft)	0	0		0	0					0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1479			210			400			1035	
Travel Time (s)		33.6			4.8			9.1			23.5	
Volume (vph)	32	328	101	43	218	55	0	0	0	38	19	29
Lane Group Flow (vph)	0	506	0	0	339	0	0	0	0	0	95	0
Turn Type	Perm			pm+pt						Split		
Protected Phases		1		3	1					4	4	
Permitted Phases	1			1								
Detector Phases	1	1		3	1					4	4	
Minimum Initial (s)	4.0	4.0		4.0	4.0					4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0					20.0	20.0	
Total Split (s)	35.0	35.0	0.0	24.0	35.0	0.0	0.0	0.0	0.0	20.0	20.0	0.0
Total Split (%)	35.0%	35.0%	0.0%	24.0%	35.0%	0.0%	0.0%	0.0%	0.0%	20.0%	20.0%	0.0%
Yellow Time (s)	3.0	3.0		3.0	3.0					3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0					2.0	2.0	
Lead/Lag	Lead	Lead		Lead	Lead					Lag	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes					Yes	Yes	
Recall Mode	C-Max	C-Max		None	C-Max					None	None	
v/c Ratio		0.33			0.18						0.52	
Control Delay		12.2			1.0						35.4	
Queue Delay		0.0			0.1						0.0	
Total Delay		12.2			1.2						35.4	
Queue Length 50th (ft)		78			0						44	
Queue Length 95th (ft)		134			0						89	
Internal Link Dist (ft)		1399			130			320			955	
Turn Bay Length (ft)												
Base Capacity (vph)		1534			1879						234	
Starvation Cap Reductn		0			758						0	
Spillback Cap Reductn		0			0						0	
Storage Cap Reductn		0			0						0	
Reduced v/c Ratio		0.33			0.30						0.41	

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 39 (39%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated

Splits and Phases: 2: Northern Avenue & D Street



Lane Group	ø2
Lane Configurations	
Ideal Flow (vphpl)	
Lane Width (ft)	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Right Turn on Red	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	21%
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lead/Lag	Lag
Lead-Lag Optimize?	Yes
Recall Mode	None
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	11	12	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0						4.0	
Lane Util. Factor		0.95			0.95						1.00	
Frt		0.97			0.97						0.95	
Flt Protected		1.00			0.99						0.98	
Satd. Flow (prot)		2914			2735						1296	
Flt Permitted		0.91			0.86						0.98	
Satd. Flow (perm)		2660			2365						1296	
Volume (vph)	32	328	101	43	218	55	0	0	0	38	19	29
Peak-hour factor, PHF	0.91	0.91	0.91	0.93	0.93	0.93	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	35	360	111	46	234	59	0	0	0	42	21	32
RTOR Reduction (vph)	0	16	0	0	9	0	0	0	0	0	19	0
Lane Group Flow (vph)	0	490	0	0	330	0	0	0	0	0	76	0
Heavy Vehicles (%)	9%	9%	2%	5%	9%	24%	2%	2%	2%	29%	32%	10%
Turn Type	Perm			pm+pt						Split		
Protected Phases		1		3	1					4	4	
Permitted Phases	1			1								
Actuated Green, G (s)		56.3			73.5						11.5	
Effective Green, g (s)		57.3			75.5						12.5	
Actuated g/C Ratio		0.57			0.76						0.12	
Clearance Time (s)		5.0			5.0						5.0	
Vehicle Extension (s)		3.0			3.0						3.0	
Lane Grp Cap (vph)		1524			1853						162	
v/s Ratio Prot					c0.03						c0.06	
v/s Ratio Perm		c0.18			0.10							
v/c Ratio		0.32			0.18						0.47	
Uniform Delay, d1		11.2			3.5						40.7	
Progression Factor		1.00			0.32						1.00	
Incremental Delay, d2		0.6			0.0						2.1	
Delay (s)		11.7			1.1						42.8	
Level of Service		B			A						D	
Approach Delay (s)		11.7			1.1			0.0			42.8	
Approach LOS		B			A			A			D	

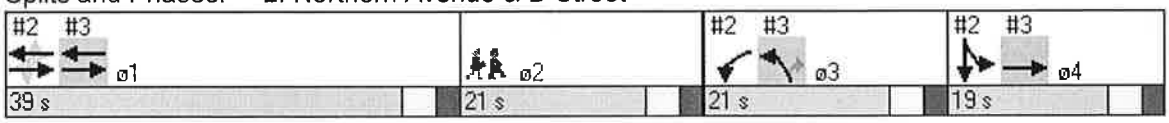
Intersection Summary			
HCM Average Control Delay	11.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	40.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	11	12	12	12	12	12	12	12
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50					50	50	
Trailing Detector (ft)	0	0		0	0					0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1479			210			400			1035	
Travel Time (s)		33.6			4.8			9.1			23.5	
Volume (vph)	29	254	230	60	500	23	0	0	0	12	20	40
Lane Group Flow (vph)	0	546	0	0	620	0	0	0	0	0	88	0
Turn Type	Perm			pm+pt						Split		
Protected Phases		1		3	1					4	4	
Permitted Phases	1			1								
Detector Phases	1	1		3	1					4	4	
Minimum Initial (s)	4.0	4.0		4.0	4.0					4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0					19.0	19.0	
Total Split (s)	39.0	39.0	0.0	21.0	39.0	0.0	0.0	0.0	0.0	19.0	19.0	0.0
Total Split (%)	39.0%	39.0%	0.0%	21.0%	39.0%	0.0%	0.0%	0.0%	0.0%	19.0%	19.0%	0.0%
Yellow Time (s)	3.0	3.0		3.0	3.0					3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0					2.0	2.0	
Lead/Lag	Lead	Lead		Lead	Lead					Lag	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes					Yes	Yes	
Recall Mode	C-Max	C-Max		None	C-Max					None	None	
v/c Ratio		0.31			0.31						0.47	
Control Delay		5.7			1.1						24.7	
Queue Delay		0.0			0.1						0.0	
Total Delay		5.7			1.3						24.7	
Queue Length 50th (ft)		41			2						24	
Queue Length 95th (ft)		80			5						59	
Internal Link Dist (ft)		1399			130			320			955	
Turn Bay Length (ft)												
Base Capacity (vph)		1754			1989						262	
Starvation Cap Reductn		0			503						0	
Spillback Cap Reductn		0			0						0	
Storage Cap Reductn		0			0						0	
Reduced v/c Ratio		0.31			0.42						0.34	

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 47 (47%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 2: Northern Avenue & D Street



Lane Group	ø2
Lane Configurations	
Ideal Flow (vphpl)	
Lane Width (ft)	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Right Turn on Red	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	21%
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lead/Lag	Lag
Lead-Lag Optimize?	Yes
Recall Mode	None
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↑↕			↕↑↕						↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	11	12	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0						4.0	
Lane Util. Factor		0.95			0.95						1.00	
Frt		0.93			0.99						0.92	
Flt Protected		1.00			0.99						0.99	
Satd. Flow (prot)		2937			2869						1466	
Flt Permitted		0.90			0.85						0.99	
Satd. Flow (perm)		2641			2448						1466	
Volume (vph)	29	254	230	60	500	23	0	0	0	12	20	40
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.82	0.82	0.82
Adj. Flow (vph)	31	270	245	64	532	24	0	0	0	15	24	49
RTOR Reduction (vph)	0	82	0	0	1	0	0	0	0	0	44	0
Lane Group Flow (vph)	0	464	0	0	619	0	0	0	0	0	44	0
Heavy Vehicles (%)	0%	4%	2%	7%	8%	18%	2%	2%	2%	33%	5%	0%
Turn Type	Perm			pm+pt						Split		
Protected Phases		1		3	1					4	4	
Permitted Phases	1			1								
Actuated Green, G (s)		62.6			76.3						8.7	
Effective Green, g (s)		63.6			78.3						9.7	
Actuated g/C Ratio		0.64			0.78						0.10	
Clearance Time (s)		5.0			5.0						5.0	
Vehicle Extension (s)		3.0			3.0						3.0	
Lane Grp Cap (vph)		1680			1979						142	
v/s Ratio Prot					c0.05						c0.03	
v/s Ratio Perm		0.18			c0.20							
v/c Ratio		0.28			0.31						0.31	
Uniform Delay, d1		8.0			3.1						42.0	
Progression Factor		1.00			0.31						1.00	
Incremental Delay, d2		0.4			0.1						1.2	
Delay (s)		8.4			1.1						43.3	
Level of Service		A			A						D	
Approach Delay (s)		8.4			1.1			0.0			43.3	
Approach LOS		A			A			A			D	

Intersection Summary			
HCM Average Control Delay	7.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	49.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

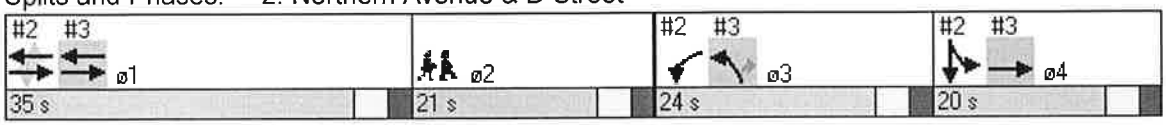


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	11	12	12	12	12	12	12	12
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50					50	50	
Trailing Detector (ft)	0	0		0	0					0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1479			210			400			1035	
Travel Time (s)		33.6			4.8			9.1			23.5	
Volume (vph)	32	431	128	44	593	62	0	0	0	38	19	29
Lane Group Flow (vph)	0	650	0	0	752	0	0	0	0	0	95	0
Turn Type	Perm			pm+pt						Split		
Protected Phases		1		3	1					4	4	
Permitted Phases	1			1								
Detector Phases	1	1		3	1					4	4	
Minimum Initial (s)	4.0	4.0		4.0	4.0					4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0					20.0	20.0	
Total Split (s)	35.0	35.0	0.0	24.0	35.0	0.0	0.0	0.0	0.0	20.0	20.0	0.0
Total Split (%)	35.0%	35.0%	0.0%	24.0%	35.0%	0.0%	0.0%	0.0%	0.0%	20.0%	20.0%	0.0%
Yellow Time (s)	3.0	3.0		3.0	3.0					3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0					2.0	2.0	
Lead/Lag	Lead	Lead		Lead	Lead					Lag	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes					Yes	Yes	
Recall Mode	C-Max	C-Max		None	C-Max					None	None	
v/c Ratio		0.46			0.38						0.52	
Control Delay		14.6			2.0						35.4	
Queue Delay		0.0			0.1						0.0	
Total Delay		14.6			2.1						35.4	
Queue Length 50th (ft)		113			3						44	
Queue Length 95th (ft)		186			m0						89	
Internal Link Dist (ft)		1399			130			320			955	
Turn Bay Length (ft)												
Base Capacity (vph)		1412			1964						234	
Starvation Cap Reductn		0			397						0	
Spillback Cap Reductn		0			0						0	
Storage Cap Reductn		0			0						0	
Reduced v/c Ratio		0.46			0.48						0.41	

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 39 (39%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Northern Avenue & D Street



Lane Group	ø2
Lane Configurations	
Ideal Flow (vphpl)	
Lane Width (ft)	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Right Turn on Red	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	21%
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lead/Lag	Lag
Lead-Lag Optimize?	Yes
Recall Mode	None
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	11	12	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0						4.0	
Lane Util. Factor		0.95			0.95						1.00	
Frt		0.97			0.99						0.95	
Flt Protected		1.00			1.00						0.98	
Satd. Flow (prot)		2917			2806						1296	
Flt Permitted		0.88			0.89						0.98	
Satd. Flow (perm)		2579			2504						1296	
Volume (vph)	32	431	128	44	593	62	0	0	0	38	19	29
Peak-hour factor, PHF	0.91	0.91	0.91	0.93	0.93	0.93	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	35	474	141	47	638	67	0	0	0	42	21	32
RTOR Reduction (vph)	0	17	0	0	4	0	0	0	0	0	19	0
Lane Group Flow (vph)	0	633	0	0	748	0	0	0	0	0	76	0
Heavy Vehicles (%)	9%	9%	2%	5%	9%	24%	2%	2%	2%	29%	32%	10%
Turn Type	Perm			pm+pt						Split		
Protected Phases		1		3	1					4	4	
Permitted Phases	1			1								
Actuated Green, G (s)		54.4			73.4						11.6	
Effective Green, g (s)		55.4			75.4						12.6	
Actuated g/C Ratio		0.55			0.75						0.13	
Clearance Time (s)		5.0			5.0						5.0	
Vehicle Extension (s)		3.0			3.0						3.0	
Lane Grp Cap (vph)		1429			1948						163	
v/s Ratio Prot					c0.08						c0.06	
v/s Ratio Perm		c0.25			0.21							
v/c Ratio		0.44			0.38						0.46	
Uniform Delay, d1		13.2			4.3						40.6	
Progression Factor		1.00			0.42						1.00	
Incremental Delay, d2		1.0			0.1						2.1	
Delay (s)		14.2			1.9						42.7	
Level of Service		B			A						D	
Approach Delay (s)		14.2			1.9			0.0			42.7	
Approach LOS		B			A			A			D	

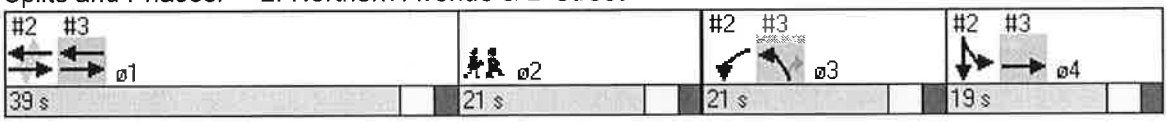
Intersection Summary			
HCM Average Control Delay	9.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	56.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	11	12	12	12	12	12	12	12
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50					50	50	
Trailing Detector (ft)	0	0		0	0					0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1479			210			400			1035	
Travel Time (s)		33.6			4.8			9.1			23.5	
Volume (vph)	29	320	301	66	695	23	0	0	0	12	20	40
Lane Group Flow (vph)	0	691	0	0	833	0	0	0	0	0	88	0
Turn Type	Perm			pm+pt						Split		
Protected Phases		1		3	1					4	4	
Permitted Phases	1			1								
Detector Phases	1	1		3	1					4	4	
Minimum Initial (s)	4.0	4.0		4.0	4.0					4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0					19.0	19.0	
Total Split (s)	39.0	39.0	0.0	21.0	39.0	0.0	0.0	0.0	0.0	19.0	19.0	0.0
Total Split (%)	39.0%	39.0%	0.0%	21.0%	39.0%	0.0%	0.0%	0.0%	0.0%	19.0%	19.0%	0.0%
Yellow Time (s)	3.0	3.0		3.0	3.0					3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0					2.0	2.0	
Lead/Lag	Lead	Lead		Lead	Lead					Lag	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes					Yes	Yes	
Recall Mode	C-Max	C-Max		None	C-Max					None	None	
v/c Ratio		0.40			0.44						0.47	
Control Delay		7.1			2.0						24.7	
Queue Delay		0.0			0.1						0.0	
Total Delay		7.1			2.1						24.7	
Queue Length 50th (ft)		64			13						24	
Queue Length 95th (ft)		116			18						59	
Internal Link Dist (ft)		1399			130			320			955	
Turn Bay Length (ft)												
Base Capacity (vph)		1708			1890						262	
Starvation Cap Reductn		0			160						0	
Spillback Cap Reductn		0			0						0	
Storage Cap Reductn		0			0						0	
Reduced v/c Ratio		0.40			0.48						0.34	

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 47 (47%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 2: Northern Avenue & D Street



Lane Group	ø2
Lane Configurations	
Ideal Flow (vphpl)	
Lane Width (ft)	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Right Turn on Red	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	21%
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lead/Lag	Lag
Lead-Lag Optimize?	Yes
Recall Mode	None
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	11	12	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0						4.0	
Lane Util. Factor		0.95			0.95						1.00	
Frt		0.93			1.00						0.92	
Flt Protected		1.00			1.00						0.99	
Satd. Flow (prot)		2932			2878						1466	
Flt Permitted		0.89			0.84						0.99	
Satd. Flow (perm)		2614			2424						1466	
Volume (vph)	29	320	301	66	695	23	0	0	0	12	20	40
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.82	0.82	0.82
Adj. Flow (vph)	31	340	320	70	739	24	0	0	0	15	24	49
RTOR Reduction (vph)	0	91	0	0	1	0	0	0	0	0	44	0
Lane Group Flow (vph)	0	600	0	0	832	0	0	0	0	0	44	0
Heavy Vehicles (%)	0%	4%	2%	7%	8%	18%	2%	2%	2%	33%	5%	0%
Turn Type	Perm			pm+pt						Split		
Protected Phases		1		3	1					4	4	
Permitted Phases	1			1								
Actuated Green, G (s)		61.2			76.2						8.8	
Effective Green, g (s)		62.2			78.2						9.8	
Actuated g/C Ratio		0.62			0.78						0.10	
Clearance Time (s)		5.0			5.0						5.0	
Vehicle Extension (s)		3.0			3.0						3.0	
Lane Grp Cap (vph)		1626			1968						144	
v/s Ratio Prot					c0.07						c0.03	
v/s Ratio Perm		0.23			c0.26							
v/c Ratio		0.37			0.42						0.30	
Uniform Delay, d1		9.3			3.6						41.9	
Progression Factor		1.00			0.46						1.00	
Incremental Delay, d2		0.6			0.1						1.2	
Delay (s)		9.9			1.8						43.1	
Level of Service		A			A						D	
Approach Delay (s)		9.9			1.8			0.0			43.1	
Approach LOS		A			A			A			D	

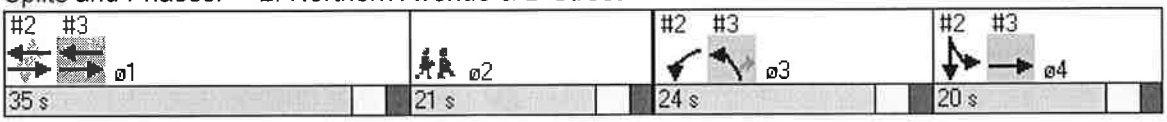
Intersection Summary			
HCM Average Control Delay	7.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	11	12	12	12	12	12	12	12
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50					50	50	
Trailing Detector (ft)	0	0		0	0					0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1479			210			400			1035	
Travel Time (s)		33.6			4.8			9.1			23.5	
Volume (vph)	32	467	128	44	625	62	0	0	0	38	19	29
Lane Group Flow (vph)	0	689	0	0	786	0	0	0	0	0	95	0
Turn Type	Perm			pm+pt						Split		
Protected Phases		1		3	1					4	4	
Permitted Phases	1			1								
Detector Phases	1	1		3	1					4	4	
Minimum Initial (s)	4.0	4.0		4.0	4.0					4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0					20.0	20.0	
Total Split (s)	35.0	35.0	0.0	24.0	35.0	0.0	0.0	0.0	0.0	20.0	20.0	0.0
Total Split (%)	35.0%	35.0%	0.0%	24.0%	35.0%	0.0%	0.0%	0.0%	0.0%	20.0%	20.0%	0.0%
Yellow Time (s)	3.0	3.0		3.0	3.0					3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0					2.0	2.0	
Lead/Lag	Lead	Lead		Lead	Lead					Lag	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes					Yes	Yes	
Recall Mode	C-Max	C-Max		None	C-Max					None	None	
v/c Ratio		0.49			0.40						0.52	
Control Delay		15.3			2.2						35.4	
Queue Delay		0.0			0.1						0.0	
Total Delay		15.3			2.3						35.4	
Queue Length 50th (ft)		124			4						44	
Queue Length 95th (ft)		204			m0						89	
Internal Link Dist (ft)		1399			130			320			955	
Turn Bay Length (ft)												
Base Capacity (vph)		1394			1950						234	
Starvation Cap Reductn		0			368						0	
Spillback Cap Reductn		0			0						0	
Storage Cap Reductn		0			0						0	
Reduced v/c Ratio		0.49			0.50						0.41	

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 39 (39%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Northern Avenue & D Street



Lane Group	ø2
Lane Configurations	
Ideal Flow (vphpl)	
Lane Width (ft)	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Right Turn on Red	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	21%
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lead/Lag	Lag
Lead-Lag Optimize?	Yes
Recall Mode	None
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	11	12	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0						4.0	
Lane Util. Factor		0.95			0.95						1.00	
Frt		0.97			0.99						0.95	
Flt Protected		1.00			1.00						0.98	
Satd. Flow (prot)		2920			2809						1296	
Flt Permitted		0.88			0.89						0.98	
Satd. Flow (perm)		2582			2502						1296	
Volume (vph)	32	467	128	44	625	62	0	0	0	38	19	29
Peak-hour factor, PHF	0.91	0.91	0.91	0.93	0.93	0.93	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	35	513	141	47	672	67	0	0	0	42	21	32
RTOR Reduction (vph)	0	15	0	0	3	0	0	0	0	0	19	0
Lane Group Flow (vph)	0	674	0	0	783	0	0	0	0	0	76	0
Heavy Vehicles (%)	9%	9%	2%	5%	9%	24%	2%	2%	2%	29%	32%	10%
Turn Type	Perm			pm+pt						Split		
Protected Phases		1		3	1					4	4	
Permitted Phases	1			1								
Actuated Green, G (s)		54.4			73.4						11.6	
Effective Green, g (s)		55.4			75.4						12.6	
Actuated g/C Ratio		0.55			0.75						0.13	
Clearance Time (s)		5.0			5.0						5.0	
Vehicle Extension (s)		3.0			3.0						3.0	
Lane Grp Cap (vph)		1430			1948						163	
v/s Ratio Prot					c0.08						c0.06	
v/s Ratio Perm		c0.26			0.22							
v/c Ratio		0.47			0.40						0.46	
Uniform Delay, d1		13.5			4.3						40.6	
Progression Factor		1.00			0.45						1.00	
Incremental Delay, d2		1.1			0.1						2.1	
Delay (s)		14.6			2.1						42.7	
Level of Service		B			A						D	
Approach Delay (s)		14.6			2.1			0.0			42.7	
Approach LOS		B			A			A			D	

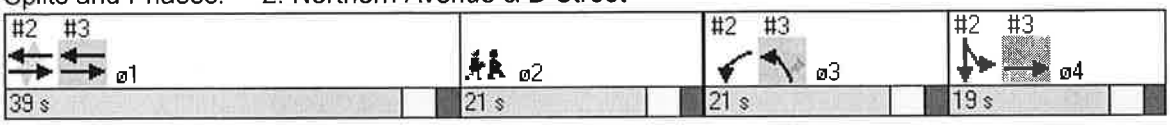
Intersection Summary			
HCM Average Control Delay	10.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	11	12	12	12	12	12	12	12
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50					50	50	
Trailing Detector (ft)	0	0		0	0					0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1479			210			400			1035	
Travel Time (s)		33.6			4.8			9.1			23.5	
Volume (vph)	29	361	301	66	713	23	0	0	0	12	20	40
Lane Group Flow (vph)	0	735	0	0	853	0	0	0	0	0	88	0
Turn Type	Perm			pm+pt						Split		
Protected Phases		1		3	1					4	4	
Permitted Phases	1			1								
Detector Phases	1	1		3	1					4	4	
Minimum Initial (s)	4.0	4.0		4.0	4.0					4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0					19.0	19.0	
Total Split (s)	39.0	39.0	0.0	21.0	39.0	0.0	0.0	0.0	0.0	19.0	19.0	0.0
Total Split (%)	39.0%	39.0%	0.0%	21.0%	39.0%	0.0%	0.0%	0.0%	0.0%	19.0%	19.0%	0.0%
Yellow Time (s)	3.0	3.0		3.0	3.0					3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0					2.0	2.0	
Lead/Lag	Lead	Lead		Lead	Lead					Lag	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes					Yes	Yes	
Recall Mode	C-Max	C-Max		None	C-Max					None	None	
v/c Ratio		0.43			0.46						0.47	
Control Delay		8.0			2.2						24.7	
Queue Delay		0.0			0.0						0.0	
Total Delay		8.0			2.2						24.7	
Queue Length 50th (ft)		78			15						24	
Queue Length 95th (ft)		135			22						59	
Internal Link Dist (ft)		1399			130			320			955	
Turn Bay Length (ft)												
Base Capacity (vph)		1696			1860						262	
Starvation Cap Reductn		0			108						0	
Spillback Cap Reductn		0			0						0	
Storage Cap Reductn		0			0						0	
Reduced v/c Ratio		0.43			0.49						0.34	

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 47 (47%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 2: Northern Avenue & D Street



Lane Group	ø2
Lane Configurations	
Ideal Flow (vphpl)	
Lane Width (ft)	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Right Turn on Red	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	21%
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lead/Lag	Lag
Lead-Lag Optimize?	Yes
Recall Mode	None
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	11	12	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0						4.0	
Lane Util. Factor		0.95			0.95						1.00	
Frt		0.93			1.00						0.92	
Flt Protected		1.00			1.00						0.99	
Satd. Flow (prot)		2943			2879						1466	
Flt Permitted		0.89			0.83						0.99	
Satd. Flow (perm)		2629			2410						1466	
Volume (vph)	29	361	301	66	713	23	0	0	0	12	20	40
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.82	0.82	0.82
Adj. Flow (vph)	31	384	320	70	759	24	0	0	0	15	24	49
RTOR Reduction (vph)	0	81	0	0	1	0	0	0	0	0	44	0
Lane Group Flow (vph)	0	654	0	0	852	0	0	0	0	0	44	0
Heavy Vehicles (%)	0%	4%	2%	7%	8%	18%	2%	2%	2%	33%	5%	0%
Turn Type	Perm			pm+pt						Split		
Protected Phases		1		3	1					4	4	
Permitted Phases	1			1								
Actuated Green, G (s)		61.2			76.2						8.8	
Effective Green, g (s)		62.2			78.2						9.8	
Actuated g/C Ratio		0.62			0.78						0.10	
Clearance Time (s)		5.0			5.0						5.0	
Vehicle Extension (s)		3.0			3.0						3.0	
Lane Grp Cap (vph)		1635			1960						144	
v/s Ratio Prot					c0.07						c0.03	
v/s Ratio Perm		0.25			c0.27							
v/c Ratio		0.40			0.43						0.30	
Uniform Delay, d1		9.5			3.6						41.9	
Progression Factor		1.00			0.49						1.00	
Incremental Delay, d2		0.7			0.1						1.2	
Delay (s)		10.2			1.9						43.1	
Level of Service		B			A						D	
Approach Delay (s)		10.2			1.9			0.0			43.1	
Approach LOS		B			A			A			D	

Intersection Summary			
HCM Average Control Delay	7.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	62.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

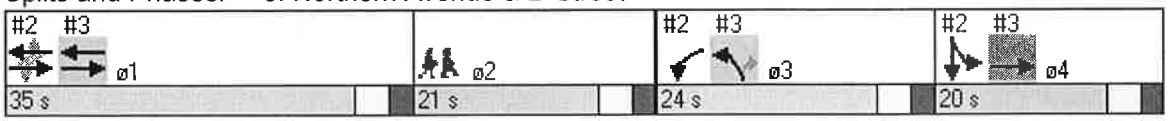
Seaport Boulevard and Northern Avenue at D Street Northbound

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2	ø4
Lane Configurations	↑↑			↑↑	↖	↱		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	12	12	12	11	12	12		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Leading Detector (ft)	50			50	50	50		
Trailing Detector (ft)	0			0	0	0		
Turning Speed (mph)		9	15		15	9		
Right Turn on Red		Yes				Yes		
Link Speed (mph)	30			30	30			
Link Distance (ft)	210			920	224			
Travel Time (s)	4.8			20.9	5.1			
Volume (vph)	366	0	0	316	186	16		
Lane Group Flow (vph)	402	0	0	347	209	18		
Turn Type						Perm		
Protected Phases	1 4			1	3		2	4
Permitted Phases						3		
Detector Phases	1 4			1	3	3		
Minimum Initial (s)				4.0	4.0	4.0	4.0	4.0
Minimum Split (s)				20.0	20.0	20.0	21.0	20.0
Total Split (s)	55.0	0.0	0.0	35.0	24.0	24.0	21.0	20.0
Total Split (%)	55.0%	0.0%	0.0%	35.0%	24.0%	24.0%	21%	20%
Yellow Time (s)				3.0	3.0	3.0	3.0	3.0
All-Red Time (s)				2.0	2.0	2.0	2.0	2.0
Lead/Lag				Lead	Lead	Lead	Lag	Lag
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes
Recall Mode				C-Max	None	None	None	None
v/c Ratio	0.18			0.21	0.79	0.06		
Control Delay	1.5			12.0	53.9	14.6		
Queue Delay	0.2			0.0	0.0	0.0		
Total Delay	1.7			12.0	53.9	14.6		
Queue Length 50th (ft)	8			54	125	0		
Queue Length 95th (ft)	11			94	#224	18		
Internal Link Dist (ft)	130			840	144			
Turn Bay Length (ft)								
Base Capacity (vph)	2181			1651	290	305		
Starvation Cap Reductn	1095			0	0	0		
Spillback Cap Reductn	0			0	0	0		
Storage Cap Reductn	0			0	0	0		
Reduced v/c Ratio	0.37			0.21	0.72	0.06		

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 39 (39%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Northern Avenue & D Street



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	11	12	12
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.95			0.95	1.00	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	2981			2881	1450	1454
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	2981			2881	1450	1454
Volume (vph)	366	0	0	316	186	16
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.89	0.89
Adj. Flow (vph)	402	0	0	347	209	18
RTOR Reduction (vph)	0	0	0	0	0	15
Lane Group Flow (vph)	402	0	0	347	209	3
Heavy Vehicles (%)	9%	0%	0%	9%	12%	0%
Turn Type						Perm
Protected Phases	1 4			1	3	
Permitted Phases						3
Actuated Green, G (s)	72.8			56.3	17.2	17.2
Effective Green, g (s)	73.8			57.3	18.2	18.2
Actuated g/C Ratio	0.74			0.57	0.18	0.18
Clearance Time (s)				5.0	5.0	5.0
Vehicle Extension (s)				3.0	3.0	3.0
Lane Grp Cap (vph)	2200			1651	264	265
v/s Ratio Prot	c0.13			c0.12	c0.14	
v/s Ratio Perm						0.00
v/c Ratio	0.18			0.21	0.79	0.01
Uniform Delay, d1	4.0			10.4	39.1	33.5
Progression Factor	0.31			1.00	1.00	1.00
Incremental Delay, d2	0.0			0.3	14.9	0.0
Delay (s)	1.3			10.7	54.0	33.6
Level of Service	A			B	D	C
Approach Delay (s)	1.3			10.7	52.4	
Approach LOS	A			B	D	

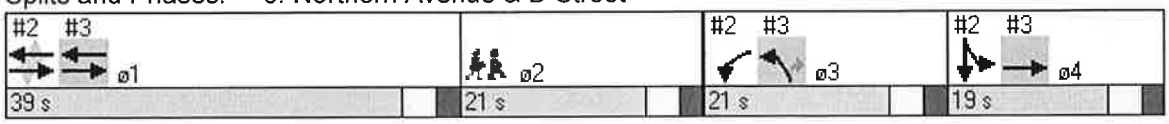
Intersection Summary			
HCM Average Control Delay	16.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	29.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2	ø4
Lane Configurations	↑↑			↑↑	↰	↱		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	12	12	12	11	12	12		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Leading Detector (ft)	50			50	50	50		
Trailing Detector (ft)	0			0	0	0		
Turning Speed (mph)		9	15		15	9		
Right Turn on Red		Yes				Yes		
Link Speed (mph)	30			30	30			
Link Distance (ft)	210			920	224			
Travel Time (s)	4.8			20.9	5.1			
Volume (vph)	266	0	0	434	149	26		
Lane Group Flow (vph)	283	0	0	462	159	28		
Turn Type						Perm		
Protected Phases	1 4			1	3		2	4
Permitted Phases						3		
Detector Phases	1 4			1	3	3		
Minimum Initial (s)				4.0	4.0	4.0	4.0	4.0
Minimum Split (s)				20.0	20.0	20.0	21.0	19.0
Total Split (s)	58.0	0.0	0.0	39.0	21.0	21.0	21.0	19.0
Total Split (%)	58.0%	0.0%	0.0%	39.0%	21.0%	21.0%	21%	19%
Yellow Time (s)				3.0	3.0	3.0	3.0	3.0
All-Red Time (s)				2.0	2.0	2.0	2.0	2.0
Lead/Lag				Lead	Lead	Lead	Lag	Lag
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes
Recall Mode				C-Max	None	None	None	None
v/c Ratio	0.12			0.25	0.68	0.12		
Control Delay	1.8			9.1	49.2	14.2		
Queue Delay	0.3			0.0	0.0	0.0		
Total Delay	2.1			9.1	49.2	14.2		
Queue Length 50th (ft)	11			62	96	0		
Queue Length 95th (ft)	14			103	163	24		
Internal Link Dist (ft)	130			840	144			
Turn Bay Length (ft)								
Base Capacity (vph)	2396			1850	271	261		
Starvation Cap Reductn	1505			0	0	0		
Spillback Cap Reductn	0			0	0	0		
Storage Cap Reductn	0			0	0	0		
Reduced v/c Ratio	0.32			0.25	0.59	0.11		

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 47 (47%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 3: Northern Avenue & D Street



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	11	12	12
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.95			0.95	1.00	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	3124			2908	1593	1398
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	3124			2908	1593	1398
Volume (vph)	266	0	0	434	149	26
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	283	0	0	462	159	28
RTOR Reduction (vph)	0	0	0	0	0	24
Lane Group Flow (vph)	283	0	0	462	159	4
Heavy Vehicles (%)	4%	0%	0%	8%	2%	4%
Turn Type						Perm
Protected Phases	1 4			1	3	
Permitted Phases						3
Actuated Green, G (s)	76.3			62.6	13.7	13.7
Effective Green, g (s)	77.3			63.6	14.7	14.7
Actuated g/C Ratio	0.77			0.64	0.15	0.15
Clearance Time (s)				5.0	5.0	5.0
Vehicle Extension (s)				3.0	3.0	3.0
Lane Grp Cap (vph)	2415			1849	234	206
v/s Ratio Prot	c0.09			c0.16	c0.10	
v/s Ratio Perm						0.00
v/c Ratio	0.12			0.25	0.68	0.02
Uniform Delay, d1	2.8			7.9	40.4	36.5
Progression Factor	0.57			1.00	1.00	1.00
Incremental Delay, d2	0.0			0.3	7.6	0.0
Delay (s)	1.6			8.2	48.0	36.5
Level of Service	A			A	D	D
Approach Delay (s)	1.6			8.2	46.3	
Approach LOS	A			A	D	

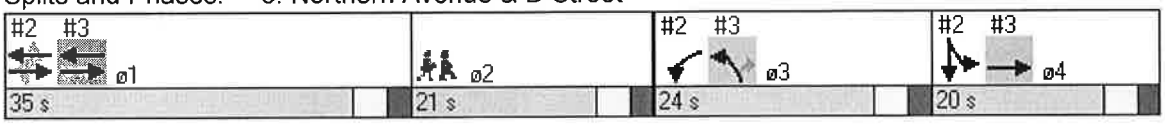
Intersection Summary			
HCM Average Control Delay	13.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	29.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2	ø4
Lane Configurations	↑↑			↑↑	↖	↱		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	12	12	12	11	12	12		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Leading Detector (ft)	50			50	50	50		
Trailing Detector (ft)	0			0	0	0		
Turning Speed (mph)		9	15		15	9		
Right Turn on Red		Yes				Yes		
Link Speed (mph)	30			30	30			
Link Distance (ft)	210			920	224			
Travel Time (s)	4.8			20.9	5.1			
Volume (vph)	469	0	0	459	240	16		
Lane Group Flow (vph)	515	0	0	504	270	18		
Turn Type						Perm		
Protected Phases	1 4			1	3		2	4
Permitted Phases						3		
Detector Phases	1 4			1	3	3		
Minimum Initial (s)				4.0	4.0	4.0	4.0	4.0
Minimum Split (s)				20.0	20.0	20.0	21.0	20.0
Total Split (s)	55.0	0.0	0.0	35.0	24.0	24.0	21.0	20.0
Total Split (%)	55.0%	0.0%	0.0%	35.0%	24.0%	24.0%	21%	20%
Yellow Time (s)				3.0	3.0	3.0	3.0	3.0
All-Red Time (s)				2.0	2.0	2.0	2.0	2.0
Lead/Lag				Lead	Lead	Lead	Lag	Lag
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes
Recall Mode				C-Max	None	None	None	None
v/c Ratio	0.24			0.32	0.93	0.06		
Control Delay	1.7			13.5	78.8	14.6		
Queue Delay	0.2			0.0	0.0	0.0		
Total Delay	1.9			13.5	78.8	14.6		
Queue Length 50th (ft)	11			84	171	0		
Queue Length 95th (ft)	13			138	#319	18		
Internal Link Dist (ft)	130			840	144			
Turn Bay Length (ft)								
Base Capacity (vph)	2127			1597	290	305		
Starvation Cap Reductn	901			0	0	0		
Spillback Cap Reductn	0			0	0	0		
Storage Cap Reductn	0			0	0	0		
Reduced v/c Ratio	0.42			0.32	0.93	0.06		

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 39 (39%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Northern Avenue & D Street



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	11	12	12
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.95			0.95	1.00	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	2981			2881	1450	1454
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	2981			2881	1450	1454
Volume (vph)	469	0	0	459	240	16
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.89	0.89
Adj. Flow (vph)	515	0	0	504	270	18
RTOR Reduction (vph)	0	0	0	0	0	14
Lane Group Flow (vph)	515	0	0	504	270	4
Heavy Vehicles (%)	9%	0%	0%	9%	12%	0%
Turn Type						Perm
Protected Phases	1 4			1	3	
Permitted Phases						3
Actuated Green, G (s)	71.0			54.4	19.0	19.0
Effective Green, g (s)	72.0			55.4	20.0	20.0
Actuated g/C Ratio	0.72			0.55	0.20	0.20
Clearance Time (s)				5.0	5.0	5.0
Vehicle Extension (s)				3.0	3.0	3.0
Lane Grp Cap (vph)	2146			1596	290	291
v/s Ratio Prot	c0.17			c0.17	c0.19	
v/s Ratio Perm						0.00
v/c Ratio	0.24			0.32	0.93	0.01
Uniform Delay, d1	4.7			12.1	39.3	32.1
Progression Factor	0.29			1.00	1.00	1.00
Incremental Delay, d2	0.1			0.5	35.0	0.0
Delay (s)	1.4			12.6	74.3	32.1
Level of Service	A			B	E	C
Approach Delay (s)	1.4			12.6	71.7	
Approach LOS	A			B	E	

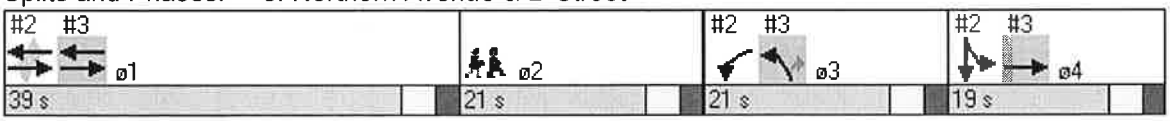
Intersection Summary			
HCM Average Control Delay	21.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	35.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2	ø4
Lane Configurations	↑↑			↑↑	↰	↱		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	12	12	12	11	12	12		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Leading Detector (ft)	50			50	50	50		
Trailing Detector (ft)	0			0	0	0		
Turning Speed (mph)		9	15		15	9		
Right Turn on Red		Yes				Yes		
Link Speed (mph)	30			30	30			
Link Distance (ft)	210			920	224			
Travel Time (s)	4.8			20.9	5.1			
Volume (vph)	332	0	0	597	187	27		
Lane Group Flow (vph)	353	0	0	635	199	29		
Turn Type						Perm		
Protected Phases	1 4			1	3		2	4
Permitted Phases						3		
Detector Phases	1 4			1	3	3		
Minimum Initial (s)				4.0	4.0	4.0	4.0	4.0
Minimum Split (s)				20.0	20.0	20.0	21.0	19.0
Total Split (s)	58.0	0.0	0.0	39.0	21.0	21.0	21.0	19.0
Total Split (%)	58.0%	0.0%	0.0%	39.0%	21.0%	21.0%	21%	19%
Yellow Time (s)				3.0	3.0	3.0	3.0	3.0
All-Red Time (s)				2.0	2.0	2.0	2.0	2.0
Lead/Lag				Lead	Lead	Lead	Lag	Lag
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes
Recall Mode				C-Max	None	None	None	None
v/c Ratio	0.15			0.35	0.78	0.12		
Control Delay	1.9			10.4	57.2	13.9		
Queue Delay	0.3			0.0	0.0	0.0		
Total Delay	2.2			10.4	57.2	13.9		
Queue Length 50th (ft)	13			95	122	0		
Queue Length 95th (ft)	15			148	#225	25		
Internal Link Dist (ft)	130			840	144			
Turn Bay Length (ft)								
Base Capacity (vph)	2357			1810	271	262		
Starvation Cap Reductn	1360			0	0	0		
Spillback Cap Reductn	0			0	0	0		
Storage Cap Reductn	0			0	0	0		
Reduced v/c Ratio	0.35			0.35	0.73	0.11		

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 47 (47%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Northern Avenue & D Street



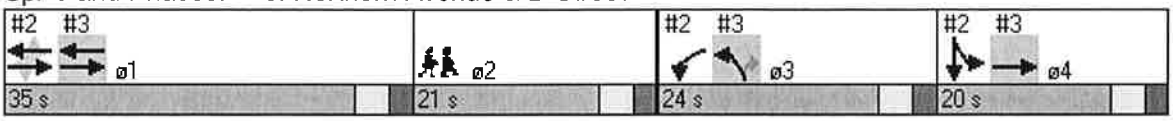
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	11	12	12
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.95			0.95	1.00	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	3124			2908	1593	1398
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	3124			2908	1593	1398
Volume (vph)	332	0	0	597	187	27
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	353	0	0	635	199	29
RTOR Reduction (vph)	0	0	0	0	0	24
Lane Group Flow (vph)	353	0	0	635	199	5
Heavy Vehicles (%)	4%	0%	0%	8%	2%	4%
Turn Type						Perm
Protected Phases	1 4			1	3	
Permitted Phases						3
Actuated Green, G (s)	75.0			61.2	15.0	15.0
Effective Green, g (s)	76.0			62.2	16.0	16.0
Actuated g/C Ratio	0.76			0.62	0.16	0.16
Clearance Time (s)				5.0	5.0	5.0
Vehicle Extension (s)				3.0	3.0	3.0
Lane Grp Cap (vph)	2374			1809	255	224
v/s Ratio Prot	c0.11			c0.22	c0.12	
v/s Ratio Perm						0.00
v/c Ratio	0.15			0.35	0.78	0.02
Uniform Delay, d1	3.2			9.1	40.3	35.4
Progression Factor	0.52			1.00	1.00	1.00
Incremental Delay, d2	0.0			0.5	14.3	0.0
Delay (s)	1.7			9.7	54.6	35.4
Level of Service	A			A	D	D
Approach Delay (s)	1.7			9.7	52.2	
Approach LOS	A			A	D	

Intersection Summary			
HCM Average Control Delay	15.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	36.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2	ø4
Lane Configurations	↑↑			↑↑	↰	↱		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	12	12	12	11	12	12		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Leading Detector (ft)	50			50	50	50		
Trailing Detector (ft)	0			0	0	0		
Turning Speed (mph)		9	15		15	9		
Right Turn on Red		Yes				Yes		
Link Speed (mph)	30			30	30			
Link Distance (ft)	210			920	224			
Travel Time (s)	4.8			20.9	5.1			
Volume (vph)	505	0	0	471	260	16		
Lane Group Flow (vph)	555	0	0	518	292	18		
Turn Type						Perm		
Protected Phases	1 4			1	3		2	4
Permitted Phases						3		
Detector Phases	1 4			1	3	3		
Minimum Initial (s)				4.0	4.0	4.0	4.0	4.0
Minimum Split (s)				20.0	20.0	20.0	21.0	20.0
Total Split (s)	55.0	0.0	0.0	35.0	24.0	24.0	21.0	20.0
Total Split (%)	55.0%	0.0%	0.0%	35.0%	24.0%	24.0%	21%	20%
Yellow Time (s)				3.0	3.0	3.0	3.0	3.0
All-Red Time (s)				2.0	2.0	2.0	2.0	2.0
Lead/Lag				Lead	Lead	Lead	Lag	Lag
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes
Recall Mode				C-Max	None	None	None	None
v/c Ratio	0.26			0.32	0.95	0.06		
Control Delay	1.6			13.6	81.5	14.6		
Queue Delay	0.2			0.0	0.0	0.0		
Total Delay	1.9			13.6	81.5	14.6		
Queue Length 50th (ft)	11			87	185	0		
Queue Length 95th (ft)	13			143	#342	18		
Internal Link Dist (ft)	130			840	144			
Turn Bay Length (ft)								
Base Capacity (vph)	2127			1597	307	305		
Starvation Cap Reductn	850			0	0	0		
Spillback Cap Reductn	0			0	0	0		
Storage Cap Reductn	0			0	0	0		
Reduced v/c Ratio	0.43			0.32	0.95	0.06		

Intersection Summary
Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 39 (39%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Northern Avenue & D Street



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↖	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	11	12	12
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.95			0.95	1.00	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	2981			2881	1533	1454
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	2981			2881	1533	1454
Volume (vph)	505	0	0	471	260	16
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.89	0.89
Adj. Flow (vph)	555	0	0	518	292	18
RTOR Reduction (vph)	0	0	0	0	0	14
Lane Group Flow (vph)	555	0	0	518	292	4
Heavy Vehicles (%)	9%	0%	0%	9%	6%	0%
Turn Type						Perm
Protected Phases	1 4			1	3	
Permitted Phases						3
Actuated Green, G (s)	71.0			54.4	19.0	19.0
Effective Green, g (s)	72.0			55.4	20.0	20.0
Actuated g/C Ratio	0.72			0.55	0.20	0.20
Clearance Time (s)				5.0	5.0	5.0
Vehicle Extension (s)				3.0	3.0	3.0
Lane Grp Cap (vph)	2146			1596	307	291
v/s Ratio Prot	c0.19			c0.18	c0.19	
v/s Ratio Perm						0.00
v/c Ratio	0.26			0.32	0.95	0.01
Uniform Delay, d1	4.8			12.1	39.5	32.1
Progression Factor	0.28			1.00	1.00	1.00
Incremental Delay, d2	0.1			0.5	38.3	0.0
Delay (s)	1.4			12.7	77.8	32.1
Level of Service	A			B	E	C
Approach Delay (s)	1.4			12.7	75.2	
Approach LOS	A			B	E	

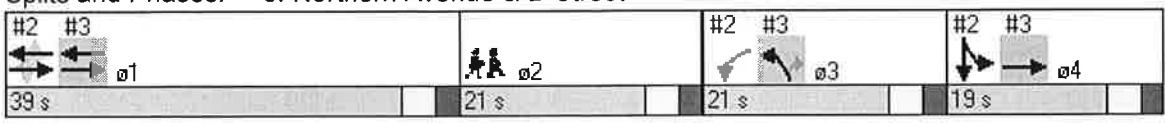
Intersection Summary			
HCM Average Control Delay	22.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	38.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2	ø4
Lane Configurations	↑↑			↑↑	↖	↱		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	12	12	12	11	12	12		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Leading Detector (ft)	50			50	50	50		
Trailing Detector (ft)	0			0	0	0		
Turning Speed (mph)		9	15		15	9		
Right Turn on Red		Yes				Yes		
Link Speed (mph)	30			30	30			
Link Distance (ft)	210			920	224			
Travel Time (s)	4.8			20.9	5.1			
Volume (vph)	373	0	0	615	187	27		
Lane Group Flow (vph)	397	0	0	654	199	29		
Turn Type						Perm		
Protected Phases	1 4			1	3		2	4
Permitted Phases						3		
Detector Phases	1 4			1	3	3		
Minimum Initial (s)				4.0	4.0	4.0	4.0	4.0
Minimum Split (s)				20.0	20.0	20.0	21.0	19.0
Total Split (s)	58.0	0.0	0.0	39.0	21.0	21.0	21.0	19.0
Total Split (%)	58.0%	0.0%	0.0%	39.0%	21.0%	21.0%	21%	19%
Yellow Time (s)				3.0	3.0	3.0	3.0	3.0
All-Red Time (s)				2.0	2.0	2.0	2.0	2.0
Lead/Lag				Lead	Lead	Lead	Lag	Lag
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	Yes
Recall Mode				C-Max	None	None	None	None
v/c Ratio	0.17			0.36	0.78	0.12		
Control Delay	1.8			10.5	57.2	13.9		
Queue Delay	0.2			0.0	0.0	0.0		
Total Delay	2.1			10.5	57.2	13.9		
Queue Length 50th (ft)	13			98	122	0		
Queue Length 95th (ft)	16			153	#225	25		
Internal Link Dist (ft)	130			840	144			
Turn Bay Length (ft)								
Base Capacity (vph)	2357			1809	271	262		
Starvation Cap Reductn	1280			0	0	0		
Spillback Cap Reductn	0			0	0	0		
Storage Cap Reductn	0			0	0	0		
Reduced v/c Ratio	0.37			0.36	0.73	0.11		

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 47 (47%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Northern Avenue & D Street



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	11	12	12
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.95			0.95	1.00	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	3124			2908	1593	1398
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	3124			2908	1593	1398
Volume (vph)	373	0	0	615	187	27
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	397	0	0	654	199	29
RTOR Reduction (vph)	0	0	0	0	0	24
Lane Group Flow (vph)	397	0	0	654	199	5
Heavy Vehicles (%)	4%	0%	0%	8%	2%	4%
Turn Type						Perm
Protected Phases	1 4			1	3	
Permitted Phases						3
Actuated Green, G (s)	75.0			61.2	15.0	15.0
Effective Green, g (s)	76.0			62.2	16.0	16.0
Actuated g/C Ratio	0.76			0.62	0.16	0.16
Clearance Time (s)				5.0	5.0	5.0
Vehicle Extension (s)				3.0	3.0	3.0
Lane Grp Cap (vph)	2374			1809	255	224
v/s Ratio Prot	c0.13			c0.22	c0.12	
v/s Ratio Perm						0.00
v/c Ratio	0.17			0.36	0.78	0.02
Uniform Delay, d1	3.3			9.2	40.3	35.4
Progression Factor	0.48			1.00	1.00	1.00
Incremental Delay, d2	0.0			0.6	14.3	0.0
Delay (s)	1.6			9.8	54.6	35.4
Level of Service	A			A	D	D
Approach Delay (s)	1.6			9.8	52.2	
Approach LOS	A			A	D	

Intersection Summary			
HCM Average Control Delay	14.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	37.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Northern Avenue at Congress Street

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	315	30	40	289	17	195
Peak Hour Factor	0.89	0.89	0.94	0.94	0.88	0.88
Hourly flow rate (vph)	354	34	43	307	19	222
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	920					
pX, platoon unblocked						
vC, conflicting volume			388		763	194
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			388		763	194
tC, single (s)			4.2		6.9	7.1
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.4
p0 queue free %			96		94	72
cM capacity (veh/h)			1160		320	794

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2
Volume Total	236	152	350	19	222
Volume Left	0	0	43	19	0
Volume Right	0	34	0	0	222
cSH	1700	1700	1160	320	794
Volume to Capacity	0.14	0.09	0.04	0.06	0.28
Queue Length 95th (ft)	0	0	3	5	29
Control Delay (s)	0.0	0.0	1.3	17.0	11.3
Lane LOS			A	C	B
Approach Delay (s)	0.0		1.3	11.7	
Approach LOS				B	

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	43.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	239	29	67	379	60	97
Peak Hour Factor	0.83	0.83	0.75	0.75	0.91	0.91
Hourly flow rate (vph)	288	35	89	505	66	107
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	920					
pX, platoon unblocked						
vC, conflicting volume			323		989	161
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			323		989	161
tC, single (s)			4.1		6.9	7.1
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.4
p0 queue free %			93		71	87
cM capacity (veh/h)			1248		225	824

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2
Volume Total	192	131	595	66	107
Volume Left	0	0	89	66	0
Volume Right	0	35	0	0	107
cSH	1700	1700	1248	225	824
Volume to Capacity	0.11	0.08	0.07	0.29	0.13
Queue Length 95th (ft)	0	0	6	29	11
Control Delay (s)	0.0	0.0	1.9	27.6	10.0
Lane LOS			A	D	B
Approach Delay (s)	0.0		1.9	16.7	
Approach LOS				C	

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	48.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	419	31	44	433	17	209
Peak Hour Factor	0.89	0.89	0.94	0.94	0.88	0.88
Hourly flow rate (vph)	471	35	47	461	19	238
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	920					
pX, platoon unblocked						
vC, conflicting volume			506		1042	253
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			506		1042	253
tC, single (s)			4.2		6.9	7.1
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.4
p0 queue free %			96		91	67
cM capacity (veh/h)			1048		209	726

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2
Volume Total	314	192	507	19	238
Volume Left	0	0	47	19	0
Volume Right	0	35	0	0	238
cSH	1700	1700	1048	209	726
Volume to Capacity	0.18	0.11	0.04	0.09	0.33
Queue Length 95th (ft)	0	0	4	8	36
Control Delay (s)	0.0	0.0	1.3	24.0	12.4
Lane LOS			A	C	B
Approach Delay (s)	0.0		1.3	13.2	
Approach LOS				B	

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	55.3%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	305	30	76	541	62	108
Peak Hour Factor	0.83	0.83	0.75	0.75	0.91	0.91
Hourly flow rate (vph)	367	36	101	721	68	119
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	920					
pX, platoon unblocked						
vC, conflicting volume			404		1310	202
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			404		1310	202
tC, single (s)			4.1		6.9	7.1
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.4
p0 queue free %			91		50	85
cM capacity (veh/h)			1166		136	775

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2
Volume Total	245	159	823	68	119
Volume Left	0	0	101	68	0
Volume Right	0	36	0	0	119
cSH	1700	1700	1166	136	775
Volume to Capacity	0.14	0.09	0.09	0.50	0.15
Queue Length 95th (ft)	0	0	7	59	13
Control Delay (s)	0.0	0.0	2.1	55.2	10.5
Lane LOS			A	F	B
Approach Delay (s)	0.0		2.1	26.8	
Approach LOS				D	

Intersection Summary			
Average Delay	4.8		
Intersection Capacity Utilization	60.6%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	439	47	60	433	29	215
Peak Hour Factor	0.89	0.89	0.94	0.94	0.88	0.88
Hourly flow rate (vph)	493	53	64	461	33	244
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	920			630		
pX, platoon unblocked						
vC, conflicting volume			546		1108	273
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			546		1108	273
tC, single (s)			4.2		6.9	7.1
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.4
p0 queue free %			94		82	65
cM capacity (veh/h)			1012		185	704

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2
Volume Total	329	217	524	33	244
Volume Left	0	0	64	33	0
Volume Right	0	53	0	0	244
cSH	1700	1700	1012	185	704
Volume to Capacity	0.19	0.13	0.06	0.18	0.35
Queue Length 95th (ft)	0	0	5	16	39
Control Delay (s)	0.0	0.0	1.7	28.6	12.8
Lane LOS			A	D	B
Approach Delay (s)	0.0		1.7	14.7	
Approach LOS				B	

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	57.5%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	329	47	94	541	101	119
Peak Hour Factor	0.83	0.83	0.75	0.75	0.91	0.91
Hourly flow rate (vph)	396	57	125	721	111	131
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	920			610		
pX, platoon unblocked						
vC, conflicting volume			453		1397	227
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			453		1397	227
tC, single (s)			4.1		6.9	7.1
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.4
p0 queue free %			89		4	82
cM capacity (veh/h)			1118		116	747

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2
Volume Total	264	189	847	111	131
Volume Left	0	0	125	111	0
Volume Right	0	57	0	0	131
cSH	1700	1700	1118	116	747
Volume to Capacity	0.16	0.11	0.11	0.96	0.18
Queue Length 95th (ft)	0	0	9	153	16
Control Delay (s)	0.0	0.0	2.7	141.9	10.8
Lane LOS			A	F	B
Approach Delay (s)	0.0		2.7	71.0	
Approach LOS				F	

Intersection Summary			
Average Delay	12.6		
Intersection Capacity Utilization	65.4%	ICU Level of Service	C
Analysis Period (min)	15		

Congress Street at Park Lane and the Project Driveway



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	5	2	2	212	62	6
Peak Hour Factor	0.44	0.44	0.86	0.86	0.71	0.71
Hourly flow rate (vph)	11	5	2	247	87	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				220		
pX, platoon unblocked						
vC, conflicting volume	343	92	96			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	343	92	96			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	100	100			
cM capacity (veh/h)	657	971	1511			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	16	249	96
Volume Left	11	2	0
Volume Right	5	0	8
cSH	724	1511	1700
Volume to Capacity	0.02	0.00	0.06
Queue Length 95th (ft)	2	0	0
Control Delay (s)	10.1	0.1	0.0
Lane LOS	B	A	
Approach Delay (s)	10.1	0.1	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	24.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	9	7	6	159	104	3
Peak Hour Factor	0.57	0.57	0.88	0.88	0.84	0.84
Hourly flow rate (vph)	16	12	7	181	124	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				220		
pX, platoon unblocked						
vC, conflicting volume	320	126	127			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	320	126	127			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	99	100			
cM capacity (veh/h)	675	930	1471			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	28	188	127
Volume Left	16	7	0
Volume Right	12	0	4
cSH	767	1471	1700
Volume to Capacity	0.04	0.00	0.07
Queue Length 95th (ft)	3	0	0
Control Delay (s)	9.9	0.3	0.0
Lane LOS	A	A	
Approach Delay (s)	9.9	0.3	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	24.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	5	2	2	226	67	6
Peak Hour Factor	0.44	0.44	0.86	0.86	0.71	0.71
Hourly flow rate (vph)	11	5	2	263	94	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				220		
pX, platoon unblocked						
vC, conflicting volume	366	99	103			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	366	99	103			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	100	100			
cM capacity (veh/h)	637	963	1502			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	16	265	103
Volume Left	11	2	0
Volume Right	5	0	8
cSH	705	1502	1700
Volume to Capacity	0.02	0.00	0.06
Queue Length 95th (ft)	2	0	0
Control Delay (s)	10.2	0.1	0.0
Lane LOS	B	A	
Approach Delay (s)	10.2	0.1	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	25.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	9	7	6	172	114	3
Peak Hour Factor	0.57	0.57	0.88	0.88	0.84	0.84
Hourly flow rate (vph)	16	12	7	195	136	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				220		
pX, platoon unblocked						
vC, conflicting volume	347	138	139			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	347	138	139			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	99	100			
cM capacity (veh/h)	651	916	1457			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	28	202	139
Volume Left	16	7	0
Volume Right	12	0	4
cSH	746	1457	1700
Volume to Capacity	0.04	0.00	0.08
Queue Length 95th (ft)	3	0	0
Control Delay (s)	10.0	0.3	0.0
Lane LOS	B	A	
Approach Delay (s)	10.0	0.3	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	25.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	5	0	2	28	0	19	2	225	63	32	67	6
Peak Hour Factor	0.44	0.44	0.44	0.92	0.92	0.92	0.86	0.86	0.86	0.71	0.71	0.71
Hourly flow rate (vph)	11	0	5	30	0	21	2	262	73	45	94	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)								220				
pX, platoon unblocked												
vC, conflicting volume	512	528	99	496	496	298	103			335		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	512	528	99	496	496	298	103			335		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	100	100	93	100	97	100			96		
cM capacity (veh/h)	449	441	963	468	457	741	1502			1224		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	16	51	337	148
Volume Left	11	30	2	45
Volume Right	5	21	73	8
cSH	529	550	1502	1224
Volume to Capacity	0.03	0.09	0.00	0.04
Queue Length 95th (ft)	2	8	0	3
Control Delay (s)	12.0	12.2	0.1	2.7
Lane LOS	B	B	A	A
Approach Delay (s)	12.0	12.2	0.1	2.7
Approach LOS	B	B		

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	37.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	9	0	7	71	0	53	6	169	77	36	113	3
Peak Hour Factor	0.57	0.57	0.57	0.92	0.92	0.92	0.88	0.88	0.88	0.84	0.84	0.84
Hourly flow rate (vph)	16	0	12	77	0	58	7	192	88	43	135	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)								220				
pX, platoon unblocked												
vC, conflicting volume	529	515	136	484	473	236	138			280		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	529	515	136	484	473	236	138			280		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	100	99	84	100	93	100			97		
cM capacity (veh/h)	418	449	918	473	471	803	1458			1283		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	28	135	286	181
Volume Left	16	77	7	43
Volume Right	12	58	88	4
cSH	548	574	1458	1283
Volume to Capacity	0.05	0.24	0.00	0.03
Queue Length 95th (ft)	4	23	0	3
Control Delay (s)	11.9	13.2	0.2	2.1
Lane LOS	B	B	A	A
Approach Delay (s)	11.9	13.2	0.2	2.1
Approach LOS	B	B		

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	44.3%	ICU Level of Service	A
Analysis Period (min)	15		

Northern Avenue at Haul Road

MOVEMENT SUMMARY

Site: New Site - 1

Northern Avenue/Haul Road - 2012 Existing AM Peak Hour
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Haul Road											
3	L	59	7.0	0.103	6.8	LOS A	0.3	8.7	0.49	0.82	26.5
8	T	6	0.0	0.103	6.8	LOS A	0.3	8.7	0.49	0.64	29.1
18	R	166	19.0	0.289	10.3	LOS B	0.9	26.6	0.54	0.78	26.9
Approach		232	15.4	0.289	9.3	LOS A	0.9	26.6	0.53	0.79	26.8
East: Northern Avenue WB											
1	L	56	2.0	0.371	8.0	LOS A	1.6	43.8	0.28	0.84	26.1
6	T	287	12.0	0.371	8.0	LOS A	1.6	43.8	0.28	0.46	28.9
16	R	2	50.0	0.371	8.0	LOS A	1.6	43.8	0.28	0.54	28.4
Approach		344	10.6	0.371	8.0	LOS A	1.6	43.8	0.28	0.52	28.4
North: Driveway											
7	L	2	0.0	0.047	5.8	LOS A	0.1	3.9	0.45	0.87	27.3
4	T	16	14.0	0.047	5.8	LOS A	0.1	3.9	0.45	0.59	30.2
14	R	14	0.0	0.047	5.8	LOS A	0.1	3.9	0.45	0.65	29.8
Approach		32	7.0	0.047	5.8	LOS A	0.1	3.9	0.45	0.64	29.8
West: Northern Avenue EB											
5	L	23	8.0	0.481	9.6	LOS A	2.5	66.5	0.29	0.85	25.4
2	T	434	10.0	0.481	9.6	LOS A	2.5	66.5	0.29	0.46	28.0
12	R	54	12.0	0.058	4.4	LOS A	0.2	5.0	0.18	0.51	30.4
Approach		512	10.1	0.481	9.1	LOS A	2.5	66.5	0.28	0.48	28.1
All Vehicles		1120	11.3	0.481	8.7	LOS A	2.5	66.5	0.33	0.56	27.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

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MOVEMENT SUMMARY

Site: New Site - 1

Northern Avenue/Haul Road - 2012 Existing PM Peak Hour
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Haul Road											
3	L	89	3.0	0.123	6.1	LOS A	0.4	10.9	0.44	0.78	26.8
8	T	4	0.0	0.123	6.1	LOS A	0.4	10.9	0.44	0.58	29.5
18	R	43	57.0	0.086	8.4	LOS A	0.2	6.8	0.42	0.65	27.9
Approach		135	19.9	0.123	6.8	LOS A	0.4	10.9	0.43	0.73	27.2
East: Northern Avenue WB											
1	L	158	9.0	0.642	14.1	LOS B	4.4	115.3	0.54	0.83	23.7
6	T	418	5.0	0.642	14.1	LOS B	4.4	115.3	0.54	0.60	25.5
16	R	1	0.0	0.642	14.1	LOS B	4.4	115.3	0.54	0.65	25.2
Approach		578	6.1	0.642	14.1	LOS B	4.4	115.3	0.54	0.67	24.9
North: Driveway											
7	L	20	9.0	0.089	7.8	LOS A	0.3	7.3	0.55	0.93	26.2
4	T	17	0.0	0.089	7.8	LOS A	0.3	7.3	0.55	0.73	28.7
14	R	11	0.0	0.089	7.8	LOS A	0.3	7.3	0.55	0.77	28.3
Approach		48	3.8	0.089	7.8	LOS A	0.3	7.3	0.55	0.82	27.5
West: Northern Avenue EB											
5	L	69	6.0	0.387	8.7	LOS A	1.7	45.2	0.43	0.86	25.9
2	T	266	6.0	0.387	8.7	LOS A	1.7	45.2	0.43	0.57	28.4
12	R	66	6.0	0.076	4.9	LOS A	0.3	6.6	0.32	0.56	30.1
Approach		400	6.0	0.387	8.1	LOS A	1.7	45.2	0.41	0.62	28.1
All Vehicles		1161	7.6	0.642	10.9	LOS B	4.4	115.3	0.49	0.66	26.3

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

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MOVEMENT SUMMARY

Site: New Site - 1

Northern Avenue/Haul Road - 2018 No-Build AM Peak Hour
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Haul Road											
3	L	61	7.0	0.119	7.9	LOS A	0.4	10.0	0.54	0.88	26.0
8	T	6	0.0	0.119	7.9	LOS A	0.4	10.0	0.54	0.71	28.3
18	R	171	19.0	0.340	12.5	LOS B	1.1	32.2	0.60	0.82	25.7
Approach		238	15.4	0.340	11.2	LOS B	1.1	32.2	0.58	0.84	25.9
East: Northern Avenue WB											
1	L	57	2.0	0.550	11.3	LOS B	3.0	81.9	0.35	0.83	24.7
6	T	449	12.0	0.550	11.3	LOS B	3.0	81.9	0.35	0.48	27.0
16	R	2	50.0	0.550	11.3	LOS B	3.0	81.9	0.35	0.56	26.6
Approach		508	11.1	0.550	11.3	LOS B	3.0	81.9	0.35	0.52	26.7
North: Driveway											
7	L	2	0.0	0.056	7.0	LOS A	0.2	4.6	0.52	0.92	26.7
4	T	16	14.0	0.056	7.0	LOS A	0.2	4.6	0.52	0.68	29.3
14	R	14	0.0	0.056	7.0	LOS A	0.2	4.6	0.52	0.73	29.0
Approach		32	7.0	0.056	7.0	LOS A	0.2	4.6	0.52	0.72	29.0
West: Northern Avenue EB											
5	L	23	8.0	0.608	12.5	LOS B	3.8	102.3	0.35	0.83	24.3
2	T	554	10.0	0.608	12.5	LOS B	3.8	102.3	0.35	0.47	26.4
12	R	55	12.0	0.059	4.4	LOS A	0.2	5.1	0.18	0.51	30.4
Approach		633	10.1	0.608	11.8	LOS B	3.8	102.3	0.34	0.49	26.6
All Vehicles		1411	11.3	0.608	11.4	LOS B	3.8	102.3	0.39	0.57	26.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

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MOVEMENT SUMMARY

Site: New Site - 1

Northern Avenue/Haul Road - 2018 No-Build PM Peak Hour
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Haul Road											
3	L	91	3.0	0.138	6.7	LOS A	0.5	12.2	0.49	0.82	26.5
8	T	4	0.0	0.138	6.7	LOS A	0.5	12.2	0.49	0.63	29.0
18	R	44	57.0	0.097	9.3	LOS A	0.2	7.6	0.46	0.69	27.4
Approach		139	20.0	0.138	7.6	LOS A	0.5	12.2	0.48	0.77	26.8
East: Northern Avenue WB											
1	L	162	9.0	0.890	30.7	LOS D	14.6	382.5	0.92	0.92	18.9
6	T	637	5.0	0.890	30.7	LOS D	14.6	382.5	0.92	0.88	19.4
16	R	1	0.0	0.890	30.7	LOS D	14.6	382.5	0.92	0.89	19.3
Approach		800	5.8	0.890	30.7	LOS D	14.6	382.5	0.92	0.89	19.3
North: Driveway											
7	L	20	9.0	0.113	10.1	LOS B	0.4	9.1	0.64	0.94	25.2
4	T	17	0.0	0.113	10.1	LOS B	0.4	9.1	0.64	0.78	27.3
14	R	11	0.0	0.113	10.1	LOS B	0.4	9.1	0.64	0.82	27.0
Approach		48	3.8	0.113	10.1	LOS B	0.4	9.1	0.64	0.86	26.3
West: Northern Avenue EB											
5	L	70	6.0	0.486	10.5	LOS B	2.4	63.3	0.48	0.87	25.2
2	T	348	6.0	0.486	10.5	LOS B	2.4	63.3	0.48	0.60	27.4
12	R	67	6.0	0.078	4.9	LOS A	0.3	6.8	0.32	0.57	30.1
Approach		484	6.0	0.486	9.7	LOS A	2.4	63.3	0.46	0.64	27.3
All Vehicles		1472	7.1	0.890	21.0	LOS C	14.6	382.5	0.72	0.79	22.2

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

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SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: New Site - 1

Northern Avenue/Haul Road - 2018 Build AM Peak Hour
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Haul Road											
3	L	65	7.0	0.127	8.0	LOS A	0.4	10.7	0.55	0.88	25.9
8	T	6	0.0	0.127	8.0	LOS A	0.4	10.7	0.55	0.71	28.2
18	R	171	19.0	0.342	12.6	LOS B	1.1	32.4	0.60	0.83	25.7
Approach		242	15.3	0.342	11.3	LOS B	1.1	32.4	0.59	0.84	25.8
East: Northern Avenue WB											
1	L	57	2.0	0.568	11.8	LOS B	3.2	86.6	0.37	0.83	24.6
6	T	463	12.0	0.568	11.8	LOS B	3.2	86.6	0.37	0.49	26.8
16	R	2	50.0	0.568	11.8	LOS B	3.2	86.6	0.37	0.56	26.4
Approach		522	11.1	0.568	11.8	LOS B	3.2	86.6	0.37	0.53	26.5
North: Driveway											
7	L	2	0.0	0.057	7.2	LOS A	0.2	4.7	0.53	0.93	26.7
4	T	16	14.0	0.057	7.2	LOS A	0.2	4.7	0.53	0.69	29.2
14	R	14	0.0	0.057	7.2	LOS A	0.2	4.7	0.53	0.74	28.9
Approach		32	7.0	0.057	7.2	LOS A	0.2	4.7	0.53	0.73	28.9
West: Northern Avenue EB											
5	L	23	8.0	0.612	12.6	LOS B	3.9	103.9	0.36	0.83	24.2
2	T	559	10.0	0.612	12.6	LOS B	3.9	103.9	0.36	0.47	26.3
12	R	57	12.0	0.062	4.4	LOS A	0.2	5.3	0.18	0.51	30.4
Approach		639	10.1	0.612	11.9	LOS B	3.9	103.9	0.34	0.49	26.6
All Vehicles		1435	11.3	0.612	11.6	LOS B	3.9	103.9	0.40	0.57	26.5

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

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SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: New Site - 1

Northern Avenue/Haul Road - 2018 Build PM Peak Hour
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Haul Road											
3	L	95	3.0	0.146	6.9	LOS A	0.5	12.9	0.50	0.83	26.4
8	T	4	0.0	0.146	6.9	LOS A	0.5	12.9	0.50	0.65	28.9
18	R	44	57.0	0.099	9.5	LOS A	0.2	7.7	0.47	0.70	27.3
Approach		143	19.5	0.146	7.7	LOS A	0.5	12.9	0.49	0.78	26.7
East: Northern Avenue WB											
1	L	162	9.0	0.915	34.4	LOS D	17.1	446.2	0.99	0.96	18.1
6	T	657	5.0	0.915	34.4	LOS D	17.1	446.2	0.99	0.95	18.5
16	R	1	0.0	0.915	34.4	LOS D	17.1	446.2	0.99	0.95	18.4
Approach		820	5.8	0.915	34.4	LOS D	17.1	446.2	0.99	0.95	18.4
North: Driveway											
7	L	20	9.0	0.116	10.4	LOS B	0.4	9.3	0.65	0.94	25.1
4	T	17	0.0	0.116	10.4	LOS B	0.4	9.3	0.65	0.79	27.1
14	R	11	0.0	0.116	10.4	LOS B	0.4	9.3	0.65	0.82	26.9
Approach		48	3.8	0.116	10.4	LOS B	0.4	9.3	0.65	0.86	26.1
West: Northern Avenue EB											
5	L	70	6.0	0.505	10.9	LOS B	2.6	67.4	0.49	0.87	25.0
2	T	364	6.0	0.505	10.9	LOS B	2.6	67.4	0.49	0.61	27.2
12	R	70	6.0	0.081	5.0	LOS A	0.3	7.1	0.32	0.57	30.0
Approach		504	6.0	0.505	10.1	LOS B	2.6	67.4	0.47	0.64	27.2
All Vehicles		1515	7.1	0.915	23.0	LOS C	17.1	446.2	0.76	0.83	21.5

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

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Northern Avenue at the Project Driveway

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	634	20	0	493	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	689	22	0	536	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	1200			350		
pX, platoon unblocked			0.95		0.95	0.95
vC, conflicting volume			711		968	700
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			697		966	686
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			854		241	372

Direction, Lane #	EB 1	WB 1	WB 2
Volume Total	711	268	268
Volume Left	0	0	0
Volume Right	22	0	0
cSH	1700	1700	1700
Volume to Capacity	0.42	0.16	0.16
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			
Approach Delay (s)	0.0	0.0	
Approach LOS			

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	41.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	422	26	0	632	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	459	28	0	687	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	1200			330		
pX, platoon unblocked						
vC, conflicting volume			487		816	473
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			487		816	473
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1072		315	538

Direction, Lane #	EB 1	WB 1	WB 2
Volume Total	487	343	343
Volume Left	0	0	0
Volume Right	28	0	0
cSH	1700	1700	1700
Volume to Capacity	0.29	0.20	0.20
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			
Approach Delay (s)	0.0	0.0	
Approach LOS			

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	29.8%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix C

Pedestrian Wind Comfort and Safety Study Results Tables

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
1	A	Spring	21		Uncomfortable	29		Acceptable
		Summer	16		Walking	23		Acceptable
		Fall	19		Walking	27		Acceptable
		Winter	20		Uncomfortable	29		Acceptable
		Annual	19		Walking	27		Acceptable
	B	Spring	24	+14%	Uncomfortable	35	+21%	Unacceptable
		Summer	21	+31%	Uncomfortable	31	+35%	Acceptable
		Fall	23	+21%	Uncomfortable	33	+22%	Unacceptable
		Winter	25	+25%	Uncomfortable	36	+24%	Unacceptable
		Annual	23	+21%	Uncomfortable	34	+26%	Unacceptable
2	A	Spring	20		Uncomfortable	28		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	18		Walking	26		Acceptable
		Winter	20		Uncomfortable	28		Acceptable
		Annual	19		Walking	26		Acceptable
	B	Spring	16	-20%	Walking	24	-14%	Acceptable
		Summer	14	-12%	Standing	21		Acceptable
		Fall	15	-17%	Standing	23	-12%	Acceptable
		Winter	16	-20%	Walking	25	-11%	Acceptable
		Annual	15	-21%	Standing	23	-12%	Acceptable
3	A	Spring	19		Walking	27		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	18		Walking	25		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	18		Walking	26		Acceptable
	B	Spring	12	-37%	Sitting	19	-30%	Acceptable
		Summer	9	-44%	Sitting	16	-27%	Acceptable
		Fall	11	-39%	Sitting	18	-28%	Acceptable
		Winter	12	-40%	Sitting	20	-26%	Acceptable
		Annual	11	-39%	Sitting	18	-31%	Acceptable
4	A	Spring	19		Walking	26		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	18		Walking	25		Acceptable
		Winter	19		Walking	27		Acceptable
		Annual	18		Walking	25		Acceptable
	B	Spring	12	-37%	Sitting	20	-23%	Acceptable
		Summer	10	-38%	Sitting	16	-27%	Acceptable
		Fall	11	-39%	Sitting	19	-24%	Acceptable
		Winter	12	-37%	Sitting	21	-22%	Acceptable
		Annual	11	-39%	Sitting	19	-24%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
5	A	Spring	20		Uncomfortable	27		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	19		Walking	26		Acceptable
	B	Spring	11	-45%	Sitting	18	-33%	Acceptable
		Summer	9	-44%	Sitting	15	-32%	Acceptable
		Fall	10	-47%	Sitting	18	-28%	Acceptable
		Winter	12	-40%	Sitting	20	-26%	Acceptable
		Annual	11	-42%	Sitting	18	-31%	Acceptable
6	A	Spring	19		Walking	25		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	18		Walking	24		Acceptable
	B	Spring	15	-21%	Standing	24		Acceptable
		Summer	14		Standing	21		Acceptable
		Fall	15	-12%	Standing	23		Acceptable
		Winter	16	-11%	Walking	25		Acceptable
		Annual	15	-17%	Standing	24		Acceptable
7	A	Spring	18		Walking	24		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	17		Walking	23		Acceptable
	B	Spring	23	+28%	Uncomfortable	31	+29%	Acceptable
		Summer	19	+36%	Walking	25	+32%	Acceptable
		Fall	21	+24%	Uncomfortable	29	+26%	Acceptable
		Winter	23	+28%	Uncomfortable	31	+24%	Acceptable
		Annual	22	+29%	Uncomfortable	29	+26%	Acceptable
8	A	Spring	19		Walking	25		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	19		Walking	25		Acceptable
		Annual	18		Walking	24		Acceptable
	B	Spring	27	+42%	Uncomfortable	37	+48%	Unacceptable
		Summer	23	+53%	Uncomfortable	31	+55%	Acceptable
		Fall	25	+47%	Uncomfortable	34	+48%	Unacceptable
		Winter	27	+42%	Uncomfortable	37	+48%	Unacceptable
		Annual	26	+44%	Uncomfortable	35	+46%	Unacceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
9	A	Spring	18		Walking	25		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	19		Walking	25		Acceptable
		Annual	17		Walking	24		Acceptable
	B	Spring	20	+11%	Uncomfortable	27		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	18		Walking	25		Acceptable
		Winter	17	-11%	Walking	24		Acceptable
		Annual	18		Walking	24		Acceptable
10	A	Spring	18		Walking	25		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	17		Walking	24		Acceptable
	B	Spring	23	+28%	Uncomfortable	31	+24%	Acceptable
		Summer	16	+14%	Walking	22		Acceptable
		Fall	20	+18%	Uncomfortable	28	+17%	Acceptable
		Winter	19		Walking	28		Acceptable
		Annual	20	+18%	Uncomfortable	28	+17%	Acceptable
11	A	Spring	17		Walking	25		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	16		Walking	24		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	17		Walking	24		Acceptable
	B	Spring	18		Walking	26		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	16		Walking	24		Acceptable
		Winter	16	-11%	Walking	25		Acceptable
		Annual	16		Walking	24		Acceptable
12	A	Spring	17		Walking	25		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	17		Walking	25		Acceptable
		Annual	16		Walking	23		Acceptable
	B	Spring	23	+35%	Uncomfortable	31	+24%	Acceptable
		Summer	17	+21%	Walking	23	+21%	Acceptable
		Fall	21	+31%	Uncomfortable	29	+26%	Acceptable
		Winter	23	+35%	Uncomfortable	32	+28%	Unacceptable
		Annual	21	+31%	Uncomfortable	29	+26%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
13	A	Spring	17		Walking	25		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	17		Walking	24		Acceptable
	B	Spring	19	+12%	Walking	27		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	17		Walking	25		Acceptable
		Winter	20	+11%	Uncomfortable	28	+12%	Acceptable
		Annual	18		Walking	26		Acceptable
14	A	Spring	16		Walking	23		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	17		Walking	25		Acceptable
		Annual	16		Walking	23		Acceptable
	B	Spring	22	+38%	Uncomfortable	31	+35%	Acceptable
		Summer	17	+31%	Walking	23	+21%	Acceptable
		Fall	20	+25%	Uncomfortable	28	+27%	Acceptable
		Winter	21	+24%	Uncomfortable	29	+16%	Acceptable
		Annual	20	+25%	Uncomfortable	28	+22%	Acceptable
15	A	Spring	18		Walking	25		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	17		Walking	24		Acceptable
	B	Spring	24	+33%	Uncomfortable	32	+28%	Unacceptable
		Summer	19	+27%	Walking	25	+25%	Acceptable
		Fall	23	+35%	Uncomfortable	29	+21%	Acceptable
		Winter	26	+37%	Uncomfortable	33	+27%	Unacceptable
		Annual	24	+41%	Uncomfortable	30	+25%	Acceptable
16	A	Spring	18		Walking	25		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	17		Walking	24		Acceptable
	B	Spring	22	+22%	Uncomfortable	31	+24%	Acceptable
		Summer	17	+21%	Walking	23	+15%	Acceptable
		Fall	20	+18%	Uncomfortable	28	+17%	Acceptable
		Winter	23	+21%	Uncomfortable	31	+19%	Acceptable
		Annual	21	+24%	Uncomfortable	29	+21%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
17	A	Spring	18		Walking	26		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	19		Walking	27		Acceptable
		Annual	18		Walking	25		Acceptable
	B	Spring	16	-11%	Walking	23	-12%	Acceptable
		Summer	12	-20%	Sitting	18	-14%	Acceptable
		Fall	14	-18%	Standing	21	-12%	Acceptable
		Winter	16	-16%	Walking	23	-15%	Acceptable
		Annual	15	-17%	Standing	22	-12%	Acceptable
18	A	Spring	17		Walking	24		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	17		Walking	24		Acceptable
		Annual	16		Walking	22		Acceptable
	B	Spring	29	+71%	Dangerous	38	+58%	Unacceptable
		Summer	22	+69%	Uncomfortable	28	+47%	Acceptable
		Fall	26	+73%	Uncomfortable	35	+59%	Unacceptable
		Winter	29	+71%	Dangerous	38	+58%	Unacceptable
		Annual	27	+69%	Uncomfortable	35	+59%	Unacceptable
19	A	Spring	17		Walking	23		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	17		Walking	23		Acceptable
	B	Spring	22	+29%	Uncomfortable	29	+26%	Acceptable
		Summer	17	+21%	Walking	23	+21%	Acceptable
		Fall	21	+31%	Uncomfortable	27	+23%	Acceptable
		Winter	23	+28%	Uncomfortable	30	+20%	Acceptable
		Annual	21	+24%	Uncomfortable	28	+22%	Acceptable
20	A	Spring	19		Walking	25		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	20		Uncomfortable	26		Acceptable
		Annual	18		Walking	24		Acceptable
	B	Spring	18		Walking	27		Acceptable
		Summer	14		Standing	21		Acceptable
		Fall	17		Walking	26		Acceptable
		Winter	19		Walking	28		Acceptable
		Annual	18		Walking	26		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
21	A	Spring	21		Uncomfortable	27		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	22		Uncomfortable	29		Acceptable
		Annual	20		Uncomfortable	26		Acceptable
	B	Spring	19		Walking	27		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	17	-11%	Walking	25		Acceptable
		Winter	19	-14%	Walking	26	-10%	Acceptable
		Annual	17	-15%	Walking	25		Acceptable
22	A	Spring	23		Uncomfortable	30		Acceptable
		Summer	18		Walking	24		Acceptable
		Fall	21		Uncomfortable	28		Acceptable
		Winter	24		Uncomfortable	32		Unacceptable
		Annual	22		Uncomfortable	29		Acceptable
	B	Spring	22		Uncomfortable	29		Acceptable
		Summer	16	-11%	Walking	22		Acceptable
		Fall	19		Walking	26		Acceptable
		Winter	21	-12%	Uncomfortable	28	-12%	Acceptable
		Annual	20		Uncomfortable	27		Acceptable
23	A	Spring	22		Uncomfortable	31		Acceptable
		Summer	18		Walking	25		Acceptable
		Fall	21		Uncomfortable	28		Acceptable
		Winter	23		Uncomfortable	32		Unacceptable
		Annual	21		Uncomfortable	29		Acceptable
	B	Spring	22		Uncomfortable	31		Acceptable
		Summer	17		Walking	24		Acceptable
		Fall	20		Uncomfortable	28		Acceptable
		Winter	22		Uncomfortable	30		Acceptable
		Annual	21		Uncomfortable	29		Acceptable
24	A	Spring	22		Uncomfortable	31		Acceptable
		Summer	17		Walking	24		Acceptable
		Fall	19		Walking	28		Acceptable
		Winter	20		Uncomfortable	30		Acceptable
		Annual	20		Uncomfortable	29		Acceptable
	B	Spring	24		Uncomfortable	32		Unacceptable
		Summer	19	+12%	Walking	26		Acceptable
		Fall	22	+16%	Uncomfortable	30		Acceptable
		Winter	25	+25%	Uncomfortable	33		Unacceptable
		Annual	23	+15%	Uncomfortable	31		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
25	A	Spring	21		Uncomfortable	29		Acceptable
		Summer	17		Walking	23		Acceptable
		Fall	19		Walking	27		Acceptable
		Winter	20		Uncomfortable	29		Acceptable
		Annual	19		Walking	27		Acceptable
	B	Spring	20		Uncomfortable	28		Acceptable
		Summer	16		Walking	24		Acceptable
		Fall	19		Walking	27		Acceptable
		Winter	20		Uncomfortable	29		Acceptable
		Annual	19		Walking	27		Acceptable
26	A	Spring	22		Uncomfortable	32		Unacceptable
		Summer	18		Walking	27		Acceptable
		Fall	20		Uncomfortable	29		Acceptable
		Winter	21		Uncomfortable	31		Acceptable
		Annual	20		Uncomfortable	30		Acceptable
	B	Spring	26	+18%	Uncomfortable	34		Unacceptable
		Summer	21	+17%	Uncomfortable	28		Acceptable
		Fall	24	+20%	Uncomfortable	32	+10%	Unacceptable
		Winter	26	+24%	Uncomfortable	35	+13%	Unacceptable
		Annual	24	+20%	Uncomfortable	33		Unacceptable
27	A	Spring	26		Uncomfortable	34		Unacceptable
		Summer	20		Uncomfortable	27		Acceptable
		Fall	24		Uncomfortable	32		Unacceptable
		Winter	27		Uncomfortable	35		Unacceptable
		Annual	25		Uncomfortable	33		Unacceptable
	B	Spring	22	-15%	Uncomfortable	31		Acceptable
		Summer	17	-15%	Walking	25		Acceptable
		Fall	20	-17%	Uncomfortable	29		Acceptable
		Winter	22	-19%	Uncomfortable	32		Unacceptable
		Annual	21	-16%	Uncomfortable	30		Acceptable
28	A	Spring	19		Walking	25		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	18		Walking	24		Acceptable
	B	Spring	17	-11%	Walking	25		Acceptable
		Summer	14		Standing	21		Acceptable
		Fall	16		Walking	24		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	17		Walking	25		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
29	A	Spring	15		Standing	22		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	14		Standing	21		Acceptable
		Winter	16		Walking	23		Acceptable
		Annual	14		Standing	21		Acceptable
	B	Spring	14		Standing	22		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	14		Standing	21		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	14		Standing	21		Acceptable
30	A	Spring	18		Walking	24		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	17		Walking	22		Acceptable
		Winter	19		Walking	25		Acceptable
		Annual	17		Walking	23		Acceptable
	B	Spring	16	-11%	Walking	22		Acceptable
		Summer	13		Standing	17	-11%	Acceptable
		Fall	15	-12%	Standing	21		Acceptable
		Winter	16	-16%	Walking	23		Acceptable
		Annual	15	-12%	Standing	21		Acceptable
31	A	Spring	16		Walking	24		Acceptable
		Summer	13		Standing	20		Acceptable
		Fall	15		Standing	23		Acceptable
		Winter	17		Walking	25		Acceptable
		Annual	16		Walking	23		Acceptable
	B	Spring	15		Standing	22		Acceptable
		Summer	12		Sitting	19		Acceptable
		Fall	14		Standing	21		Acceptable
		Winter	15	-12%	Standing	23		Acceptable
		Annual	14	-12%	Standing	22		Acceptable
32	A	Spring	16		Walking	24		Acceptable
		Summer	13		Standing	20		Acceptable
		Fall	15		Standing	23		Acceptable
		Winter	18		Walking	27		Acceptable
		Annual	16		Walking	24		Acceptable
	B	Spring	16		Walking	24		Acceptable
		Summer	13		Standing	20		Acceptable
		Fall	15		Standing	23		Acceptable
		Winter	17		Walking	27		Acceptable
		Annual	16		Walking	24		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
33	A	Spring	20		Uncomfortable	28		Acceptable
		Summer	16		Walking	23		Acceptable
		Fall	19		Walking	27		Acceptable
		Winter	20		Uncomfortable	29		Acceptable
		Annual	19		Walking	27		Acceptable
	B	Spring	22		Uncomfortable	29		Acceptable
		Summer	16		Walking	23		Acceptable
		Fall	20		Uncomfortable	27		Acceptable
		Winter	21		Uncomfortable	29		Acceptable
		Annual	20		Uncomfortable	27		Acceptable
34	A	Spring	15		Standing	23		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	14		Standing	22		Acceptable
		Winter	16		Walking	24		Acceptable
		Annual	15		Standing	22		Acceptable
	B	Spring	15		Standing	22		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	14		Standing	21		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	14		Standing	21		Acceptable
35	A	Spring	16		Walking	22		Acceptable
		Summer	13		Standing	18		Acceptable
		Fall	15		Standing	21		Acceptable
		Winter	16		Walking	23		Acceptable
		Annual	15		Standing	21		Acceptable
	B	Spring	15		Standing	20		Acceptable
		Summer	11	-15%	Sitting	16	-11%	Acceptable
		Fall	14		Standing	19		Acceptable
		Winter	15		Standing	21		Acceptable
		Annual	14		Standing	19		Acceptable
36	A	Spring	17		Walking	28		Acceptable
		Summer	16		Walking	25		Acceptable
		Fall	17		Walking	27		Acceptable
		Winter	19		Walking	30		Acceptable
		Annual	17		Walking	28		Acceptable
	B	Spring	17		Walking	29		Acceptable
		Summer	15		Standing	24		Acceptable
		Fall	16		Walking	27		Acceptable
		Winter	18		Walking	31		Acceptable
		Annual	17		Walking	28		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
37	A	Spring	18		Walking	26		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	19		Walking	27		Acceptable
		Annual	18		Walking	25		Acceptable
	B	Spring	18		Walking	26		Acceptable
		Summer	14		Standing	21		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	20		Uncomfortable	28		Acceptable
		Annual	18		Walking	25		Acceptable
38	A	Spring	14		Standing	22		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	21		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	14		Standing	21		Acceptable
	B	Spring	16	+14%	Walking	24		Acceptable
		Summer	12		Sitting	19	+12%	Acceptable
		Fall	14		Standing	22		Acceptable
		Winter	16		Walking	25		Acceptable
		Annual	15		Standing	23		Acceptable
39	A	Spring	24		Uncomfortable	34		Unacceptable
		Summer	18		Walking	26		Acceptable
		Fall	22		Uncomfortable	31		Acceptable
		Winter	25		Uncomfortable	35		Unacceptable
		Annual	23		Uncomfortable	33		Unacceptable
	B	Spring	25		Uncomfortable	35		Unacceptable
		Summer	19		Walking	26		Acceptable
		Fall	23		Uncomfortable	32		Unacceptable
		Winter	25		Uncomfortable	36		Unacceptable
		Annual	24		Uncomfortable	33		Unacceptable
40	A	Spring	16		Walking	25		Acceptable
		Summer	13		Standing	20		Acceptable
		Fall	15		Standing	24		Acceptable
		Winter	17		Walking	27		Acceptable
		Annual	16		Walking	25		Acceptable
	B	Spring	17		Walking	26		Acceptable
		Summer	13		Standing	20		Acceptable
		Fall	16		Walking	24		Acceptable
		Winter	18		Walking	27		Acceptable
		Annual	16		Walking	25		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
41	A	Spring	16		Walking	25		Acceptable
		Summer	13		Standing	20		Acceptable
		Fall	15		Standing	23		Acceptable
		Winter	17		Walking	26		Acceptable
		Annual	16		Walking	24		Acceptable
	B	Spring	17		Walking	25		Acceptable
		Summer	13		Standing	20		Acceptable
		Fall	16		Walking	24		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	16		Walking	25		Acceptable
42	A	Spring	23		Uncomfortable	32		Unacceptable
		Summer	17		Walking	25		Acceptable
		Fall	21		Uncomfortable	30		Acceptable
		Winter	24		Uncomfortable	34		Unacceptable
		Annual	22		Uncomfortable	31		Acceptable
	B	Spring	24		Uncomfortable	33		Unacceptable
		Summer	18		Walking	25		Acceptable
		Fall	22		Uncomfortable	30		Acceptable
		Winter	24		Uncomfortable	34		Unacceptable
		Annual	23		Uncomfortable	32		Unacceptable
43	A	Spring	20		Uncomfortable	30		Acceptable
		Summer	15		Standing	22		Acceptable
		Fall	18		Walking	27		Acceptable
		Winter	19		Walking	29		Acceptable
		Annual	18		Walking	28		Acceptable
	B	Spring	21		Uncomfortable	31		Acceptable
		Summer	15		Standing	23		Acceptable
		Fall	19		Walking	28		Acceptable
		Winter	19		Walking	29		Acceptable
		Annual	19		Walking	28		Acceptable
44	A	Spring	24		Uncomfortable	34		Unacceptable
		Summer	19		Walking	27		Acceptable
		Fall	23		Uncomfortable	32		Unacceptable
		Winter	26		Uncomfortable	36		Unacceptable
		Annual	24		Uncomfortable	33		Unacceptable
	B	Spring	23		Uncomfortable	33		Unacceptable
		Summer	19		Walking	26		Acceptable
		Fall	23		Uncomfortable	32		Unacceptable
		Winter	26		Uncomfortable	36		Unacceptable
		Annual	23		Uncomfortable	33		Unacceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
45	A	Spring	21		Uncomfortable	30		Acceptable
		Summer	17		Walking	24		Acceptable
		Fall	20		Uncomfortable	29		Acceptable
		Winter	23		Uncomfortable	33		Unacceptable
		Annual	21		Uncomfortable	30		Acceptable
	B	Spring	21		Uncomfortable	31		Acceptable
		Summer	17		Walking	25		Acceptable
		Fall	20		Uncomfortable	29		Acceptable
		Winter	23		Uncomfortable	33		Unacceptable
		Annual	21		Uncomfortable	30		Acceptable
46	A	Spring	23		Uncomfortable	31		Acceptable
		Summer	18		Walking	25		Acceptable
		Fall	22		Uncomfortable	30		Acceptable
		Winter	24		Uncomfortable	33		Unacceptable
		Annual	22		Uncomfortable	30		Acceptable
	B	Spring	22		Uncomfortable	31		Acceptable
		Summer	19		Walking	25		Acceptable
		Fall	21		Uncomfortable	29		Acceptable
		Winter	24		Uncomfortable	32		Unacceptable
		Annual	22		Uncomfortable	30		Acceptable
47	A	Spring	22		Uncomfortable	37		Unacceptable
		Summer	17		Walking	29		Acceptable
		Fall	20		Uncomfortable	35		Unacceptable
		Winter	24		Uncomfortable	41		Unacceptable
		Annual	22		Uncomfortable	37		Unacceptable
	B	Spring	20		Uncomfortable	35		Unacceptable
		Summer	15	-12%	Standing	27		Acceptable
		Fall	19		Walking	32		Unacceptable
		Winter	22		Uncomfortable	38		Unacceptable
		Annual	20		Uncomfortable	34		Unacceptable
48	A	Spring	19		Walking	26		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	19		Walking	27		Acceptable
		Annual	18		Walking	25		Acceptable
	B	Spring	18		Walking	25		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	17	-11%	Walking	25		Acceptable
		Annual	16	-11%	Walking	24		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
49	A	Spring	11		Sitting	19		Acceptable
		Summer	9		Sitting	15		Acceptable
		Fall	10		Sitting	17		Acceptable
		Winter	11		Sitting	18		Acceptable
		Annual	11		Sitting	17		Acceptable
	B	Spring	12		Sitting	19		Acceptable
		Summer	10	+11%	Sitting	16		Acceptable
		Fall	11		Sitting	18		Acceptable
		Winter	11		Sitting	19		Acceptable
		Annual	11		Sitting	18		Acceptable
50	A	Spring	18		Walking	27		Acceptable
		Summer	14		Standing	22		Acceptable
		Fall	17		Walking	26		Acceptable
		Winter	19		Walking	29		Acceptable
		Annual	17		Walking	27		Acceptable
	B	Spring	17		Walking	26		Acceptable
		Summer	13		Standing	20		Acceptable
		Fall	16		Walking	25		Acceptable
		Winter	18		Walking	28		Acceptable
		Annual	17		Walking	26		Acceptable
51	A	Spring	15		Standing	25		Acceptable
		Summer	12		Sitting	20		Acceptable
		Fall	15		Standing	24		Acceptable
		Winter	17		Walking	27		Acceptable
		Annual	15		Standing	25		Acceptable
	B	Spring	15		Standing	25		Acceptable
		Summer	12		Sitting	20		Acceptable
		Fall	15		Standing	24		Acceptable
		Winter	16		Walking	27		Acceptable
		Annual	15		Standing	24		Acceptable
52	A	Spring	22		Uncomfortable	29		Acceptable
		Summer	18		Walking	24		Acceptable
		Fall	21		Uncomfortable	28		Acceptable
		Winter	23		Uncomfortable	30		Acceptable
		Annual	21		Uncomfortable	28		Acceptable
	B	Spring	22		Uncomfortable	30		Acceptable
		Summer	18		Walking	24		Acceptable
		Fall	21		Uncomfortable	28		Acceptable
		Winter	23		Uncomfortable	31		Acceptable
		Annual	21		Uncomfortable	29		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
53	A	Spring	16		Walking	24		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	14		Standing	22		Acceptable
		Winter	15		Standing	24		Acceptable
		Annual	15		Standing	22		Acceptable
	B	Spring	13	-19%	Standing	21	-12%	Acceptable
		Summer	11	-21%	Sitting	18		Acceptable
		Fall	12	-14%	Sitting	20		Acceptable
		Winter	14		Standing	22		Acceptable
		Annual	13	-13%	Standing	21		Acceptable
54	A	Spring	22		Uncomfortable	29		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	19		Walking	26		Acceptable
		Winter	20		Uncomfortable	28		Acceptable
		Annual	20		Uncomfortable	27		Acceptable
	B	Spring	22		Uncomfortable	29		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	20		Uncomfortable	27		Acceptable
		Winter	20		Uncomfortable	28		Acceptable
		Annual	20		Uncomfortable	27		Acceptable
55	A	Spring	17		Walking	25		Acceptable
		Summer	13		Standing	20		Acceptable
		Fall	16		Walking	24		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	16		Walking	24		Acceptable
	B	Spring	17		Walking	25		Acceptable
		Summer	13		Standing	20		Acceptable
		Fall	16		Walking	24		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	16		Walking	24		Acceptable
56	A	Spring	17		Walking	25		Acceptable
		Summer	14		Standing	21		Acceptable
		Fall	15		Standing	23		Acceptable
		Winter	16		Walking	26		Acceptable
		Annual	16		Walking	24		Acceptable
	B	Spring	14	-18%	Standing	23		Acceptable
		Summer	12	-14%	Sitting	20		Acceptable
		Fall	13	-13%	Standing	22		Acceptable
		Winter	14	-12%	Standing	24		Acceptable
		Annual	13	-19%	Standing	22		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
57	A	Spring	22		Uncomfortable	29		Acceptable
		Summer	18		Walking	23		Acceptable
		Fall	21		Uncomfortable	28		Acceptable
		Winter	24		Uncomfortable	31		Acceptable
		Annual	22		Uncomfortable	29		Acceptable
	B	Spring	18	-18%	Walking	25	-14%	Acceptable
		Summer	14	-22%	Standing	20	-13%	Acceptable
		Fall	17	-19%	Walking	23	-18%	Acceptable
		Winter	20	-17%	Uncomfortable	26	-16%	Acceptable
		Annual	17	-23%	Walking	24	-17%	Acceptable
58	A	Spring	24		Uncomfortable	33		Unacceptable
		Summer	20		Uncomfortable	27		Acceptable
		Fall	22		Uncomfortable	31		Acceptable
		Winter	24		Uncomfortable	32		Unacceptable
		Annual	23		Uncomfortable	31		Acceptable
	B	Spring	26		Uncomfortable	35		Unacceptable
		Summer	21		Uncomfortable	28		Acceptable
		Fall	24		Uncomfortable	32		Unacceptable
		Winter	26		Uncomfortable	35		Unacceptable
		Annual	25		Uncomfortable	33		Unacceptable
59	A	Spring	18		Walking	28		Acceptable
		Summer	15		Standing	23		Acceptable
		Fall	16		Walking	25		Acceptable
		Winter	18		Walking	28		Acceptable
		Annual	17		Walking	26		Acceptable
	B	Spring	15	-17%	Standing	23	-18%	Acceptable
		Summer	13	-13%	Standing	19	-17%	Acceptable
		Fall	14	-12%	Standing	22	-12%	Acceptable
		Winter	15	-17%	Standing	24	-14%	Acceptable
		Annual	14	-18%	Standing	22	-15%	Acceptable
60	A	Spring	21		Uncomfortable	29		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	19		Walking	27		Acceptable
		Winter	20		Uncomfortable	29		Acceptable
		Annual	19		Walking	27		Acceptable
	B	Spring	23		Uncomfortable	32	+10%	Unacceptable
		Summer	18	+12%	Walking	25	+14%	Acceptable
		Fall	21	+11%	Uncomfortable	30	+11%	Acceptable
		Winter	24	+20%	Uncomfortable	33	+14%	Unacceptable
		Annual	22	+16%	Uncomfortable	31	+15%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
61	A	Spring	19		Walking	28		Acceptable
		Summer	15		Standing	22		Acceptable
		Fall	17		Walking	26		Acceptable
		Winter	19		Walking	28		Acceptable
		Annual	18		Walking	26		Acceptable
	B	Spring	16	-16%	Walking	25	-11%	Acceptable
		Summer	13	-13%	Standing	20		Acceptable
		Fall	14	-18%	Standing	23	-12%	Acceptable
		Winter	16	-16%	Walking	26		Acceptable
		Annual	15	-17%	Standing	24		Acceptable
62	A	Spring	20		Uncomfortable	28		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	19		Walking	26		Acceptable
		Winter	20		Uncomfortable	28		Acceptable
		Annual	19		Walking	26		Acceptable
	B	Spring	19		Walking	29		Acceptable
		Summer	15		Standing	23		Acceptable
		Fall	17	-11%	Walking	26		Acceptable
		Winter	19		Walking	30		Acceptable
		Annual	18		Walking	27		Acceptable
63	A	Spring	19		Walking	27		Acceptable
		Summer	15		Standing	22		Acceptable
		Fall	17		Walking	25		Acceptable
		Winter	18		Walking	27		Acceptable
		Annual	18		Walking	25		Acceptable
	B	Spring	17	-11%	Walking	26		Acceptable
		Summer	14		Standing	22		Acceptable
		Fall	15	-12%	Standing	24		Acceptable
		Winter	17		Walking	27		Acceptable
		Annual	16	-11%	Walking	25		Acceptable
64	A	Spring	20		Uncomfortable	29		Acceptable
		Summer	18		Walking	26		Acceptable
		Fall	19		Walking	28		Acceptable
		Winter	21		Uncomfortable	30		Acceptable
		Annual	19		Walking	28		Acceptable
	B	Spring	19		Walking	29		Acceptable
		Summer	17		Walking	25		Acceptable
		Fall	19		Walking	28		Acceptable
		Winter	20		Uncomfortable	30		Acceptable
		Annual	19		Walking	28		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
65	A	Spring	20		Uncomfortable	27		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	18		Walking	25		Acceptable
		Winter	19		Walking	27		Acceptable
		Annual	19		Walking	26		Acceptable
	B	Spring	17	-15%	Walking	27		Acceptable
		Summer	14	-12%	Standing	22		Acceptable
		Fall	16	-11%	Walking	24		Acceptable
		Winter	17	-11%	Walking	27		Acceptable
		Annual	17	-11%	Walking	25		Acceptable
66	A	Spring	20		Uncomfortable	27		Acceptable
		Summer	17		Walking	23		Acceptable
		Fall	19		Walking	26		Acceptable
		Winter	20		Uncomfortable	28		Acceptable
		Annual	19		Walking	26		Acceptable
	B	Spring	16	-20%	Walking	24	-11%	Acceptable
		Summer	13	-24%	Standing	19	-17%	Acceptable
		Fall	14	-26%	Standing	21	-19%	Acceptable
		Winter	15	-25%	Standing	24	-14%	Acceptable
		Annual	15	-21%	Standing	22	-15%	Acceptable
67	A	Spring	20		Uncomfortable	27		Acceptable
		Summer	17		Walking	22		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	20		Uncomfortable	28		Acceptable
		Annual	19		Walking	26		Acceptable
	B	Spring	14	-30%	Standing	23	-15%	Acceptable
		Summer	12	-29%	Sitting	19	-14%	Acceptable
		Fall	14	-26%	Standing	22	-12%	Acceptable
		Winter	15	-25%	Standing	24	-14%	Acceptable
		Annual	14	-26%	Standing	22	-15%	Acceptable
68	A	Spring	19		Walking	25		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	18		Walking	24		Acceptable
	B	Spring	19		Walking	28	+12%	Acceptable
		Summer	16	+14%	Walking	23	+15%	Acceptable
		Fall	18		Walking	26	+13%	Acceptable
		Winter	19		Walking	29	+16%	Acceptable
		Annual	18		Walking	26		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
69	A	Spring	19		Walking	25		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	17		Walking	23		Acceptable
	B	Spring	23	+21%	Uncomfortable	30	+20%	Acceptable
		Summer	17	+21%	Walking	23	+21%	Acceptable
		Fall	20	+18%	Uncomfortable	27	+17%	Acceptable
		Winter	22	+22%	Uncomfortable	30	+20%	Acceptable
		Annual	21	+24%	Uncomfortable	28	+22%	Acceptable
70	A	Spring	19		Walking	25		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	19		Walking	25		Acceptable
		Annual	18		Walking	23		Acceptable
	B	Spring	21	+11%	Uncomfortable	28	+12%	Acceptable
		Summer	16	+14%	Walking	21	+11%	Acceptable
		Fall	19	+12%	Walking	25		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	19		Walking	26	+13%	Acceptable
71	A	Spring	18		Walking	24		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	17		Walking	23		Acceptable
	B	Spring	19		Walking	26		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18	+12%	Walking	24		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	18		Walking	24		Acceptable
72	A	Spring	19		Walking	25		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	17		Walking	23		Acceptable
	B	Spring	22	+16%	Uncomfortable	29	+16%	Acceptable
		Summer	17	+21%	Walking	23	+21%	Acceptable
		Fall	20	+18%	Uncomfortable	27	+17%	Acceptable
		Winter	21	+17%	Uncomfortable	29	+16%	Acceptable
		Annual	20	+18%	Uncomfortable	27	+17%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
73	A	Spring	19		Walking	25		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	18		Walking	24		Acceptable
	B	Spring	25	+32%	Uncomfortable	33	+32%	Unacceptable
		Summer	21	+40%	Uncomfortable	28	+40%	Acceptable
		Fall	23	+28%	Uncomfortable	31	+29%	Acceptable
		Winter	25	+32%	Uncomfortable	34	+31%	Unacceptable
		Annual	24	+33%	Uncomfortable	32	+33%	Unacceptable
74	A	Spring	21		Uncomfortable	28		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	19		Walking	26		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	20		Uncomfortable	26		Acceptable
	B	Spring	21		Uncomfortable	28		Acceptable
		Summer	17		Walking	22		Acceptable
		Fall	20		Uncomfortable	26		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	20		Uncomfortable	26		Acceptable
75	A	Spring	19		Walking	25		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	17		Walking	24		Acceptable
	B	Spring	21	+11%	Uncomfortable	29	+16%	Acceptable
		Summer	16	+14%	Walking	23	+15%	Acceptable
		Fall	19	+12%	Walking	27	+17%	Acceptable
		Winter	20		Uncomfortable	29	+12%	Acceptable
		Annual	19	+12%	Walking	27	+12%	Acceptable
76	A	Spring	18		Walking	25		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	17		Walking	24		Acceptable
	B	Spring	20	+11%	Uncomfortable	29	+16%	Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	18		Walking	26		Acceptable
		Winter	20		Uncomfortable	29	+12%	Acceptable
		Annual	19	+12%	Walking	27	+12%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
77	A	Spring	18		Walking	25		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	18		Walking	24		Acceptable
	B	Spring	19		Walking	26		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	18		Walking	25		Acceptable
78	A	Spring	20		Uncomfortable	26		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	19		Walking	25		Acceptable
	B	Spring	20		Uncomfortable	26		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	18		Walking	25		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	19		Walking	25		Acceptable
79	A	Spring	18		Walking	24		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	19		Walking	25		Acceptable
		Annual	17		Walking	24		Acceptable
	B	Spring	17		Walking	23		Acceptable
		Summer	13		Standing	18		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	18		Walking	24		Acceptable
		Annual	16		Walking	23		Acceptable
80	A	Spring	19		Walking	25		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	23		Acceptable
		Winter	20		Uncomfortable	26		Acceptable
		Annual	18		Walking	24		Acceptable
	B	Spring	19		Walking	25		Acceptable
		Summer	15		Standing	19		Acceptable
		Fall	18		Walking	23		Acceptable
		Winter	20		Uncomfortable	26		Acceptable
		Annual	18		Walking	24		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
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Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
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	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
81	A	Spring	14		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	13		Standing	18		Acceptable
		Winter	14		Standing	20		Acceptable
		Annual	13		Standing	19		Acceptable
	B	Spring	15		Standing	21		Acceptable
		Summer	12		Sitting	16		Acceptable
		Fall	14		Standing	19		Acceptable
		Winter	15		Standing	21		Acceptable
		Annual	14		Standing	20		Acceptable
82	A	Spring	17		Walking	23		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	17		Walking	22		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	17		Walking	23		Acceptable
	B	Spring	16		Walking	23		Acceptable
		Summer	14		Standing	18		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	17		Walking	24		Acceptable
		Annual	16		Walking	22		Acceptable
83	A	Spring	19		Walking	26		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	19		Walking	27		Acceptable
		Annual	18		Walking	25		Acceptable
	B	Spring	19		Walking	25		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	17		Walking	24		Acceptable
84	A	Spring	19		Walking	25		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	18		Walking	24		Acceptable
	B	Spring	19		Walking	25		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	18		Walking	24		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
85	A	Spring	19		Walking	26		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	18		Walking	25		Acceptable
	B	Spring	20		Uncomfortable	26		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	19		Walking	25		Acceptable
86	A	Spring	19		Walking	26		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	19		Walking	27		Acceptable
		Annual	18		Walking	25		Acceptable
	B	Spring	18		Walking	25		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	17		Walking	24		Acceptable
87	A	Spring	18		Walking	25		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	18		Walking	24		Acceptable
		Annual	17		Walking	23		Acceptable
	B	Spring	16	-11%	Walking	22	-12%	Acceptable
		Summer	13		Standing	18		Acceptable
		Fall	15	-12%	Standing	21		Acceptable
		Winter	15	-17%	Standing	22		Acceptable
		Annual	15	-12%	Standing	21		Acceptable
88	A	Spring	21		Uncomfortable	29		Acceptable
		Summer	17		Walking	24		Acceptable
		Fall	19		Walking	27		Acceptable
		Winter	21		Uncomfortable	30		Acceptable
		Annual	20		Uncomfortable	28		Acceptable
	B	Spring	16	-24%	Walking	23	-21%	Acceptable
		Summer	13	-24%	Standing	18	-25%	Acceptable
		Fall	15	-21%	Standing	21	-22%	Acceptable
		Winter	16	-24%	Walking	22	-27%	Acceptable
		Annual	15	-25%	Standing	21	-25%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
89	A	Spring	20		Uncomfortable	27		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	18		Walking	25		Acceptable
		Winter	19		Walking	28		Acceptable
		Annual	18		Walking	26		Acceptable
	B	Spring	16	-20%	Walking	24	-11%	Acceptable
		Summer	12	-20%	Sitting	18	-14%	Acceptable
		Fall	15	-17%	Standing	22	-12%	Acceptable
		Winter	16	-16%	Walking	24	-14%	Acceptable
		Annual	15	-17%	Standing	23	-12%	Acceptable
90	A	Spring	19		Walking	25		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	17		Walking	24		Acceptable
	B	Spring	17	-11%	Walking	24		Acceptable
		Summer	13		Standing	18		Acceptable
		Fall	15	-12%	Standing	22		Acceptable
		Winter	16	-11%	Walking	24		Acceptable
		Annual	15	-12%	Standing	22		Acceptable
91	A	Spring	16		Walking	24		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	16		Walking	24		Acceptable
		Annual	15		Standing	23		Acceptable
	B	Spring	19	+19%	Walking	27	+12%	Acceptable
		Summer	15	+15%	Standing	21	+11%	Acceptable
		Fall	18	+20%	Walking	25	+14%	Acceptable
		Winter	19	+19%	Walking	26		Acceptable
		Annual	18	+20%	Walking	25		Acceptable
92	A	Spring	19		Walking	26		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	18		Walking	25		Acceptable
	B	Spring	19		Walking	26		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	18		Walking	25		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
93	A	Spring	16		Walking	21		Acceptable
		Summer	13		Standing	17		Acceptable
		Fall	15		Standing	20		Acceptable
		Winter	17		Walking	23		Acceptable
		Annual	16		Walking	21		Acceptable
	B	Spring	19	+19%	Walking	26	+24%	Acceptable
		Summer	15	+15%	Standing	21	+24%	Acceptable
		Fall	17	+13%	Walking	24	+20%	Acceptable
		Winter	20	+18%	Uncomfortable	27	+17%	Acceptable
		Annual	18	+12%	Walking	25	+19%	Acceptable
94	A	Spring	16		Walking	22		Acceptable
		Summer	13		Standing	17		Acceptable
		Fall	15		Standing	21		Acceptable
		Winter	17		Walking	23		Acceptable
		Annual	16		Walking	21		Acceptable
	B	Spring	16		Walking	24		Acceptable
		Summer	13		Standing	18		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	16		Walking	24		Acceptable
		Annual	15		Standing	22		Acceptable
95	A	Spring	16		Walking	23		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	16		Walking	23		Acceptable
		Annual	15		Standing	22		Acceptable
	B	Spring	13	-19%	Standing	21		Acceptable
		Summer	11	-15%	Sitting	17	-11%	Acceptable
		Fall	12	-20%	Sitting	20		Acceptable
		Winter	14	-12%	Standing	22		Acceptable
		Annual	13	-13%	Standing	20		Acceptable
96	A	Spring	23		Uncomfortable	30		Acceptable
		Summer	17		Walking	22		Acceptable
		Fall	21		Uncomfortable	27		Acceptable
		Winter	22		Uncomfortable	29		Acceptable
		Annual	21		Uncomfortable	27		Acceptable
	B	Spring	23		Uncomfortable	29		Acceptable
		Summer	17		Walking	21		Acceptable
		Fall	20		Uncomfortable	26		Acceptable
		Winter	21		Uncomfortable	27		Acceptable
		Annual	21		Uncomfortable	26		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
97	A	Spring	19		Walking	26		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	20		Uncomfortable	26		Acceptable
		Annual	18		Walking	25		Acceptable
	B	Spring	17	-11%	Walking	24		Acceptable
		Summer	13	-13%	Standing	18		Acceptable
		Fall	16	-11%	Walking	22		Acceptable
		Winter	18		Walking	24		Acceptable
		Annual	16	-11%	Walking	23		Acceptable
98	A	DATA NOT AVAILABLE						
	B	Spring	24		Uncomfortable	32		Unacceptable
		Summer	19		Walking	24		Acceptable
		Fall	21		Uncomfortable	29		Acceptable
		Winter	23		Uncomfortable	31		Acceptable
		Annual	22		Uncomfortable	29		Acceptable
99	A	DATA NOT AVAILABLE						
	B	Spring	9		Sitting	14		Acceptable
		Summer	7		Sitting	11		Acceptable
		Fall	8		Sitting	13		Acceptable
		Winter	9		Sitting	14		Acceptable
		Annual	9		Sitting	13		Acceptable
100	A	DATA NOT AVAILABLE						
	B	Spring	15		Standing	23		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	14		Standing	21		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	14		Standing	21		Acceptable
101	A	DATA NOT AVAILABLE						
	B	Spring	12		Sitting	17		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	11		Sitting	16		Acceptable
		Winter	12		Sitting	18		Acceptable
		Annual	11		Sitting	17		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
102	A	DATA NOT AVAILABLE						
	B	Spring	17		Walking	25		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	15		Standing	23		Acceptable
		Winter	17		Walking	25		Acceptable
		Annual	16		Walking	24		Acceptable
103	A	DATA NOT AVAILABLE						
	B	Spring	23		Uncomfortable	31		Acceptable
		Summer	20		Uncomfortable	27		Acceptable
		Fall	21		Uncomfortable	30		Acceptable
		Winter	23		Uncomfortable	32		Unacceptable
		Annual	22		Uncomfortable	30		Acceptable
104	A	DATA NOT AVAILABLE						
	B	Spring	20		Uncomfortable	29		Acceptable
		Summer	17		Walking	25		Acceptable
		Fall	19		Walking	27		Acceptable
		Winter	20		Uncomfortable	30		Acceptable
		Annual	19		Walking	28		Acceptable
105	A	DATA NOT AVAILABLE						
	B	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	13		Standing	18		Acceptable
		Winter	14		Standing	20		Acceptable
		Annual	13		Standing	19		Acceptable
106	A	DATA NOT AVAILABLE						
	B	Spring	12		Sitting	19		Acceptable
		Summer	10		Sitting	16		Acceptable
		Fall	11		Sitting	18		Acceptable
		Winter	12		Sitting	19		Acceptable
		Annual	12		Sitting	18		Acceptable
107	A	DATA NOT AVAILABLE						
	B	Spring	25		Uncomfortable	33		Unacceptable
		Summer	22		Uncomfortable	29		Acceptable
		Fall	24		Uncomfortable	32		Unacceptable
		Winter	25		Uncomfortable	34		Unacceptable
		Annual	24		Uncomfortable	32		Unacceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
108	A	DATA NOT AVAILABLE						
	B	Spring	16		Walking	25		Acceptable
		Summer	13		Standing	20		Acceptable
		Fall	15		Standing	23		Acceptable
		Winter	17		Walking	25		Acceptable
		Annual	15		Standing	23		Acceptable
109	A	DATA NOT AVAILABLE						
	B	Spring	21		Uncomfortable	29		Acceptable
		Summer	16		Walking	23		Acceptable
		Fall	19		Walking	27		Acceptable
		Winter	21		Uncomfortable	30		Acceptable
		Annual	19		Walking	28		Acceptable
110	A	DATA NOT AVAILABLE						
	B	Spring	19		Walking	26		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	18		Walking	25		Acceptable
111	A	DATA NOT AVAILABLE						
	B	Spring	13		Standing	20		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	19		Acceptable
112	A	Spring	19		Walking	26		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	18		Walking	24		Acceptable
	B	Spring	24	+26%	Uncomfortable	31	+19%	Acceptable
		Summer	19	+27%	Walking	25	+25%	Acceptable
		Fall	21	+24%	Uncomfortable	28	+17%	Acceptable
		Winter	25	+32%	Uncomfortable	33	+27%	Unacceptable
		Annual	22	+22%	Uncomfortable	30	+25%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
113	A	Spring	19		Walking	27		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	18		Walking	25		Acceptable
		Winter	19		Walking	28		Acceptable
		Annual	18		Walking	26		Acceptable
	B	Spring	12	-37%	Sitting	19	-30%	Acceptable
		Summer	10	-38%	Sitting	16	-27%	Acceptable
		Fall	11	-39%	Sitting	18	-28%	Acceptable
		Winter	13	-32%	Standing	20	-29%	Acceptable
		Annual	12	-33%	Sitting	18	-31%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Appendix D

Air Quality

APPENDIX D - AIR QUALITY

Introduction

This Air Quality Appendix provides modeling assumptions and backup for results presented in Section 3.6 of the Expanded PNF. Included within this documentation is a brief description of the methodology employed along with pertinent calculations and data used in the emissions and dispersion calculations supporting the microscale and stationary source air quality analyses.

Motor Vehicle Emissions

The EPA MOBILE6.2 computer program generated motor vehicle emissions used in the garage stationary source analysis along with the mobile source CAL3QHC modeling and mesoscale analysis. The model input parameters were provided by MassDEP. Emission rates were derived for 2012 and 2018 for speed limits of 2.5, 10, 15, and 30 mph for use in the microscale analyses. The 10 mph rate was used to estimate parking garage emissions.

CAL3QHC

For the intersections studied, the CAL3QHC model was applied to calculate CO concentrations at sensitive receptor locations using emission rates derived in MOBILE6.2. The intersection's queue links and free flow links were input to the model along with sensitive receptors at all locations nearby each intersection. The meteorological assumptions input into the model were a 1.0 meter per second wind speed, Pasquill-Gifford Class D stability combined with a mixing height of 1000 meters. For each direction, the full range of wind directions at 10 degree intervals was examined. In addition, a surface roughness (z_0) of 321 cm was used for all intersections. Idle emission rates for queue links were based on 2.5 mph emission rates derived in MOBILE6.2 and converted from grams per mile to grams per hour. Emission rates for speeds of 10, 15, and 30 mph were used for right turn, left turn, and free flow links, respectively.

Stationary Source Emissions

Emissions for the heating combustion units were calculated using the latest DEP emission limits for boilers based on the Boiler Environmental Results Program (ERP). Emissions for the emergency generators and cooling towers were obtained from vendor information for a similar size unit. The resulting hourly emission rate in pounds per hour were converted to grams per second and input to the AERMOD model. For the NAAQS analysis, a similar approach was conducted for CO, SO_2, NOx, PM-10, and PM-2.5. The emergency generator emissions were calculated based on a g/bhp-hr emission factor provided by vendor information for typical size units.

All assumptions and data used in the stationary source emissions and stack parameter calculations are provided herein.

AERMOD

The EPA AERMOD model was used to calculate air quality impacts due to the installation of heating combustion boilers, emergency generators, parking garage vents, loading dock vents and cooling towers. For non-combustion sources, ambient temperature releases were assumed; otherwise temperatures from the exhaust gas were used. Urban dispersion coefficients were used. Building downwash was accounted for in the modeling based on the building heights and projected widths of the buildings. The maximum modeled impacts from the garage vents and the stack sources were conservatively added to monitored background values for comparison to the NAAQS.

Conroy Parcel K

Roads

	VOC lbs/day	VOC tons/yr	NOx lbs/day	NOx tons/yr	CO2 lbs/day	CO2 tons/yr
2012 Existing	8.1	1.3	15.9	2.5	13935.7	2174.0
2018 No-Build	6.9	1.1	9.0	1.4	16317.4	2545.5
delta from 2012 Existing	-1.1	-0.2	-6.8	-1.1	2381.7	371.5
2018 Build	7.3	1.1	9.5	1.5	17183.2	2680.6
delta from 2018 No-Build	0.4	0.1	0.5	0.1	865.8	135.1

Intersections

	VOC lbs/day	VOC tons/yr	NOx lbs/day	NOx tons/yr	CO2 lbs/day	CO2 tons/yr
2012 Existing	1.2	0.2	0.7	0.1	309.0	48.2
2018 No-Build	1.1	0.2	0.4	0.1	413.5	64.5
delta from 2012 Existing	-0.1	0.0	-0.3	-0.1	104.5	16.3
2018 Build	1.3	0.2	0.5	0.1	468.0	73.0
delta from 2018 No-Build	0.1	0.0	0.1	0.0	54.5	8.5

Total

Pollutant	VOC lbs/day	VOC tons/yr	NOx lbs/day	NOx tons/yr	CO2 lbs/day	CO2 tons/yr
2012 Existing	9.3	1.4	16.6	2.6	14244.7	2222.2
2018 No-Build	8.1	1.3	9.5	1.5	16730.9	2610.0
delta from 2012 Existing	-1.2	-0.2	-7.2	-1.1	2486.2	387.8
2018 Build	8.6	1.3	10.0	1.6	17651.2	2753.6
delta from 2018 No-Build	0.5	0.1	0.5	0.1	920.4	143.6

Minor differences in sums are due to rounding of individual values.

Pound per day to tons per year is based on an 85% factor to account for peak daily to annual data.

Conroy Parcel K

	Case 1 2018 Build minus No Build
Net VMT, miles/day	685
Net Delay, hrs/day	17
Roadway GHG, tpy	135
Intersection GHG, tpy	9
Net GHG Emissions, tpy	144
Percent Change	---

Conroy Parcel K

Intersections (Signalized and *Unsignalized*)	2012 Existing Weekday AM Peak LOS	Delay (Sec)	Traffic Volume	2012 Existing Weekday PM Peak LOS	Delay (Sec)	Traffic Volume
Congress at D Street	D	35.8	1636	D	38.8	1850
Seaport Boulevard & Northern Avenue at D Street Southboun	B	11.1	863	A	7.2	1168
Seaport Boulevard & Northern Avenue at D Street Northboun	B	16.5	884	B	13.9	875
Northern Avenue at Congress Street	-	3.4	886	-	3.7	871
Congress Street at Park Lane/Project Driveway	-	0.5	289	-	1.0	288
Haul Road at Project Driveway	-	0.0	0	-	0.0	0
Northern Avenue at Haul Road Roundabout	A	8.7	1120	B	10.9	1161

LOS is HCM value for signalized intersections and ICU value for unsignalized intersections.
Color Code:
Red = Signalized intersections at LOS D or worse.
Green = Top 3 signalized intersections based on volume.
Dark Blue = Volume increase >20%
Light Blue = Volume increase > 10%

Conroy Parcel K

Intersections (Signalized and *Unsignalized*)	2018 No-Build Weekday AM Peak LOS	Delay (Sec)	Traffic Volume	2018 No-Build Weekday PM Peak LOS	Delay (Sec)	Traffic Volume
Congress at D Street	D	36.2	1817	D	40.2	2078
Seaport Boulevard & Northern Avenue at D Street Southboun	B	9.8	1376	A	7.5	1506
Seaport Boulevard & Northern Avenue at D Street Northboun	C	21.2	1184	B	15.3	1143
Northern Avenue at Congress Street	-	3.2	1153	-	4.8	1122
Congress Street at Park Lane/Project Driveway	-	0.5	308	-	0.9	311
Haul Road at Project Driveway	-	0.0	0	-	0.0	0
Northern Avenue at Haul Road Roundabout	B	11.4	1411	C	21.0	1472

LOS is HCM value for signalized intersections and ICU value
Color Code:
Red = Signalized intersections at LOS D or worse.
Green = Top 3 signalized intersections based on volume.
Dark Blue = Volume increase >20%
Light Blue = Volume increase > 10%

Conroy Parcel K

Intersections (Signalized and *Unsignalized*)	2018 Build Weekday AM Peak LOS	Delay (Sec)	Traffic Volume	No-Build to Build Volume % Increase	2018 Build Weekday PM Peak LOS	Delay (Sec)	Traffic Volume	No-Build to Build Volume % Increase
Congress at D Street	D	36.6	1877	3%	D	41.3	2222	7%
Seaport Boulevard & Northern Avenue at D Street Southboun	B	10.0	1444	5%	A	7.7	1565	4%
Seaport Boulevard & Northern Avenue at D Street Northbour	C	22.2	1252	6%	B	14.8	1202	5%
Northern Avenue at Congress Street	-	3.7	1223	6%	-	12.6	1231	10%
Congress Street at Park Lane/Project Driveway	-	2.2	449	46%	-	4.1	544	75%
Haul Road at Project Driveway	-	0.0	1147	N/A	-	0.0	1080	N/A
Northern Avenue at Haul Road Roundabout	B	11.6	1435	2%	C	23.0	1515	3%

LOS is HCM value for signalized intersections and ICU value
Color Code:
Red = Signalized intersections at LOS D or worse.
Green = Top 3 signalized intersections based on volume.
Dark Blue = Volume increase >20%
Light Blue = Volume increase > 10%

Conroy Parcel K
2012 Existing

K Factor	10%	factors peak hour vehicle volumes to daily volumes
Peak hr delay to daily Factor (8hr/day)	33%	Factors peak hour delay to daily delay
Daily delay to annual Factor (6 days/wk, 52 wk/yr)	85%	factors peak daily delay to annual delay

2012

Intersection	Average Peak Delay time (s)	Traffic Volume (adt)	Idle MOBILE6 VOC (g/hr)	VOC (lb/day)	VOC (tpy)	Idle MOBILE6 NOX (g/hr)	NOX (lb/day)	NOX (tpy)	Idle MOBILE6 CO2 (g/hr)	CO2 (lb/day)	CO2 (tpy)
				VOC			NOX			CO2	
Congress at D Street	37.30	18500	5.530	0.78	0.12	3.398	0.48	0.075	1403.250	197.66	30.836
Seaport Boulevard & Northern Avenue at D Street Southbound	9.15	11680	5.530	0.12	0.02	3.398	0.07	0.012	1403.250	30.61	4.776
Seaport Boulevard & Northern Avenue at D Street Northbound	15.20	8840	5.530	0.15	0.02	3.398	0.09	0.015	1403.250	38.49	6.004
Northern Avenue at Congress Street	3.55	8860	5.530	0.04	0.01	3.398	0.02	0.003	1403.250	9.01	1.406
Congress Street at Park Lane/Project Driveway	0.75	2890	5.530	0.00	0.00	3.398	0.00	0.000	1403.250	0.62	0.097
Haul Road at Project Driveway	0.00	0	5.530	0.00	0.00	3.398	0.00	0.000	1403.250	0.00	0.000
Northern Avenue at Haul Road Roundabout	9.80	11610	5.530	0.13	0.02	3.398	0.08	0.012	1403.250	32.59	5.084
Totals	hrs	99.87856		1.22	0.19		0.75	0.12		308.99	48.20

Conroy Parcel K
2018 No-Build

K Factor	10%	factors peak hour vehicle volumes to daily volumes
Peak hr delay to daily Factor (8hr/day)	33%	Factors peak hour delay to daily delay
Daily delay to annual Factor (6 days/wk, 52 wk/yr)	85%	factors peak daily delay to annual delay

2018

Intersection	Average Peak Delay time (s)	Traffic Volume (adt)	Idle MOBILE6 VOC (g/hr)	VOC (lb/day)	VOC (tpy)	Idle MOBILE6 NOX (g/hr)	NOX (lb/day)	NOX (tpy)	Idle MOBILE6 CO2 (g/hr)	CO2 (lb/day)	CO2 (tpy)
				VOC			NOX			CO2	
Congress at D Street	38.20	20780	3.863	0.63	0.10	1.433	0.23	0.036	1419.525	230.02	35.883
Seaport Boulevard & Northern Avenue at D Street Southbound	8.65	15060	3.863	0.10	0.02	1.433	0.04	0.006	1419.525	37.75	5.889
Seaport Boulevard & Northern Avenue at D Street Northbound	18.25	11840	3.863	0.17	0.03	1.433	0.06	0.010	1419.525	62.61	9.768
Northern Avenue at Congress Street	4.00	11530	3.863	0.04	0.01	1.433	0.01	0.002	1419.525	13.36	2.085
Congress Street at Park Lane/Project Driveway	0.70	3110	3.863	0.00	0.00	1.433	0.00	0.000	1419.525	0.63	0.098
Haul Road at Project Driveway	0.00	0	3.863	0.00	0.00	1.433	0.00	0.000	1419.525	0.00	0.000
Northern Avenue at Haul Road Roundabout	16.20	14720	3.863	0.19	0.03	1.433	0.07	0.011	1419.525	69.10	10.780
Totals	hrs	132.1209		1.13	0.18		0.42	0.07		413.48	64.50

Conroy Parcel K
2018 Build

K Factor	10%	factors peak hour vehicle volumes to daily volumes
Peak hr delay to daily Factor (8hr/day)	33%	Factors peak hour delay to daily delay
Daily delay to annual Factor (6 days/wk, 52 wk/yr)	85%	factors peak daily delay to annual delay

2018

Intersection	Average Peak Delay time (s)	Traffic Volume (adt)	VOC Idle MOBILE6 VOC (g/hr)	VOC (lb/day)	VOC (tpy)	NOX Idle MOBILE6 NOX (g/hr)	NOX (lb/day)	NOX (tpy)	CO2 Idle MOBILE6 CO2 (g/hr)	CO2 (lb/day)	CO2 (tpy)
Congress at D Street	38.95	22220	3.863	0.68	0.11	1.433	0.25	0.039	1419.525	250.79	39.123
Seaport Boulevard & Northern Avenue at D Street Southbound	8.85	15650	3.863	0.11	0.02	1.433	0.04	0.006	1419.525	40.13	6.261
Seaport Boulevard & Northern Avenue at D Street Northbound	18.50	12520	3.863	0.18	0.03	1.433	0.07	0.011	1419.525	67.12	10.470
Northern Avenue at Congress Street	8.15	12310	3.863	0.08	0.01	1.433	0.03	0.005	1419.525	29.07	4.535
Congress Street at Park Lane/Project Driveway	3.15	5440	3.863	0.01	0.00	1.433	0.01	0.001	1419.525	4.97	0.775
Haul Road at Project Driveway	0.00	11470	3.863	0.00	0.00	1.433	0.00	0.000	1419.525	0.00	0.000
Northern Avenue at Haul Road Roundabout	17.30	15150	3.863	0.21	0.03	1.433	0.08	0.012	1419.525	75.95	11.848
Totals	hrs	149.5508		1.27	0.20		0.47	0.07		468.02	73.01

Conroy Parcel K

Regional Mesoscale Emissions Analysis - Roadway Emissions
Link Data

Link Number	Roadway Segment	Link Distance (miles)	Estimated Average Speed (mph)	Weekday AM Peak Hour Volume			Weekday PM Peak Hour Volume			K-factor	Average Daily Traffic (ADT) Volumes		
				2012 Existing	2018 No-Build	2018 Build	2012 Existing	2018 No-Build	2018 Build		2012 Existing	2018 No-Build	2018 Build
1	Seaport Blvd (West of D St)	0.25	30	887	1,213	1,281	1,053	1,385	1,444	10.0%	10,530	13,850	14,440
2	Fish Pier	0.21	20	180	180	180	124	124	124	10.0%	1,800	1,800	1,800
3	D St SB (Northern to Congress)	0.08	30	158	169	169	420	500	500	10.0%	4,200	5,000	5,000
4	D St NB (Congress to Northern)	0.09	30	202	256	276	175	214	214	10.0%	2,020	2,560	2,760
5	Seaport Blvd (D St SB to D St NB)	0.03	30	818	1,117	1,185	783	1,044	1,103	10.0%	8,180	11,170	11,850
6	Northern Ave (D st NB to Congress)	0.09	30	661	909	957	702	932	991	10.0%	7,020	9,320	9,910
7A	Northern Ave (Congress to Site Driveway)	0.04	30	810	1,072	1,147	806	1,053	1,083	10.0%	8,100	10,720	11,470
7B	Northern Ave (Site Driveway to Haul Rd Roundabout)	0.04	30	810	1,072	1,094	806	1,053	1,089	10.0%	8,100	10,720	10,940
8	Northern Ave (E of Haul Rd)	0.10	30	851	1,115	1,132	724	968	998	10.0%	8,510	11,150	11,320
9	Private Dr at Haul Rd Roundabout (Yankee Lobster)	0.05	20	44	44	44	42	42	42	10.0%	440	440	440
10	Congress St (W of D St)	0.20	30	1,196	1,327	1,357	1,127	1,257	1,329	10.0%	11,960	13,270	13,570
11	D St (S of Congress)	0.10	30	1,069	1,197	1,227	1,334	1,509	1,581	10.0%	13,340	15,090	15,810
12	Congress St (D to Park Lane)	0.14	30	749	474	564	469	498	642	10.0%	7,490	4,980	6,420
13	Congress St (Park Lane to Northern Ave)	0.03	30	280	299	349	264	287	372	10.0%	2,800	2,990	3,720
14	Park Lane	0.05	25	15	15	15	25	25	25	10.0%	250	250	250
15A	Haul Rd (Roundabout to Site Driveway)	0.08	30	297	304	310	298	305	314	10.0%	2,980	3,050	3,140
15B	Haul Rd (S of Site Driveway)	0.08	30	297	304	310	298	305	314	10.0%	2,980	3,050	3,140
16	Park Lane Site Driveway	0.01	15	0	0	142	0	0	237	10.0%	0	0	2,370
17	Northern Ave Site Driveway	0.01	15	0	0	20	0	0	26	10.0%	0	0	260
18	Haul Road Site Driveway	0.01	15	0	0	0	0	0	0	10.0%	0	0	0

Conroy Parcel K

Regional Mesoscale Emissions Analysis - Roadway Emissions
2012 Existing

2013

	Link	Daily Average Volumes	Miles Per Link	Miles Traveled	Vehicle Speed (mph)	Avg Idle Time (hr/veh)	VOC Idle M6.2 VOC (g/hr)	VOC M6.2 VOC (g/mile)	VOC lbs/day	VOC tons/year	NOX Idle M6.2 NOX (g/hr)	NOX M6.2 NOX (g/mile)	NOX lbs/day	NOX tons/year	CO2 Idle M6.2 CO2 (g/hr)	CO2 M6.2 CO2 (g/mile)	CO2 lbs/day	CO2 tons/year
1	**Seaport Blvd (West of D St)**	10,530	0.25	2632.5	30	0.02	5.033	0.313	1.849	0.288	2.930	0.636	3.710	0.579	1406.750	562.700	3274.813	510.871
2	**Fish Pier**	1,800	0.21	378.0	20	0.02	5.033	0.367	0.311	0.049	2.930	0.699	0.586	0.091	1406.750	562.700	470.478	73.395
3	**D St SB (Northern to Congress)**	4,200	0.08	336.0	30	0.02	5.033	0.313	0.245	0.038	2.930	0.636	0.479	0.075	1406.750	562.700	420.442	65.589
4	**D St NB (Congress to Northern)**	2,020	0.09	181.8	30	0.02	5.033	0.313	0.132	0.021	2.930	0.636	0.259	0.040	1406.750	562.700	227.272	35.454
5	**Seaport Blvd (D St SB to D St NB)**	8,180	0.03	245.4	30	0.02	5.033	0.313	0.195	0.030	2.930	0.636	0.359	0.056	1406.750	562.700	311.477	48.590
6	**Northern Ave (D st NB to Congress)**	7,020	0.09	631.8	30	0.02	5.033	0.313	0.458	0.071	2.930	0.636	0.898	0.140	1406.750	562.700	789.826	123.213
7A	**Northern Ave (Congress to Site Driveway)**	8,100	0.04	283.5	30	0.02	5.033	0.313	0.221	0.034	2.930	0.636	0.412	0.064	1406.750	562.700	358.673	55.953
7B	**Northern Ave (Site Driveway to Haul Rd Roundabout)**	8,100	0.04	283.5	30	0.02	5.033	0.313	0.221	0.034	2.930	0.636	0.412	0.064	1406.750	562.700	358.673	55.953
8	**Northern Ave (E of Haul Rd)**	8,510	0.10	851.0	30	0.02	5.033	0.313	0.613	0.096	2.930	0.636	1.208	0.189	1406.750	562.700	1063.037	165.834
9	**Private Dr at Haul Rd Roundabout (Yankee Lobster)**	440	0.05	22.0	20	0.02	5.033	0.367	0.019	0.003	2.930	0.699	0.035	0.005	1406.750	562.700	27.671	4.317
10	**Congress St (W of D St)**	11,960	0.20	2392.0	30	0.02	5.033	0.313	1.687	0.263	2.930	0.636	3.375	0.527	1406.750	562.700	2977.693	464.520
11	**D St (S of Congress)**	13,340	0.10	1334.0	30	0.02	5.033	0.313	0.962	0.150	2.930	0.636	1.894	0.296	1406.750	562.700	1666.383	259.956
12	**Congress St (D to Park Lane)**	7,490	0.14	1048.6	30	0.02	5.033	0.313	0.747	0.116	2.930	0.636	1.484	0.231	1406.750	562.700	1307.291	203.937
13	**Congress St (Park Lane to Northern Ave)**	2,800	0.03	84.0	30	0.02	5.033	0.313	0.067	0.010	2.930	0.636	0.123	0.019	1406.750	562.700	106.618	16.632
14	**Park Lane**	250	0.05	12.5	25	0.02	5.033	0.334	0.010	0.002	2.930	0.658	0.019	0.003	1406.750	562.700	15.722	2.453
15A	**Haul Rd (Roundabout to Site Driveway)**	2,980	0.08	223.5	30	0.02	5.033	0.313	0.163	0.025	2.930	0.636	0.319	0.050	1406.750	562.700	279.830	43.653
15B	**Haul Rd (S of Site Driveway)**	2,980	0.08	223.5	30	0.02	5.033	0.313	0.163	0.025	2.930	0.636	0.319	0.050	1406.750	562.700	279.830	43.653
16	**Park Lane Site Driveway**	0	0.01	0.0	15	0.02	5.033	0.424	0.000	0.000	2.930	0.765	0.000	0.000	1406.750	562.700	0.000	0.000
17	**Northern Ave Site Driveway**	0	0.01	0.0	15	0.02	5.033	0.424	0.000	0.000	2.930	0.765	0.000	0.000	1406.750	562.700	0.000	0.000
18	**Haul Road Site Driveway**	0	0.01	0.0	15	0.02	5.033	0.424	0.000	0.000	2.930	0.765	0.000	0.000	1406.750	562.700	0.000	0.000
	Total	100700.000	1.670	11163.600					8.062	1.258			15.890	2.479			13935.730	2173.974

Notes: Daily to annual factor (6 days/week * 52 weeks per year / 365 days per year) = 85%

Conroy Parcel K

Regional Mesoscale Emissions Analysis - Roadway Emissions
2018 No-Build

2018							VOC	VOC			NOX	NOX			CO2	CO2		
	Link	Daily Average Volumes	Miles Per Link	Miles Traveled	Vehicle Speed (mph)	Avg Idle Time (hr/veh)	Idle M6.2 VOC (g/hr)	M6.2 VOC (g/mile)	lbs/day	tons/year	Idle M6.2 NOX (g/hr)	M6.2 NOX (g/mile)	lbs/day	tons/year	Idle M6.2 CO2 (g/hr)	M6.2 CO2 (g/mile)	lbs/day	tons/year
1	Seaport Blvd (West of D St)	13,850	0.25	3462.5	30	0.02	3.863	0.232	1.804	0.281	1.433	0.312	2.394	0.373	1419.525	567.810	4346.444	678.045
2	Fish Pier	1,800	0.21	378.0	20	0.02	3.863	0.273	0.232	0.036	1.433	0.342	0.287	0.045	1419.525	567.810	474.750	74.061
3	D St SB (Northern to Congress)	5,000	0.08	400.0	30	0.02	3.863	0.232	0.216	0.034	1.433	0.312	0.280	0.044	1419.525	567.810	505.072	78.791
4	D St NB (Congress to Northern)	2,560	0.09	230.4	30	0.02	3.863	0.232	0.124	0.019	1.433	0.312	0.161	0.025	1419.525	567.810	290.643	45.340
5	Seaport Blvd (D St SB to D St NB)	11,170	0.03	335.1	30	0.02	3.863	0.232	0.198	0.031	1.433	0.312	0.240	0.037	1419.525	567.810	429.193	66.954
6	Northern Ave (D st NB to Congress)	9,320	0.09	838.8	30	0.02	3.863	0.232	0.451	0.070	1.433	0.312	0.585	0.091	1419.525	567.810	1058.123	165.067
7A	Northern Ave (Congress to Site Driveway)	10,720	0.04	375.2	30	0.02	3.863	0.232	0.217	0.034	1.433	0.312	0.267	0.042	1419.525	567.810	478.999	74.724
7B	Northern Ave (Site Driveway to Haul Rd Roundabout)	10,720	0.04	375.2	30	0.02	3.863	0.232	0.217	0.034	1.433	0.312	0.267	0.042	1419.525	567.810	478.999	74.724
8	Northern Ave (E of Haul Rd)	11,150	0.10	1115.0	30	0.02	3.863	0.232	0.597	0.093	1.433	0.312	0.777	0.121	1419.525	567.810	1405.465	219.252
9	Private Dr at Haul Rd Roundabout (Yankee Lobster)	440	0.05	22.0	20	0.02	3.863	0.273	0.014	0.002	1.433	0.342	0.017	0.003	1419.525	567.810	27.922	4.356
10	Congress St (W of D St)	13,270	0.20	2654.0	30	0.02	3.863	0.232	1.389	0.217	1.433	0.312	1.837	0.287	1419.525	567.810	3333.848	520.080
11	D St (S of Congress)	15,090	0.10	1509.0	30	0.02	3.863	0.232	0.808	0.126	1.433	0.312	1.051	0.164	1419.525	567.810	1902.104	296.728
12	Congress St (D to Park Lane)	4,980	0.14	697.2	30	0.02	3.863	0.232	0.368	0.057	1.433	0.312	0.484	0.075	1419.525	567.810	877.093	136.827
13	Congress St (Park Lane to Northern Ave)	2,990	0.03	89.7	30	0.02	3.863	0.232	0.053	0.008	1.433	0.312	0.064	0.010	1419.525	567.810	114.887	17.922
14	Park Lane	250	0.05	12.5	25	0.02	3.863	0.248	0.007	0.001	1.433	0.323	0.009	0.001	1419.525	567.810	15.865	2.475
15A	Haul Rd (Roundabout to Site Driveway)	3,050	0.08	228.8	30	0.02	3.863	0.232	0.124	0.019	1.433	0.312	0.160	0.025	1419.525	567.810	289.004	45.085
15B	Haul Rd (S of Site Driveway)	3,050	0.08	228.8	30	0.02	3.863	0.232	0.124	0.019	1.433	0.312	0.160	0.025	1419.525	567.810	289.004	45.085
16	Park Lane Site Driveway	0	0.01	0.0	15	0.02	3.863	0.318	0.000	0.000	1.433	0.374	0.000	0.000	1419.525	567.810	0.000	0.000
17	Northern Ave Site Driveway	0	0.01	0.0	15	0.02	3.863	0.318	0.000	0.000	1.433	0.374	0.000	0.000	1419.525	567.810	0.000	0.000
18	Haul Road Site Driveway	0	0.01	0.0	15	0.02	3.863	0.318	0.000	0.000	1.433	0.374	0.000	0.000	1419.525	567.810	0.000	0.000
	Total	119410.000	1.670	12952.100					6.944	1.083			9.041	1.410			16317.416	2545.517

Notes: Daily to annual factor (6 days/week * 52 weeks per year / 365 days per year) = 85%

Conroy Parcel K

Regional Mesoscale Emissions Analysis - Roadway Emissions
2018 Build

2018

	Link	Daily Average Volumes	Miles Per Link	Miles Traveled	Vehicle Speed (mph)	Avg Idle Time (hr/veh)	VOC Idle M6.2 VOC (g/hr)	VOC M6.2 VOC (g/mile)	VOC lbs/day	VOC tons/year	NOX Idle M6.2 NOX (g/hr)	NOX M6.2 NOX (g/mile)	NOX lbs/day	NOX tons/year	CO2 Idle M6.2 CO2 (g/hr)	CO2 M6.2 CO2 (g/mile)	CO2 lbs/day	CO2 tons/year
1	**Seaport Blvd (West of D St)**	14,440	0.25	3610.0	30	0.02	3.863	0.232	1.881	0.293	1.433	0.312	2.496	0.389	1419.525	567.810	4531.599	706.929
2	**Fish Pier**	1,800	0.21	378.0	20	0.02	3.863	0.273	0.232	0.036	1.433	0.342	0.287	0.045	1419.525	567.810	474.750	74.061
3	**D St SB (Northern to Congress)**	5,000	0.08	400.0	30	0.02	3.863	0.232	0.216	0.034	1.433	0.312	0.280	0.044	1419.525	567.810	505.072	78.791
4	**D St NB (Congress to Northern)**	2,760	0.09	248.4	30	0.02	3.863	0.232	0.134	0.021	1.433	0.312	0.173	0.027	1419.525	567.810	313.350	48.883
5	**Seaport Blvd (D St SB to D St NB)**	11,850	0.03	355.5	30	0.02	3.863	0.232	0.210	0.033	1.433	0.312	0.255	0.040	1419.525	567.810	455.321	71.030
6	**Northern Ave (D st NB to Congress)**	9,910	0.09	891.9	30	0.02	3.863	0.232	0.480	0.075	1.433	0.312	0.622	0.097	1419.525	567.810	1125.107	175.517
7A	**Northern Ave (Congress to Site Driveway)**	11,470	0.04	401.5	30	0.02	3.863	0.232	0.232	0.036	1.433	0.312	0.286	0.045	1419.525	567.810	512.511	79.952
7B	**Northern Ave (Site Driveway to Haul Rd Roundabout)**	10,940	0.04	382.9	30	0.02	3.863	0.232	0.222	0.035	1.433	0.312	0.273	0.043	1419.525	567.810	488.830	76.257
8	**Northern Ave (E of Haul Rd)**	11,320	0.10	1132.0	30	0.02	3.863	0.232	0.606	0.094	1.433	0.312	0.789	0.123	1419.525	567.810	1426.893	222.595
9	**Private Dr at Haul Rd Roundabout (Yankee Lobster)**	440	0.05	22.0	20	0.02	3.863	0.273	0.014	0.002	1.433	0.342	0.017	0.003	1419.525	567.810	27.922	4.356
10	**Congress St (W of D St)**	13,570	0.20	2714.0	30	0.02	3.863	0.232	1.420	0.222	1.433	0.312	1.879	0.293	1419.525	567.810	3409.218	531.838
11	**D St (S of Congress)**	15,810	0.10	1581.0	30	0.02	3.863	0.232	0.846	0.132	1.433	0.312	1.101	0.172	1419.525	567.810	1992.861	310.886
12	**Congress St (D to Park Lane)**	6,420	0.14	898.8	30	0.02	3.863	0.232	0.475	0.074	1.433	0.312	0.624	0.097	1419.525	567.810	1130.711	176.391
13	**Congress St (Park Lane to Northern Ave)**	3,720	0.03	111.6	30	0.02	3.863	0.232	0.066	0.010	1.433	0.312	0.080	0.012	1419.525	567.810	142.936	22.298
14	**Park Lane**	250	0.05	12.5	25	0.02	3.863	0.248	0.007	0.001	1.433	0.323	0.009	0.001	1419.525	567.810	15.865	2.475
15A	**Haul Rd (Roundabout to Site Driveway)**	3,140	0.08	235.5	30	0.02	3.863	0.232	0.128	0.020	1.433	0.312	0.165	0.026	1419.525	567.810	297.532	46.415
15B	**Haul Rd (S of Site Driveway)**	3,140	0.08	235.5	30	0.02	3.863	0.232	0.128	0.020	1.433	0.312	0.165	0.026	1419.525	567.810	297.532	46.415
16	**Park Lane Site Driveway**	2,370	0.01	23.7	15	0.02	3.863	0.318	0.022	0.003	1.433	0.374	0.022	0.003	1419.525	567.810	31.728	4.950
17	**Northern Ave Site Driveway**	260	0.01	2.6	15	0.02	3.863	0.318	0.002	0.000	1.433	0.374	0.002	0.000	1419.525	567.810	3.481	0.543
18	**Haul Road Site Driveway**	0	0.01	0.0	15	0.02	3.863	0.318	0.000	0.000	1.433	0.374	0.000	0.000	1419.525	567.810	0.000	0.000
	Total	128610.000	1.670	13637.350					7.321	1.142			9.524	1.486			17183.219	2680.582

Notes: Daily to annual factor (6 days/week * 52 weeks per year / 365 days per year) = 85%

Boiler, Cooling Tower, Emergency Generator, Garage Vent, and Loading Dock Exhaust Vent Emissions Calculations

Conroy Parcel K (HOTEL)

Heating Boilers

				Notes
Source Name		HOTWH1-2	HOTBLR1-2	
Make		PVI	AERCO	From client
Model		Power VT	BMK3000	From client
Qty.		2	2	From client
Boiler Heat Input	MMBTU/hr (ea.):	2.000	3.000	From mfg
Boiler Emission Rates	lb/MMBTU	g/s	g/s	
NOx	0.035	0.00882	0.01323	ERP
CO	0.080	0.02016	0.03024	ERP
VOC	0.030	0.00756	0.01134	ERP
PM-2.5	0.010	0.00252	0.00378	ERP
PM-10	0.010	0.00252	0.00378	ERP
SO2	0.0006	0.00015	0.00022	AP42 Table 1.4-2 (assuming 1040 Btu/scf)
CO2	115.385	29.07628	43.61442	AP42 Table 1.4-2 (assuming 1040 Btu/scf)
Gas Exit Temp	°F	170	170	assumed
Gas Exit Temp	°K	349.8	349.8	calculated
Exhaust air (CFM)	CFM	836.45	1254.67	assumed (1400 cfm/100hp)
Gas Exit Velocity	fps	71.00	59.91	calculated, should be 40 fps minimum per DEP
Gas Exit Velocity	mps	21.64	18.26	calculated
Roof Height	feet	140.00	140.00	from site plans
Stack height	feet above roofline	10	10	assumed
Stack height	feet	150	150	calculated
Stack height	meters	45.720	45.720	calculated
Stack Diameter	feet	0.500	0.667	assumed
Stack Diameter	meters	0.152	0.203	calculated

Cooling Towers

			Notes
Designation		HOTCT1-2	
Make		BAC	
Model		15200	
Cooling Tower Rate	tons	200	from mfg
Tower Overall Dimensions	feet	11'10"x8'6"x14'3"	from mfg
CT Stack Height (above roofline)	feet	14.25	from mfg
Primary Building Height (ft)	feet	140.00	from site plans
CT Stack Height	feet	154.3	calculated
CT Stack Height	meters	47.02	calculated
Number of cells (per tower)	#	1	from mfg
Cooling Tower Specs			
Cooling Tower Exhaust Flow	CFM	52320	from mfg
Cooling Tower Cell Exhaust Flow	CFM	52320	calculated (per cell)
Cooling Tower Cell Exhaust Flow	kg/s	27.5	calculated
Cooling Tower Exhaust Temp	°F	78	assumed
Cooling Tower Exhaust Temp	K	298.7	calculated
Cooling Tower Cell Diameter	feet	5.9	assumed essentially same 0.5xL
Cooling Tower Cell Diameter	meters	1.80	calculated
Cooling Tower Stack Velocity	fps	31.72	calculated
Cooling Tower Stack Velocity	mps	9.67	calculated
Cooling Tower Drift			
Drift Rate	% of circ water	0.001	assumed
Circulating Water Rate	gpm	600	assumed 3gpm/ton cooling
Circulating Water Rate	gph	36,000	calculated
TDS+TSS concentration in drift	mg/L	1,500	assumed
PM emission rate in drift (per cell)	lb/hr	0.005	calculated
PM emission rate in drift (per cell)	g/s	0.00057	calculated

Conroy Parcel K (HOTEL)

Emergency Generators

			Notes
Designation		HOTEG1	
Number		1	
Electrical output	kilowatts	800	
Make		Caterpillar	
model		C27 ATAAC	
Engine Horsepower	BHP	1214.00	Mfg data
Engine power	kilowatts	905.28	calculated
Fuel consumption @full load	gph	57.22	Mfg data
Heat Input	MMBTU/hr:	7.83914	calculated
Stack Parameters			
Exhaust Temperature	°F	955.04	Mfg data
Exhaust Temperature	°K	786.0	calculated
Total Exhaust Flow	ACFM	6045.88	Mfg data
Flange Diameter	in.	8	Mfg data
Maximum Backpressure	in. H2O	40.2	Mfg data
Maximum velocity	fpm	20245.91	calculated
Flow area required	sq. ft	0.299	calculated
Number of exhausts (typ. 1 or 2)	#	1	Assumed
Selected silencer diameter	in	8	Assumed
Actual silencer opening area	sq. ft each	0.349	calculated
Actual velocity	fpm each	17320.170	calculated
Actual velocity	fps each	288.670	calculated
Single Stack Effective Diameter	ft	0.667	calculated
Single Stack Effective Diameter	m	0.203	calculated
Single Stack Effective Velocity	fps	288.670	calculated
Single Stack Effective Velocity	mps	87.986	calculated
Primary Building Height	ft	140.00	
Stack Height (10' above roofline)	ft	*150.00*	Per DEP
Stack Height	m	*45.72*	calculated
Pollutant	Emission factor unit	Emission factor	
NOx	g/BHP-hr	6.36	EF from mfg data (Not to exceed)
CO	g/BHP-hr	0.42	EF from mfg data (Not to exceed)
VOC	g/BHP-hr	0.06	EF from mfg data (Not to exceed)
PM10	g/BHP-hr	0.05	EF from mfg data (Not to exceed)
PM2.5	g/BHP-hr	0.05	EF from mfg data (Not to exceed)
SO2	g/BHP-hr	0.004538978	15 ppm S mass conserved
HAPs	lb/MMBTU	0.00149	AP42 Table 3.4-4 & 3.3-2
CO2	lb/MMBTU	165	AP42 Table 3.4-1 & 3.3-1
Short Term Emission Rate			
NOx	g/s	0.0734	uses EPA 'intermittent" factor (300 hrs/yr)
CO	g/s	0.1424	calculated
VOC	g/s	0.0189	calculated
PM10	g/s	0.0164	calculated
PM2.5	g/s	0.0164	calculated
SO2	g/s	0.0015	calculated
Long Term (300 hr/yr) Emission Rate			
NOx	g/s	0.0734	calculated
CO	g/s	0.0049	calculated
VOC	g/s	0.0006	calculated
PM10	g/s	0.0006	calculated
PM2.5	g/s	0.0006	calculated
SO2	g/s	0.00005	calculated

Conroy Parcel K (HOTEL)

Loading Dock Active Exhaust Vent

	2018 M6.2 Emission factors (g/hr/veh)	Hourly Idle Time (min/veh)	# Vehicles	Emission Rate (g/s)	Notes
Composite VOC :	2.983	5	4	0.000276	calculated
Composite CO :	27.124	5	4	0.002512	calculated
Composite NOX :	5.646	5	4	0.000523	calculated
Composite CO2 :	3119.376	5	4	0.288831	calculated
Total PM2.5:	0.100	5	4	0.000009	calculated
Total PM10:	0.162	5	4	0.000015	calculated
SO2:	0.035	5	4	0.000003	calculated

assumption: Loading dock is capable of handling 4 trucks at a time. Assume dock is used from 7am-4pm consistently with 4 trucks idling maximum of 5 minutes per hour (MGL Chapter 90, Section 16A).

Designation		HOTLDV1	
Vent Parameters			
Stack Exhaust Flow	ACFM	3000	from project description
Stack Exhaust Temperature	*F*	*70*	assumed
Stack Exhaust Temperature	*K*	*294.3*	calculated
outlet area	sq ft	24	from MEP
effective diameter	*ft*	*5.53*	calculated
effective diameter	*m*	*1.685*	calculated
Stack Velocity	*fps*	*2.1*	calculated
Stack Velocity	*mps*	*0.64*	calculated
Stack height	*feet above grade*	*10*	minimum by code
Stack height	*meters above grade*	*3.048*	calculated

Garage Exhaust Vents

Description		
Total Below Grade spaces	640	
Residential spaces	152	
Retail/commercial spaces	488	
# vehicles entering garage/hr	394.5	assume peak turnover of 75% of total spaces
Levels	3	from project description
Below Grade Garage Area (sq ft)	259338	estimated from project plans
Number of vents	2	3 fans per vent (from MEP)
Stack Exhaust Flow (acfm)	99000	from mfg (33000/fan)
Stack Exhaust Temperature (°F)	*70*	Assumed underground temp remains consistent
Stack Exhaust Temperature (K)	*294.3*	
outlet area per vent (sqft)	150	from MEP
effective diameter (ft)	*13.81977*	
effective diameter (m)	*4.212*	
Stack Velocity (fpm)	660.00000	
Stack Velocity (fps)	11.00000	
Stack Velocity (m/s)	3.35280	
Stack height (ft)	10	minimum by code
Stack height (m)	3.048	
Garage Distance Traveled (ft)	795	Approximate distance to center of garage
Hourly garage mileage (VMT)	59.399	

Total Emissions

	Per Vent Emission Rates		2018 10mph Emission Factors M6.2 g/mile
Composite VOC (g/s):	0.00302	Composite VOC (g/mile):	0.366
Composite CO (g/s):	0.08149	Composite CO (g/mile):	9.878
Composite NOX (g/s):	0.00189	Composite NOX (g/mile):	0.230
Composite CO2 (g/s):	3.59271	Composite CO2 (g/mile):	435.486
Total PM2.5 (g/s):	0.00009	Total PM2.5 (g/mile):	0.011
Total PM10 (g/s):	0.00021	Total PM10 (g/mile):	0.025
SO2 (g/s):	0.00006	SO2 (g/mile):	0.008

Example Emissions Assumption .

Example Emissions Assumption: 4 levels underground, 1000 spaces

Of the 1000 spaces, assume 750 residential, 250 commercial. It is assumed that the garage is on average 75% full. Residential spaces are assumed to turn over 25% per hour, while commercial spaces turn over hourly.

(750 x 0.25) + (250 x 1.0) x 0.75 = 328 vehicles per hour

It is assumed that the vehicles travel halfway, on average, into the garage at any time (travel to midpoint of mid level). Some travel through all 4 levels. Some find parking on the uppermost level. In this example, the distance to the center of the garage is assumed to be approximately 500 feet.

Using this assumption, a total VMT of 31.1 miles is traveled (500 feet/level x 328 cars / 5,280 feet per mile).

Emission factor is assumed to be weighted average of 10 mph LDGV, LDGT<6000gvw, LDDV, and MC. Higher of summer/winter values

Since traffic in/out of garage will not be at peak hour for all 24 hrs per day, the following factors were assumed to account for fluctuating usage

Hour	Factor
1 AM to 5 AM	0.25
6 AM to 8 AM	1.00
9 AM to 5 PM	0.75
6 PM to 7 PM	1.00
8 PM to 12 AM	0.25

Conroy Parcel K (RESIDENCES)

Heating Boilers

				Notes
Source Name		RESWH1-2	RESBLR1-3	
Make		PVI	AERCO	From client
Model		Power VT	BMK3000	From client
Qty.		2	3	From client
Boiler Heat Input	MMBTU/hr (ea.):	2.000	3.000	From mfg
Boiler Emission Rates	lb/MMBTU	g/s	g/s	
NOx	0.035	0.00882	0.01323	ERP
CO	0.080	0.02016	0.03024	ERP
VOC	0.030	0.00756	0.01134	ERP
PM-2.5	0.010	0.00252	0.00378	ERP
PM-10	0.010	0.00252	0.00378	ERP
SO2	0.0006	0.00015	0.00022	AP42 Table 1.4-2 (assuming 1040 Btu/scf)
CO2	115.385	29.07628	43.61442	AP42 Table 1.4-2 (assuming 1040 Btu/scf)
Gas Exit Temp	°F	170	170	assumed
Gas Exit Temp	°K	349.8	349.8	calculated
Exhaust air (CFM)	CFM	836.45	1254.67	assumed (1400 cfm/100hp)
Gas Exit Velocity	fps	71.00	59.91	calculated, should be 40 fps minimum per DEP
Gas Exit Velocity	mps	21.64	18.26	calculated
Roof Height	feet	140.00	140.00	from site plans
Stack height	feet above roofline	10	10	assumed
Stack height	feet	150	150	calculated
Stack height	meters	45.720	45.720	calculated
Stack Diameter	feet	0.500	0.667	assumed
Stack Diameter	meters	0.152	0.203	calculated

Cooling Towers

			Notes
Designation		RESCT1-2	
Make		BAC	
Model		15200	
Cooling Tower Rate	tons	350	from mfg
Tower Overall Dimensions	feet	11'10"x12'1"x14'3"	from mfg
CT Stack Height (above roofline)	feet	14.25	from mfg
Primary Building Height (ft)	feet	140.00	from site plans
CT Stack Height	feet	154.3	calculated
CT Stack Height	meters	47.02	calculated
Number of cells (per tower)	#	1	from mfg
Cooling Tower Specs			
Cooling Tower Exhaust Flow	CFM	52320	from mfg
Cooling Tower Cell Exhaust Flow	CFM	52320	calculated (per cell)
Cooling Tower Cell Exhaust Flow	kg/s	27.5	calculated
Cooling Tower Exhaust Temp	°F	78	assumed
Cooling Tower Exhaust Temp	K	298.7	calculated
Cooling Tower Cell Diameter	feet	5.9	assumed essentially same 0.5xL
Cooling Tower Cell Diameter	meters	1.80	calculated
Cooling Tower Stack Velocity	fps	31.72	calculated
Cooling Tower Stack Velocity	mps	9.67	calculated
Cooling Tower Drift			
Drift Rate	% of circ water	0.001	assumed
Circulating Water Rate	gpm	1,050	assumed 3gpm/ton cooling
Circulating Water Rate	gph	63,000	calculated
TDS+TSS concentration in drift	mg/L	1,500	assumed
PM emission rate in drift (per cell)	lb/hr	0.008	calculated
PM emission rate in drift (per cell)	g/s	0.00100	calculated

Conroy Parcel K (RESIDENCES)

Emergency Generators

			Notes
Designation		RESEG1	
Number		1	
Electrical output	kilowatts	800	
Make		Caterpillar	
model		C27 ATAAC	
Engine Horsepower	BHP	1214.00	Mfg data
Engine power	kilowatts	905.28	calculated
Fuel consumption @full load	gph	57.22	Mfg data
Heat Input	MMBTU/hr:	7.83914	calculated
Stack Parameters			
Exhaust Temperature	°F	955.04	Mfg data
Exhaust Temperature	°K	786.0	calculated
Total Exhaust Flow	ACFM	6045.88	Mfg data
Flange Diameter	in.	8	Mfg data
Maximum Backpressure	in. H2O	40.2	Mfg data
Maximum velocity	fpm	20245.91	calculated
Flow area required	sq. ft	0.299	calculated
Number of exhausts (typ. 1 or 2)	#	1	Assumed
Selected silencer diameter	in	8	Assumed
Actual silencer opening area	sq. ft each	0.349	calculated
Actual velocity	fpm each	17320.170	calculated
Actual velocity	fps each	288.670	calculated
Single Stack Effective Diameter	ft	0.667	calculated
Single Stack Effective Diameter	m	0.203	calculated
Single Stack Effective Velocity	fps	288.670	calculated
Single Stack Effective Velocity	mps	87.986	calculated
Primary Building Height	ft	140.00	
Stack Height (10' above roofline)	ft	*150.00*	Per DEP
Stack Height	m	*45.72*	calculated

Pollutant	Emission factor unit	Emission factor	
NOx	g/BHP-hr	6.36	EF from mfg data (Not to exceed)
CO	g/BHP-hr	0.42	EF from mfg data (Not to exceed)
VOC	g/BHP-hr	0.06	EF from mfg data (Not to exceed)
PM10	g/BHP-hr	0.05	EF from mfg data (Not to exceed)
PM2.5	g/BHP-hr	0.05	EF from mfg data (Not to exceed)
SO2	g/BHP-hr	0.004538978	15 ppm S mass conserved
HAPs	lb/MMBTU	0.00149	AP42 Table 3.4-4 & 3.3-2
CO2	lb/MMBTU	165	AP42 Table 3.4-1 & 3.3-1
Short Term Emission Rate			
NOx	g/s	0.0734	uses EPA 'intermittent" factor (300 hrs/yr)
CO	g/s	0.1424	calculated
VOC	g/s	0.0189	calculated
PM10	g/s	0.0164	calculated
PM2.5	g/s	0.0164	calculated
SO2	g/s	0.0015	calculated
Long Term (300 hr/yr) Emission Rate			
NOx	g/s	0.0734	calculated
CO	g/s	0.0049	calculated
VOC	g/s	0.0006	calculated
PM10	g/s	0.0006	calculated
PM2.5	g/s	0.0006	calculated
SO2	g/s	0.00005	calculated

Conroy Parcel K (RESIDENCES)

Loading Dock Active Exhaust Vent

	2017 M6.2 Emission factors (g/hr/veh)	Hourly Idle Time (min/veh)	# Vehicles	Emission Rate (g/s)	Notes
Composite VOC :	2.983	5	2	0.000138	calculated
Composite CO :	27.124	5	2	0.001256	calculated
Composite NOX :	5.646	5	2	0.000261	calculated
Composite CO2 :	3119.376	5	2	0.144416	calculated
Total PM2.5:	0.100	5	2	0.000005	calculated
Total PM10:	0.162	5	2	0.000007	calculated
SO2:	0.035	5	2	0.000002	calculated

assumption: Loading dock is capable of handling 2 trucks at a time. Assume dock is used from 7am-4pm consistently with 2 trucks idling maximum of 5 minutes per hour (MGL Chapter 90, Section 16A).

Designation		RESLDV1	
Vent Parameters			
Stack Exhaust Flow	ACFM	3000	from project description
Stack Exhaust Temperature	*F*	*70*	assumed
Stack Exhaust Temperature	*K*	*294.3*	calculated
outlet area	sq ft	24	from MEP
effective diameter	*ft*	*5.53*	calculated
effective diameter	*m*	*1.685*	calculated
Stack Velocity	*fps*	*2.1*	calculated
Stack Velocity	*mps*	*0.64*	calculated
Stack height	*feet above grade*	*10*	minimum by code
Stack height	*meters above grade*	*3.048*	calculated

summer 2018 10 mph

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
GVWR:		<6000	>6000	(All)						
VMT Distribution:	0.2678	0.4333	0.1705		0.0372	0	0.0015	0.0861	0.0037	1
Fuel Economy (mpg):	24.1	18.5	14.2	17	9.9	32.4	18.4	7.3	50	16.1
Composite Emission Fa ctors (g/mi):										
Composite VOC :	0.364	0.326	0.387	0.344	0.515	0.298	0.16	0.562	5.29	0.392
Composite CO :	4.64	4.57	4.83	4.64	13.71	2.893	0.657	1.126	36.41	4.788
Composite NOX :	0.246	0.213	0.306	0.24	0.323	0.446	0.101	2.185	1	0.414
Composite CO2 :	368	479.4	624.5	520.3	894.4	314.1	552.4	1398.6	177.4	567.81
Total PM2.5:	0.0113	0.0113	0.0113	0.0113	0.0193	0.0949	0.0183	0.0474	0.0207	0.0147
Total PM10:	0.0248	0.0248	0.0248	0.0248	0.034	0.1157	0.0324	0.0763	0.0372	0.0296
SO2:	0.0066	0.0087	0.0115	0.0095	0.0163	0.0029	0.0052	0.013	0.0033	0.0092

Winter 2018 10 mph

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
GVWR:		<6000	>6000	(All)						
VMT Distribution:	0.2705	0.4324	0.1699		0.0367	0	0.0015	0.0854	0.0036	1
Fuel Economy (mpg):	24.1	18.5	14.2	17	9.9	32.4	18.4	7.3	50	16.1
Composite Emission Fa ctors (g/m i):										
Composite VOC :	0.37	0.322	0.41	0.347	0.587	0.293	0.162	0.568	4.84	0.397
Composite CO :	10.51	9.3	9.39	9.32	16.59	2.853	0.658	1.182	31.83	9.284
Composite NOX :	0.212	0.225	0.331	0.255	0.366	0.443	0.105	2.336	1.32	0.429
Composite CO2 :	368	479.3	624.4	520.3	894.4	314.1	552.3	1399.6	177.4	566.72
Total PM2.5:	0.0113	0.0113	0.0113	0.0113	0.0196	0.0949	0.0185	0.0488	0.0207	0.0148
Total PM10:	0.0248	0.0248	0.0248	0.0248	0.0343	0.1157	0.0326	0.0778	0.0372	0.0297
SO2:	0.0066	0.0087	0.0115	0.0095	0.0163	0.0029	0.0052	0.013	0.0033	0.0092

Summer garage vehicles :	LDGV	LDGT12	LDDV	MC	SUM
actual fraction	0.2678	0.4333	0	0.0037	0.7048
garage fraction	0.3800	0.6148	0.0000	0.0052	1
					Composite EF
Composite VOC :	0.364	0.326	0.298	5.29	0.366
Composite CO :	4.64	4.57	2.893	36.41	4.764
Composite NOX :	0.246	0.213	0.446	1	0.230
Composite CO2 :	368	479.4	314.1	177.4	435.486
Total PM2.5:	0.0113	0.0113	0.0949	0.0207	0.011
Total PM10:	0.0248	0.0248	0.1157	0.0372	0.025
SO2:	0.0066	0.0087	0.0029	0.0033	0.008

Winter garage vehicles :	LDGV	LDGT12	LDDV	MC	SUM
actual fraction	0.2705	0.4324	0	0.0036	0.7065
garage fraction	0.3829	0.6120	0.0000	0.0051	1
					Composite EF
Composite VOC :	0.37	0.322	0.293	4.84	0.363
Composite CO :	10.51	9.3	2.853	31.83	9.878
Composite NOX :	0.212	0.225	0.443	1.32	0.226
Composite CO2 :	368	479.3	314.1	177.4	435.148
Total PM2.5:	0.0113	0.0113	0.0949	0.0207	0.011
Total PM10:	0.0248	0.0248	0.1157	0.0372	0.025
SO2:	0.0066	0.0087	0.0029	0.0033	0.008

summer 2018 2.5 mph

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
GVWR:		<6000	>6000	(All)						
VMT Distribution:	0.2678	0.4333	0.1705		0.0372	0	0.0015	0.0861	0.0037	1
Fuel Economy (mpg):	24.1	18.5	14.2	17	9.9	32.4	18.4	7.3	50	16.1
Composite Emission Fa tors (g/mi):										
Composite VOC :	1.775	1.418	1.525	1.448	1.836	0.4	0.22	0.815	11.84	1.532
Composite CO :	11.16	9.72	10.33	9.89	25.79	4.524	1.085	2.001	119.9	10.532
Composite NOX :	0.384	0.305	0.438	0.343	0.299	0.592	0.134	2.885	1.12	0.573
Composite CO2 :	368	479.4	624.5	520.3	894.4	314.1	552.4	1398.6	177.4	567.81
Total PM2.5:	0.0113	0.0113	0.0113	0.0113	0.0193	0.0949	0.0183	0.0474	0.0207	0.0147
Total PM10:	0.0248	0.0248	0.0248	0.0248	0.034	0.1157	0.0324	0.0763	0.0372	0.0296
SO2:	0.0066	0.0087	0.0115	0.0095	0.0163	0.0029	0.0052	0.013	0.0033	0.0092

Winter 2018 2.5 mph

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
GVWR:		<6000	>6000	(All)						
VMT Distribution:	0.2705	0.4324	0.1699		0.0367	0	0.0015	0.0854	0.0036	1
Fuel Economy (mpg):	24.1	18.5	14.2	17	9.9	32.4	18.4	7.3	50	16.1
Composite Emission Fa ctors (g/mi):										
Composite VOC :	1.805	1.4	1.56	1.445	2.055	0.394	0.223	0.823	11.17	1.545
Composite CO :	18.76	16.69	17.36	16.88	31.21	4.472	1.087	2.1	100.99	16.934
Composite NOX :	0.291	0.31	0.457	0.352	0.339	0.587	0.14	3.083	1.48	0.572
Composite CO2 :	368	479.3	624.4	520.3	894.4	314.1	552.3	1399.6	177.4	566.72
Total PM2.5:	0.0113	0.0113	0.0113	0.0113	0.0196	0.0949	0.0185	0.0488	0.0207	0.0148
Total PM10:	0.0248	0.0248	0.0248	0.0248	0.0343	0.1157	0.0326	0.0778	0.0372	0.0297
SO2:	0.0066	0.0087	0.0115	0.0095	0.0163	0.0029	0.0052	0.013	0.0033	0.0092

Summer Loading Dock vehicles :	HDGV	HDDV	SUM
actual fraction	0.0372	0.0861	0.1233
garage fraction	0.3017	0.6983	1
			Composite EF
Composite VOC :	1.836	0.815	1.123
Composite CO :	25.79	2.001	9.178
Composite NOX :	0.299	2.885	2.105
Composite CO2 :	894.4	1398.6	1246.481
Total PM2.5:	0.0193	0.0474	0.039
Total PM10:	0.034	0.0763	0.064
SO2:	0.0163	0.013	0.014

Winter Loading Dock vehicles :	HDGV	HDDV	SUM
actual fraction	0.0367	0.0854	0.1221
garage fraction	0.3006	0.6994	1
			Composite EF
Composite VOC :	2.055	0.823	1.193
Composite CO :	31.21	2.1	10.850
Composite NOX :	0.339	3.083	2.258
Composite CO2 :	894.4	1399.6	1247.750
Total PM2.5:	0.0196	0.0488	0.040
Total PM10:	0.0343	0.0778	0.065
SO2:	0.0163	0.013	0.014

Background Concentrations and Modeling Results

Conroy Parcel K
Background Concentrations

Background Concentrations								
POLLUTANT	AVERAGING TIME	2010	2011	2012	Units	ppm to $\mu g/m^3$ Conversion Factor	Background Concentration ($\mu g/m^3$)	Location
SO_2 [1][7][8]	1-Hour	26.9	49	15.8	ppb	2.6	127.4	Kenmore Sq., Boston
	3-Hour	0.034	0.024	0.019	ppm	2600	88.4	Kenmore Sq., Boston
	24-Hour	8.4	12.1	6	ppb	2.6	31.5	Kenmore Sq., Boston
	Annual	2.24	2.36	1.87	ppb	2.6	6.1	Kenmore Sq., Boston
PM-10	24-Hour	32	39	41	$\mu g/m^3$	1	41.0	One City Sq. Boston
	Annual	15.1	15.9	16.8	$\mu g/m^3$	1	16.8	One City Sq. Boston
PM-2.5	24-Hour [4]	24.8	23.9	20.9	$\mu g/m^3$	1	23.2	174 North St., Boston
	Annual [5]	10.03	10.32	9.47	$\mu g/m^3$	1	9.9	174 North St., Boston
NO_2 [3]	1-Hour [6]	63.5	74.9	61	ppb	1.88	140.8	Kenmore Sq., Boston
	Annual	19.1	20.36	19.1	ppb	1.88	38.3	Kenmore Sq., Boston
CO [2]	1-Hour	1.9	1.5	1.4	ppm	1140	2166	Kenmore Sq., Boston
	8-Hour	1.5	1.3	1.1	ppm	1140	1710	Kenmore Sq., Boston

Notes: From 2007-2011 MA DEP Annual Data Summaries

[1] SO_2 reported in ppm or ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 2600 $\mu g/m^3$.

[2] CO reported in ppm or ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 1140 $\mu g/m^3$.

[3] NO_2 reported in ppm or ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 1880 $\mu g/m^3$.

[4] Background level for 24-hour PM-2.5 is the average concentration of the 98th percentile for three years.

[5] Background level for annual PM-2.5 is the average for three years.

[6] Maximum annual 1-hr concentrations.

[7] The 24-hour and Annual standards were revoked by EPA on June 22, 2010, Federal Register 75-119, p. 35520.

[8] The 2010 & 2011 SO_2 3-hr value is not reported. Years 2007-2009 used instead.

Conroy Parcel K
AERMOD Dispersion Modeling Analysis
NAAQS Results

POLLUTANT	AVERAGING TIME	MAXIMUM MODELED CONCENTRATION ($\mu g/m^3$)	YEAR of MODELED MAX (Meteorological Data)	BACKGROUND CONCENTRATION ($\mu g/m^3$)	TOTAL CONCENTRATION ($\mu g/m^3$)	STANDARD ($\mu g/m^3$)	% of Standard
SO_2	1 HOUR (1)	0.31	2008-2012	127.4	127.7	196	65%
	3 HOUR (2)	0.23	2012	88.4	88.6	1300	7%
	24 HOUR (2)	0.11	2009	31.5	31.6	365	9%
	ANNUAL (3)	0.02	2011	6.1	6.2	80	8%
PM_{10}	24 HOUR (4)	1.55	2011	41.0	42.5	150	28%
	ANNUAL (3)	0.25	2011	16.8	17.0	50	34%
$PM_{2.5}$	24 HOUR (5)	1.60	2008-2012	23.2	24.8	35	71%
	ANNUAL (6)	0.22	2008-2012	9.9	10.2	15	68%
NO_2	1 HOUR (7)	11.05	2008-2012	140.8	151.9	188	81%
	ANNUAL (3)	1.44	2011	38.3	39.7	100	40%
CO	1 HOUR (2)	931.15	2012	2166.0	3097.1	40000	8%
	8 HOUR (2)	155.20	2010	1710.0	1865.2	10000	19%

Notes:

(1) Maximum 4th-Highest Maximum Daily 1-Hr Concentration Averaged Over 5 Years
(2) Highest 2nd-High Concentration Over 5 Years
(3) Highest Annual Concentration Over 5 Years
(4) Highest 6th-High Concentration Over 5 Years
(5) Maximum 1st-Highest 24-Hour Concentration Averaged Over 5 Years
(6) Maximum Annual Concentration Averaged Over 5 Years
(7) Maximum 8th-Highest Maximum Daily 1-Hour Concentration Averaged Over 5 Years

Mesoscale MOBILE6.2 Emission Factor Summary

Arterial Roadways

MAX Summer/Winter

Year	Speed	VOC	NOX	CO2
2012	0	0	0	0
2012	Idle	5.53	3.3975	1403.25
2012	2.5	2.212	1.359	561.3
2012	5	0.948	1.221	561.3
2012	10	0.574	1.021	561.3
2012	15	0.462	0.889	561.3
2012	20	0.399	0.812	561.3
2012	25	0.364	0.766	561.3
2012	30	0.341	0.739	561.3
2012	35	0.325	0.733	561.3
2012	40	0.317	0.75	561.3
2012	45	0.312	0.783	561.3
2012	50	0.307	0.832	561.3
2012	55	0.302	0.902	561.3
2012	60	0.301	1.001	561.3
2012	65	0.301	1.194	561.3

Year	Speed	VOC	NOX	CO2
2018	0	0	0	0
2018	Idle	3.8625	1.4325	1419.525
2018	2.5	1.545	0.573	567.81
2018	5	0.66	0.513	567.81
2018	10	0.397	0.429	567.81
2018	15	0.318	0.374	567.81
2018	20	0.273	0.342	567.81
2018	25	0.248	0.323	567.81
2018	30	0.232	0.312	567.81
2018	35	0.221	0.309	567.81
2018	40	0.216	0.317	567.81
2018	45	0.212	0.33	567.81
2018	50	0.208	0.349	567.81
2018	55	0.206	0.375	567.81
2018	60	0.205	0.412	567.81
2018	65	0.206	0.464	567.81

All factors in grams/mile except Idle (grams/hour)

Conroy Parcel K - Boston, MA
Calculation of Microscale Modeling Emission Factors
Summary of MOBILE6 Output

Carbon Monoxide Only

Queues	Idle
Free Flow	30 mph
Right Turns	10 mph
Left Turns	15 mph

Winter	**2012**	**2018**	**Units**
Idle	50.215	42.335	g/hr
2.5 mph	20.086	16.934	g/mile
10 mph	10.834	9.284	g/mile
15 mph	9.736	8.380	g/mile
30 mph	8.682	7.521	g/mile

Note: Winter CO emission factors are higher than Summer and are conservatively used

Model Input/Output Files

Due to excessive size AERMOD, CAL3QHC, and MOBILE6.2 input and output files are available on digital media upon request.

Appendix E

LEED Check List

LEED-NC

LEED-NC 2009 Project Checklist

Project Name: Parcel K
Project Location: South Boston

Yes	?	No			
19	2	4	**Sustainable Sites**		**26** Points
Y			Prereq 1	**Construction Activity Pollution Prevention**	Required
1			Credit 1	**Site Selection**	1
5			Credit 2	**Development Density & Community Connectivity**	5
		1	Credit 3	**Brownfield Redevelopment**	1
6			Credit 4.1	**Alternative Transportation**, Public Transportation Access	6
1			Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
3			Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	3
		1	Credit 4.4	**Alternative Transportation**, Parking Capacity	2
	1		Credit 5.1	**Site Development,** Protect or Restore Habitat	1
	1		Credit 5.2	**Site Development,** Maximize Open Space	1
		1	Credit 6.1	**Stormwater Design,** Quantity Control	1
1			Credit 6.2	**Stormwater Design,** Quality Control	1
1			Credit 7.1	**Heat Island Effect,** Non-Roof	1
1			Credit 7.2	**Heat Island Effect,** Roof	1
		1	Credit 8	**Light Pollution Reduction**	1

Yes	?	No			
6	4		**Water Efficiency**		**10** Points
Y			Prereq 1	**Water Use Reduction, 20% Reduction**	Required
2			Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	2
2			Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	2
	2		Credit 2	**Innovative Wastewater Technologies**	2
2	2		Credit 3	**Water Use Reduction**	2 to 4
			2	30% Reduction	2
				35% Reduction	3
				40% Reduction	4

Yes	?	No			
4	21	10	**Energy & Atmosphere**		**35** Points
Y			Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y			Prereq 2	**Minimum Energy Performance:** 10% New Bldgs or 5% Existing Bldgs Renovations	Required
Y			Prereq 3	**Fundamental Refrigerant Management**	Required
2	7	10	Credit 1	**Optimize Energy Performance**	1 to19
				12% New Buildings or 8% Existing Building Renovations	1
			2	14% New Buildings or 10% Existing Building Renovations	2
				16% New Buildings or 12% Existing Building Renovations	3
				18% New Buildings or 14% Existing Building Renovations	4
				20% New Buildings or 16% Existing Building Renovations	5
				22% New Buildings or 18% Existing Building Renovations	6
				24% New Buildings or 20% Existing Building Renovations	7
				26% New Buildings or 22% Existing Building Renovations	8
				28% New Buildings or 24% Existing Building Renovations	9
				30% New Buildings or 26% Existing Building Renovations	10
				32% New Buildings or 28% Existing Building Renovations	11
				34% New Buildings or 30% Existing Building Renovations	12
				36% New Buildings or 32% Existing Building Renovations	13
				38% New Buildings or 34% Existing Building Renovations	14
				40% New Buildings or 36% Existing Building Renovations	15
				42% New Buildings or 38% Existing Building Renovations	16
				44% New Buildings or 40% Existing Building Renovations	17
				46% New Buildings or 42% Existing Building Renovations	18
				48% New Buildings or 44% Existing Building Renovations	19

Yes	?	No			
	7		Credit 2	**On-Site Renewable Energy**	1 to 7
				1% Renewable Energy	1
				3% Renewable Energy	2
				5% Renewable Energy	3
				7% Renewable Energy	4
				9% Renewable Energy	5
				11% Renewable Energy	6
				13% Renewable Energy	7
2			Credit 3	**Enhanced Commissioning**	2

	2		Credit 4	**Enhanced Refrigerant Management**	2
	3		Credit 5	**Measurement & Verification**	3
	2		Credit 6	**Green Power**	2

Yes ? No

6 2 6 Materials & Resources — 14 Points

Y			Prereq 1	**Storage & Collection of Recyclables**	Required
		3	Credit 1.1	**Building Reuse**, Maintain % of Existing Walls, Floors & Roof	1 to 3
				Maintain 55% of Existing Walls, Floors & Roof	1
				Maintain 75% of Existing Walls, Floors & Roof	2
				Maintain 95% of Existing Walls, Floors & Roof	3
		1	Credit 1.4	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1			Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
1			Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
		1	Credit 3.1	**Materials Reuse**, 5%	1
		1	Credit 3.2	**Materials Reuse**, 10%	1
1			Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
1			Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1			Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regionally	1
	1		Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regionally	1
	1		Credit 6	**Rapidly Renewable Materials**	1
1			Credit 7	**Certified Wood**	1

Yes ? No

10 3 2 Indoor Environmental Quality — 15 Points

Y			Prereq 1	**Minimum IAQ Performance**	Required
Y			Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
		1	Credit 1	**Outdoor Air Delivery Monitoring**	1
		1	Credit 2	**Increased Ventilation**	1
1			Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
1			Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1			Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1			Credit 4.3	**Low-Emitting Materials**, Flooring Systems	1
1			Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
1			Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1			Credit 6.1	**Controllability of Systems**, Lighting	1
1			Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1			Credit 7.1	**Thermal Comfort**, Design	1
	1		Credit 7.2	**Thermal Comfort**, Verification	1
	1		Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
	1		Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes ? No

4 2 Innovation & Design Process — 6 Points

1			Credit 1.1	**Innovation in Design**: Green Housekeeping	1
1			Credit 1.2	**Innovation in Design**: Transportation Program	1
1			Credit 1.3	**Innovation in Design**: Residential Occupant recycling	1
	1		Credit 1.4	**Innovation in Design**:	1
	1		Credit 1.5	**Innovation in Design**:	1
1			Credit 2	**LEED® Accredited Professional**	1

Yes ? No

2 2 Regional Priority Credits — 4 Points

1			Credit 1.1	**Regional Priority Credit: SSc7.1 Heat Island Effect - Nonroof**	1
1			Credit 1.2	**Regional Priority Credit: SSc7.2 Heat Island Effect - Roof**	1
		1	Credit 1.3	**Regional Priority Credit: SSc6.1 Stormwater Design - Quantity Control**	1
		1	Credit 1.4	**Regional Priority Credit: SSc3 Brownfield Redevelopment**	1

Yes ? No

2 2 Boston Green Credits — 4 Points

	1		Prereq 1	**Retrofit diesel construction vehicles**	1
Y			Prereq 2	**Outdoor Construction Management Plan**	1
Y			Prereq 3	**Integrated Pest Management Plan**	1
		1	Credit 1.1	**Modern Grid**	1
		1	Credit 1.2	**Historic Preservation**	1
	1		Credit 1.3	**Groundwater Recharge**	1
	1		Credit 1.4	**Modern Mobility**	1

Yes ? No

51 36 26 Project Totals (pre-certification estimates) — 110 Points

Certified 40-49 points **Silver** 50-59 points **Gold** 60-79 points **Platinum** 80+ points

Appendix F

Hydrant Flow Results

Boston Water and Sewer Commission

980 Harrison Avenue
Boston, MA 02119-2540
617-989-7000

October 22, 2012

Frederick A. Keylor
H.W. Moore Associates, Inc.
112 Shawmut Avenue
Boston, MA 02118

Re: Hydrant Flow Test
301 Northern Avenue

Dear Mr. Keylor:

At your request the Commission conducted the following hydrant flow test on October 19, 2012 at 301 Northern Avenue, South Boston. Test results are as follows:

Static	70	Psi
Residual	67	Psi
Total Flow	2242	Gpm
Flow @ 20 psi	10243	Gpm

I trust that this information is what you require. If I can be of further assistance, please feel free to call me.

Yours truly,

John P. Sullivan, Jr., P.E.
Chief Engineer

Boston Water and Sewer Commission
Field Engineering

Hydrant Flow Test Report

Date: 19-Oct-12 Time: 1:29 PM

Location: 301 Northern Ave Neighborhood: South Boston

Engineer: Taylor Technician: Bartosiak

Hydrant Information

Static Hydrant (A): H145 Map: 22M Water Main: SL16 DICL 2000 Elev. (ft): 15.8

Flow Hydrant (B): H137 Map: 22M Water Main: SL16 DICL 2006 Elev. (ft): 16.5

Flow Hydrant (C): Map: Water Main: Elev. (ft):

Flow Test Information

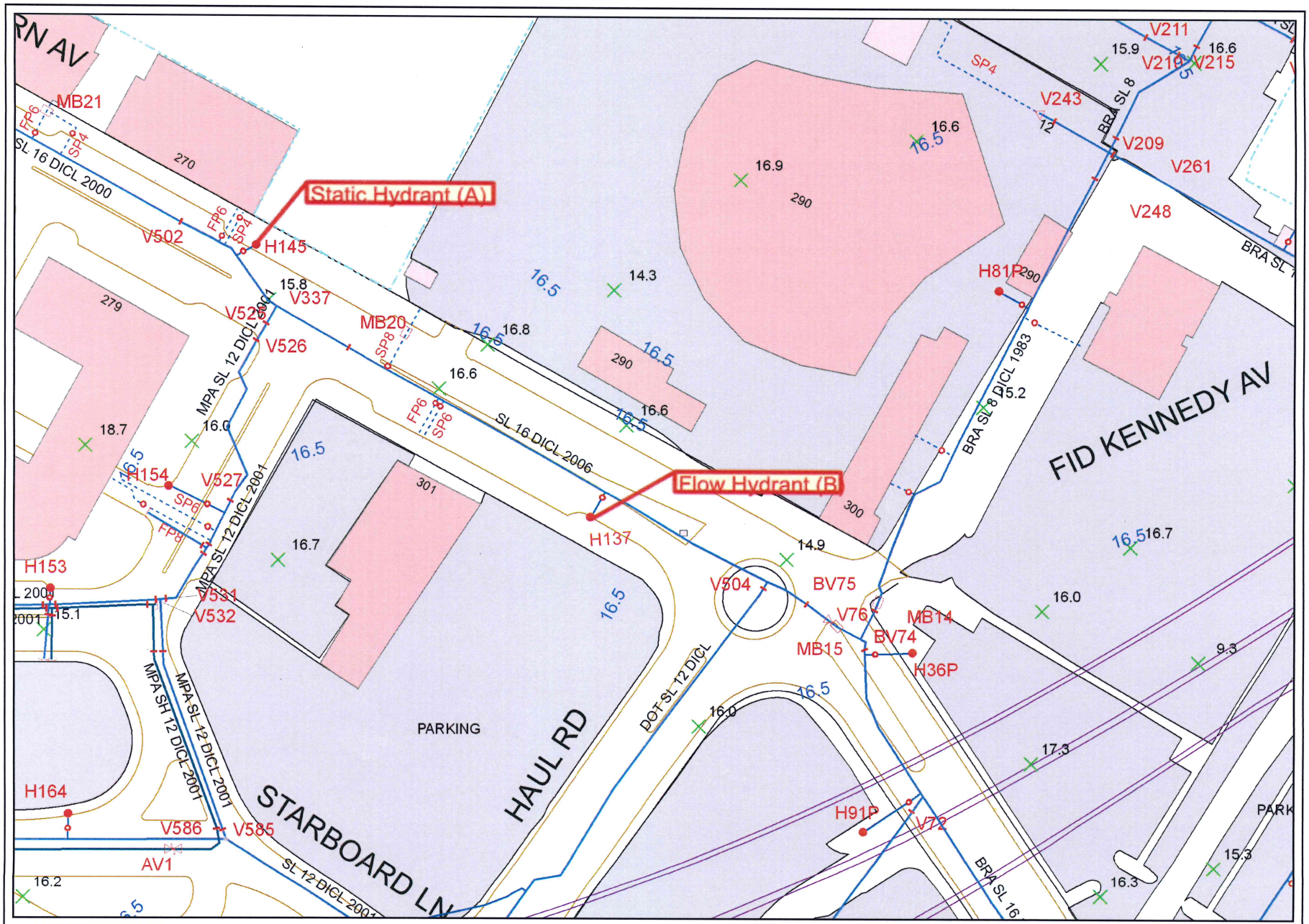
Flow Hydrant(s)	Gauge ID	Port Diameter (inches)	Transition Coefficient	Pitot Pressure (psi)	Flow (gpm)
H137	B	2.5	0.85	50	1121
H137	B	2.5	0.85	50	1121

Static Gauge: A Static (psi): 70 Residual (psi): 67

Flow Test Results

Total Flow (gpm)	Flow (gpm) @ 20 psi	Flow (gpm) @ 10 psi
2242	10243	11303

Comments:



BOSTON WATER AND SEWER

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N W E S

75 50 0 100 Feet

1 inch = 100 feet

Boston Water and Sewer Commission

980 Harrison Avenue
Boston, MA 02119-2540
617-989-7000

November 20, 2012

H.W. Moore Associates, Inc.
Attn: Frederick Keylor
112 Shawmut Avenue
Boston, MA 02118

Re: Hydrant Flow Test
301 Northern Ave

To Whom It May Concern:

At your request the Commission conducted the following hydrant flow test on November 16, 2012 at 301 Northern Ave, South Boston. Test results are as follows:

Static	71	Psi
Residual	66	Psi
Total Flow	2126	Gpm
Flow @ 20 psi	7451	Gpm

I trust that this information is what you require. If I can be of further assistance, please feel free to call me.

Yours truly,

John P. Sullivan, Jr., P.E.
Chief Engineer

Boston Water and Sewer Commission
Field Engineering

Hydrant Flow Test Report

Date: 16-Nov-12 Time: 12:48 PM

Location: 301 Northern Ave Neighborhood: South Boston

Engineer: Taylor Technician: Deveer

Hydrant Information

Static Hydrant (A): H154 Map: 22M Water Main: MPA SL12 DICL 2001 Elev. (ft): 16

Flow Hydrant (B): H153 Map: 22M Water Main: MPA SL12 DICL 2001 Elev. (ft): 15.1

Flow Hydrant (C): _____ Map: _____ Water Main: _____ Elev. (ft): _____

Flow Test Information

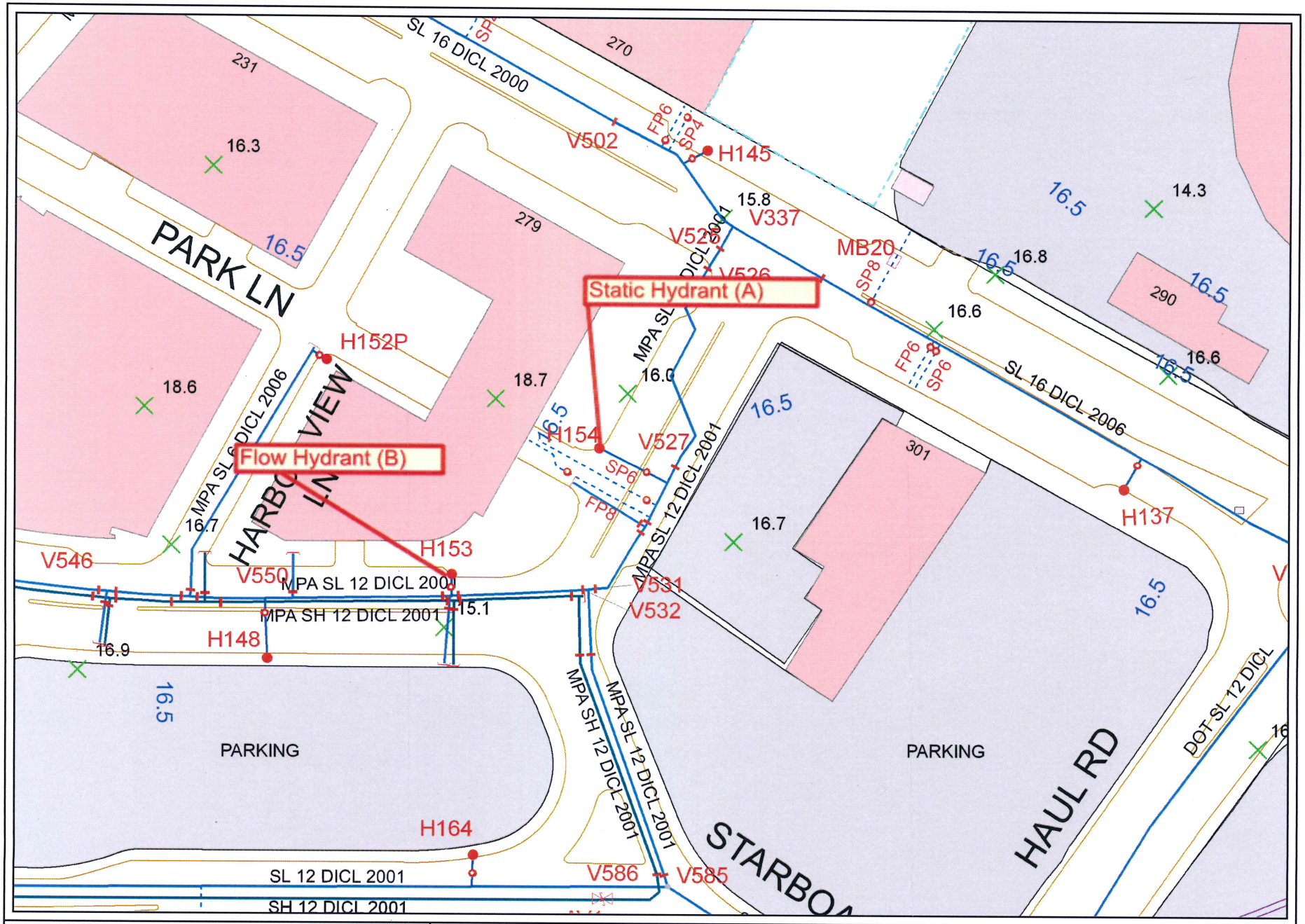
Flow Hydrant(s)	Gauge ID	Port Diameter (inches)	Transition Coefficient	Pitot Pressure (psi)	Flow (gpm)
H153	B	2.5	0.85	45	1063
H153	B	2.5	0.85	45	1063

Static Gauge: A Static (psi): 71 Residual (psi): 66

Flow Test Results

Total Flow (gpm)	Flow (gpm) @ 20 psi	Flow (gpm) @ 10 psi
2126	7451	8207

Comments: _____



BOSTON WATER AND SEWER

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N W E S

60 40 0 80 Feet

1 inch = 80 feet

301 Northern Ave, South Boston
Fire Flow Test

Appendix G

Climate Change Preparedness Questionnaire

Project Information

Project Name:	Parcel K
Project Address Primary:	301 Northern Avenue | South Boston, MA
Project Address Additional:	
Project Contact (name / Title / Company / email / phone):	Terry Conroy Jr / Manager / Parcel K LLC / tconroy@conroydev.com / 781.344.5656

Team Description

Owner / Developer:	Parcel K LLC
Architect:	Arrowstreet
Engineer (building systems):	WSP
Sustainability / LEED:	Arrowstreet & WSP
Permitting:	Epsilon
Construction Management:	Conroy Development Corporation
Climate Change Expert:	WSP

Project Permitting and Phase

At what phase is the project – at time of this questionnaire?

PNF / Expanded PNF Submitted	Draft / Final Project Impact Report Submitted	BRA Board Approved
BRA Design Approved	Under Construction	Construction just completed:

Building Classification and Description

What are the principal Building Uses - select all appropriate uses?

Residential – One to Three Unit	Residential - Multi-unit, Four +	Institutional	Education
Commercial	Office	Retail	Assembly
Laboratory / Medical	Manufacturing / Industrial	Mercantile	Storage, Utility and Other

First Floor Uses (List): retail, restaurant, lobbies, flex office, mechanical, back of house

What is the Construction Type – select most appropriate type?

Wood Frame	Masonry	Steel Frame	Concrete

Describe the building?

Site Area:	103,484 *SF*	Building Area:	+/- 520,000 *SF*
Building Height:	120' - 0" *Ft.*	Number of Stories:	11 *Flrs.*
First Floor Elevation:	16.25' BCB *Elev.*	Are there below grade spaces:	*Yes / No*

Green Building

Which LEED Rating System(s) and version has or will your project use (by area for multiple rating systems)?

Select by Primary Use:	New Construction	Core & Shell	Healthcare	Schools
	Retail	Homes Midrise	Homes	Other
Select LEED Outcome:	Certified	Silver	Gold	Platinum

Will the project be USGBC Registered and / or USGBC Certified – Primary Use?

Registered:	*Yes* / *No*	Certified:	*Yes* / *No*

Extreme Weather and Heat Events

Climate change will result in more extreme weather events including higher year round average temperatures, higher peak temperatures, and more periods of extended peak temperatures. The section explores how a project responds to higher temperatures and heat waves.

Analysis

What is the full expected life of the project?

Select most appropriate:	10 Years	25 Years	50 Years	75 Years

What time span of future Climate Conditions was considered?

Select most appropriate:	10 Years	25 Years	50 Years	75 Years

Analysis Conditions - What range of temperatures will be used for project planning – Low/High?

0 / 100 *Deg.*	

What Extreme Heat Event characteristics will be used for project planning – Peak High, Duration, and Frequency?

100 *Deg.*	4 *Days*	2 *Events / yr.*

What Drought characteristics will be used for project planning – Duration and Frequency?

30-90 *Days*	1 *Events / yr.*

What Extreme Rain Event characteristics will be used for project planning – Seasonal Rain Fall, Peak Rain Fall, and Frequency of Events per year?

48 *Inches / yr.*	8 in/hr *Inches*	1 *Events / yr.*

What Extreme Wind Storm Event characteristics will be used for project planning – Peak Wind Speed, Duration of Storm Event, and Frequency of Events per year?

105 mph *Peak Wind*	*Hours*	50 year storm

Mitigation Strategies

What will be the overall energy performance, based on use, of the project and how will performance be determined?

Energy use below code:	25 %	Approximately 25% as of MEPA submission		
Select compliance path:	Energy model	Prescriptive path	EnergyStar	Other, please

				describe

What specific measures will the project employ to reduce building energy consumption?

Select all appropriate:	High performance building envelop	High performance lighting & controls	Building day lighting	EnergyStar equip. / appliances
	High performance HVAC equipment	Energy recovery ventilation	No active cooling	No active heating
Describe any added measures:	low-flow fixture for DHW and machine roomless elevators			

What are the insulation (R) values for building envelop elements?

Roof:	*R* = 25	Walls:	*R* = 13
Foundation:	*R* = 19	Basement / Slab:	*R* = 10
Windows:	*R* = 2.6 / *U* = .35	Doors:	*R* = 2.7/ *U* = .37

What specific measures will the project employ to reduce building energy demands on the utilities and infrastructure?

	On-site clean energy / CHP system(s)	Building-wide power dimming	Thermal energy storage systems	Ground source heat pump
	On-site Solar PV	On-site Solar Thermal	Wind power	Describe any additional measures
Describe any added measures:	none			

Will the project employ Distributed Energy / Smart Grid Infrastructure and /or Systems? No

Select all appropriate:	Local Distributed Electricity connected	Building will be Smart Grid ready	Distributed steam / heat / chilled water connected	Building will be distributed thermal energy ready

Will the building remain operable without utility power for an extended period?

	Yes / No	If yes, for how long:	see note 1 below
If Yes, is service "Islandable?	see note 1 below		
If Yes, describe strategies:	see note 1 below		

Describe any non-mechanical strategies that will support building functionality and use during an extended interruption(s) of utility services and infrastructure:

Select all appropriate:	Solar oriented – longer south walls	Prevailing winds oriented	External shading devices	Tuned glazing,
	Building cool zones	Operable windows	Natural ventilation	Building shading
	Potable water for drinking / food preparation	Potable water for sinks / sanitary systems	Waste water storage capacity	High Performance Building Envelop
Describe any added measures:				

What measures will the project employ to reduce urban heat-island effect?

Select all appropriate:	High reflective paving materials	Shade trees & shrubs	High reflective roof materials	Vegetated roofs

Note 1: The building will be provided with emergency power generator and could be maintained for approximately 1 day before the fuel oil supply ran out. If a fuel oil truck was able to service the building each day the building could remain occupied. The current design does not include building heating or cooling systems on emergency power although the building is naturally ventilated which allows the occupant to open a window when too hot. The building generator also supports life safety lighting levels throughout the common areas of the building and will also power a domestic water booster pump for cold water distribution.

Describe other strategies:				

What measures will the project employ to accommodate rain events and more rain fall?

Select all appropriate:	On-site retention systems & detention ponds	Infiltration galleries & areas	Bioswales & vegetated water capture systems	Vegetated roofs
Describe other strategies:				

What measures will the project employ to accommodate extreme storm events and high winds?

Select all appropriate:	Hardened building structure & elements	Buried utilities & hardened infrastructure	Hazard removal & protective landscapes	Soft & permeable surfaces (water infiltration)
Describe other strategies:				

Sea-Level Rise and Storms

Rising Sea-Levels and more frequent Extreme Storms increase the probability of coastal and river flooding and enlarging the extent of the 100 Year Flood Plain. This section explores if a project is or might be subject to Sea-Level Rise and Storm impacts.

Location Description and Classification:

Do you believe the building to susceptible to flooding now or in the full expected life of the building?

Yes / No

Describe site conditions?

Site Elevation – Low/High Points: site existing low point = 14.65 BCB
site existing high point = 17.40 BCB

Building Proximity to Water: 100' Ft.

Is the site or building located in any of the following?

Coastal Zone:	Yes / No	Velocity Zone:	Yes / No
Flood Zone:	Yes / No	Area Prone to Flooding:	Yes / No

Are updates in the floodplain delineation due to climate change likely to change the classification of the site or building location?

Yes / No

What is the project or building proximity to nearest Coastal, Velocity or Flood Zone or Area Prone to Flooding?

0' Ft.

If you answered YES to any of the above Location Description and Classification questions, please complete the following questions. ***Otherwise you have completed the questionnaire; thank you!***

Sea-Level Rise and Storms

This section explores how a project responds to Sea-Level Rise and / or increase in storm frequency or severity.

Analysis

How were impacts from higher sea levels and more frequent and extreme storm events analyzed:

Sea Level Rise: ·75 *Ft.*

Frequency of storms: 1 per 100 year

Building Flood Proofing

Describe any strategies to limit storm and flood damage and to maintain functionality during an extended periods of disruption.

Will the building remain occupiable without utility power during an extended period of inundation:

Yes / No

If Yes, for how long: 1 day - see note 1 on two pages prior

Has the ground floor level been elevated in response to Sea Level Rise:

First Floor Elevation: min. = 16.30 BCB max. = 18.00 BCB

Height above 100 Year Floodplain: 0.84' to 2.54'

Will lower building levels be constructed in a manner to prevent water penetration:

Yes / No

If yes, what is the Flood Proof Elev. (height above 100 Year Floodplain): 17.00' to 18.00' BCB

What measures will be taken to ensure the integrity of critical building systems during a flood or severe storm event:

Systems located above 1st Floor.	Water tight utility conduits	Waste water back flow prevention	Storm water back flow prevention

Were the differing effects of fresh water and salt water flooding considered:

Yes / No

Will the project site and building(s) be accessible during periods of inundation or limited circulation and / or access to transportation:

Yes / No

If yes, to what height above 100 Year Floodplain: *Boston City Base* 36 Elev (19.7 Ft)

Will the project employ hard and / or soft landscape elements as velocity barriers to reduce wind or wave impacts?

Yes / No

If Yes, describe: The project team will evaluate landscape elements to reduce wave impacts

Describe any additional strategies to addressing sea level rise and or sever storm impacts:

See additional narrative on Climate Adaptability in EPNF

Building Resilience and Adaptability

Describe any strategies that would support rapid recovery after a weather event and accommodate future building changes that respond to climate change:

Will the building be able to withstand severe storm impacts and endure temporary inundation?

Select appropriate:			
Yes / No	Hardened / Resilient Ground Floor Construction	Temporary shutters and or barricades	Resilient site design, materials and construction

Can the site and building be reasonably modified to increase Building Flood Proofing or rising sea levels?

Select appropriate:	*Yes* / *No*	Surrounding site elevation can be raised	Building ground floor can be raised	Construction been engineered
Describe additional strategies:	The ground floor can be raised above the 100-yr flood, defined in the 2009 FEMA maps and the equipment can be raised above the ground floor elevation to offer further protections.			

Has the building been planned and designed to accommodate future resiliency enhancements?

Select appropriate:	*Yes* / *No*	Solar PV	Solar Thermal	Clean Energy / CHP System(s)
		Potable water storage	Wastewater storage	Back up energy systems & fuel

Describe any additional strategies:

The project team will evaluate future resiliency enhancements over the upcoming months.

Thank you for completing the Boston Climate Change Resilience and Preparedness Checklist!

For questions or comments about this checklist or Climate Change Resiliency and Preparedness practices, please contact: John.Dalzell.BRA@cityofboston.gov